

2011-2012



2011-12 Yearbook

Department of Environment and Conservation



Department of
Environment and Conservation



Acknowledgments

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Recommended reference

The recommended reference for this publication is:

Department of Environment and Conservation 2012

2011–12 Yearbook, Department of Environment and Conservation, Perth

ISSN 1839-888X (Print) ISSN 1839 8898 (Online)

December 2012

Cover photographs

Left: Environmental officer Saorla Finucane. Photo – Peter Nicholas/DEC

Right: Senior wildlife officer Rick Dawson with a Carnaby's cockatoo. Photo – Leighton De Barros

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Foreword

DEC's Yearbook is a companion volume to its Annual Report. The department has a responsibility to protect and conserve the state's environment on behalf of the people of Western Australia. Many members of the public have a very keen interest in what is being done to maintain a healthy environment for us to live in and enjoy a good quality of life and to protect and conserve the wildlife and landscapes they care so deeply about. It is a passion that is shared by the department's staff who are engaged in a wide variety of activities across the state, activities that range from inspecting industrial premises identified as being a potential environmental hazard to researching coral reef health in a marine park. The Yearbook is an opportunity to provide some detail about the diverse projects and programs and list achievements at various levels of activity, from big-ticket items such as the creation of two new marine parks to day-to-day activities such as monitoring Perth's air quality.

An extraordinary level of commitment to the environment and the community sees staff frequently go above and beyond expectations in so many different ways—disentangling whales, responding to pollution incidents, fighting fires, tracking endangered animals—and often in difficult and inhospitable environments. In many activities staff are supported by volunteers whose efforts and passion are much appreciated. The challenge of looking after our environment is significant and cannot be done by the department alone.

As well as providing an insight into the broad range of work undertaken by the department, the Yearbook also presents various records and statistics that are of public interest. These statistics include the number of specimens held by the Western Australian Herbarium, details of prescribed burns undertaken, translocations of threatened species and the number of reported visits to DEC-managed parks and reserves.

I am pleased to present the 2011–12 DEC Yearbook for the public record, and take this opportunity to thank the many DEC staff and volunteers who continue to strive for the health and sustainability of Western Australia's environment.

A handwritten signature in black ink that reads "Keiran McNamara". The signature is written in a cursive, flowing style.

Keiran McNamara
Director General

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Camden Sound Marine Park includes key calving habitat of the humpback whales that migrate along Western Australia's coast each year.

PART ONE: OVERVIEW



Injidup Beach, Ngari Capes Marine Park.

Key events and issues 2011–12

Two new parks part of greater plan to protect WA's marine treasures

The creation of two new marine parks, Western Australia's 11th and 12th, made 2011–12 a significant year in the state's conservation history.

On 12 and 19 June 2012 respectively, the Ngari Capes and Camden Sound marine parks were gazetted, increasing protection for two areas of outstanding biodiversity conservation value.

Ngari Capes Marine Park lies about 250 kilometres south of Perth. It covers about 124,000 hectares and stretches from Geographe Bay in the north to Flinders Bay in the south and extends seaward to the three nautical mile limit of state waters.

Funding of \$8.56 million over four years has been allocated by the state government to DEC and the Department of Fisheries to establish and manage the new marine park which features one of the most diverse temperate marine environments in Australia.

Warm, tropical waters of the Leeuwin Current mingle with the cool waters of the Capes Current, resulting in a high diversity of fish, seagrasses growing at extraordinary depths, whales, dolphins and a network of intertidal and subtidal reefs.

Many species found in the marine park are endemic to the southern coast of Australia, with extensive seagrass, seaweed and estuarine habitats functioning as spawning, nursery and feeding grounds for a wide range of marine animals.

The marine park and adjoining Leeuwin-Naturaliste National Park contribute to the distinctive character of the Capes region and provide outstanding nature-based recreation and tourism opportunities.

The Camden Sound Marine Park, the first of four new marine parks to be created under the *Kimberley Science and Conservation Strategy*, covers about 673,000 hectares. It stretches from Brunswick Bay just south of Cape Wellington, into St George Basin and continues south to incorporate Montgomery Reef.

This is the first marine park to be created in Western Australia in which joint management with the traditional owners of the area (the Dambimangari, Uungguu and Mayala), will be offered under the *Conservation and Land Management Act 1984* amendments.

The marine park includes key habitat of the humpback whale population that migrates annually along Western Australia's coast.

It also encompasses a wide range of marine habitats and associated marine life such as coral reef communities, rocky shoals, and the extensive mangrove forests and marine life of St George Basin and Prince Regent River. The marine park is home to a range of species listed as having special conservation status.

In addition to providing protection for a large, biologically diverse and spectacular part of the Kimberley, the marine park maintains recreation and tourism opportunities, which are an important focus of management of the area.

Protecting WA's marine bioregions

The creation of the Ngari Capes and Camden Sound marine parks contributes to progressively establishing a statewide representative system of multiple-use marine parks to conserve marine biodiversity and provide special places for people to enjoy, appreciate and learn about the spectacular marine life of Western Australia.

Western Australia's marine flora and fauna belong to two biogeographical provinces; a southern temperate province, and a tropical province in the north. Many of the marine plants and animals of southern Australian waters are found nowhere else in the world and the flora is among the most diverse in the world. The northern region is characterised by shallow-water tropical marine ecosystems with high species richness and a high diversity of habitats.

Between these two broad biogeographical provinces is an overlap zone, which stretches from Ningaloo Marine Park in the north to Cape Leeuwin in the south. Plant and animal types in this overlap zone combine different proportions of both tropical and southern species.

The marine environment of Australia is divided into 60 different bioregions based on the evolutionary origins and present distributions of marine plants and animals. Nineteen of these bioregions are contained in full or part within Western Australian coastal waters. To date, marine parks exist in nine of these bioregions. A representative system of marine parks covering the diversity of bioregions is progressively being established.



Premier Colin Barnett, DEC Director General Keiran McNamara, Leeuwin-Naturaliste National Park ranger Gilbert Stokman and Environment Minister Bill Marmion

Legislative changes increase Aboriginal participation and involvement on DEC-managed lands and waters

In September 2011, the state Parliament passed the *Conservation Legislation Amendment Act 2011*. Some sections came into effect on 14 March 2012, providing a mechanism for joint management of lands and waters between DEC and other parties, including traditional owners. Other sections of the Act, to come into effect in 2012–13, enable Aboriginal people to fulfil longstanding aspirations to carry out traditional activities on DEC-managed lands and waters.

The amendments have come about as a result of DEC's experience of working with Aboriginal people over many years, the growing understanding of the intrinsic connection between Aboriginal people and country, and recognition of the need to protect and conserve the value of the land to the culture and heritage of Aboriginal people.

The new legislation enables DEC to enter into voluntary agreements to jointly or solely manage private land, pastoral lease land, Crown lands and waters, and lands and waters vested in the Conservation Commission of Western Australia and the Marine Parks and Reserves Authority.

Each joint management agreement will establish how the land is to be managed and how decisions about the management of the land are made, but will not change the underlying tenure of the land.

"Joint management arrangements will provide increased opportunities for Aboriginal people to be actively involved in and contribute their knowledge to the management of the land," senior policy officer Judith White said.

Successful joint management arrangements with Aboriginal people are being implemented in the Kununurra and Broome areas with the Miriuwung and Gajerrong and Yawuru traditional owners respectively. These agreements can now be formalised under the new provisions of the *Conservation and Land Management Act 1984*.

The new legislation will also enable Aboriginal people to undertake customary activities such as food gathering, traditional medicine, artistic, ceremonial and other cultural activities on DEC-managed lands and waters.

The team behind the installation of signs at six new conservation parks established under the Ord Final Agreement that are jointly managed by DEC, the Miriuwung-Gajerrong Aboriginal Corporation and the Yoorrooyang Dawang Regional Park Council.



“The ability to carry out customary activities is an important part of Aboriginal culture, helping to reinforce spiritual beliefs and connection to country and providing a way of passing cultural knowledge on to younger generations,” Ms White said.

DEC staff, other government agencies and key external stakeholders including native title representative bodies and Aboriginal body corporate have been invited to comment on regulations being drafted to support the legislative changes.

The regulations are also dependent on ongoing 'local area arrangements' that will be established between DEC regions and districts and the local Aboriginal communities and families undertaking activities in that area.

“These arrangements would be entered into in good faith, will facilitate joint learning and joint management of local conservation issues, will be ongoing, and will be used as an alternative to regulating in the first instance,” she said.

Further information about the legislative changes is available on the DEC website:

www.dec.wa.gov.au/management-and-protection/land/joint-land-management

www.dec.wa.gov.au/news/archives/774-community-updates/6387-conservation-legislation-amendment-bill



DEC makes good progress in implementing Kimberley strategy

The creation of a 673,000 hectare marine park in Camden Sound, the establishment of key partnerships and landscape-scale conservation works are just some of the key outcomes achieved under the *Kimberley Science and Conservation Strategy*, the state government's historic conservation initiative launched in June 2011.

With an implementation budget of \$63 million over five years and a commitment to ongoing funding for key initiatives, the strategy provides the framework to conserve the Kimberley's outstanding natural values and provide new opportunities for Aboriginal involvement and employment, and nature-based tourism.

The strategy takes a landscape-scale approach to conservation, and delivers increased resources to manage threats caused by fire, feral animals and weeds across property boundaries. It is being delivered through partnerships with traditional owners, landholders, industry and non-government organisations.

The centrepiece of the strategy is the creation of the Kimberley Wilderness Parks, which will be the state's biggest interconnected system of marine and terrestrial parks. It includes the creation of a conservation corridor linking Prince Regent National Park and Drysdale River National Park across the remote north Kimberley through voluntary partnerships, and the protection of some of the Kimberley's most significant islands.

During 2011–12, the Camden Sound Marine Park was created and an indicative management plan for the proposed Eighty Mile Beach Marine Park was released for public comment. An indicative management plan for the proposed Roebuck Bay Marine Park is being developed with Yawuru traditional owners. DEC continued to work with traditional owner groups towards developing indigenous land use agreements and joint management arrangements for the marine parks.

DEC continued implementing a landscape-scale approach to conservation and improving the management of fire, introduced animals and weeds.



Bunuba Rangers installing pitfall traps for a biological survey.



Bunuba Ranger Rory Williams on patrol in Geikie Gorge National Park looking for weed infestations along the banks of the Fitzroy River and checking the freshwater sawfish sonar recorders.

An expanded early dry season prescribed burning program across the central and northern Kimberley was undertaken in cooperation with the Kimberley Land Council and ranger groups, traditional owners, the Australian Wildlife Conservancy (AWC) and pastoralists.

Between mid-February and June 2012 about 26,000 kilometres and 355 hours were flown in two aircraft covering about 6.1 million hectares. Post fire season satellite imagery showed that about 3.2 million hectares of DEC-managed lands and unallocated Crown lands, and 2.8 million hectares of Aboriginal Lands Trust lands had been successfully treated with fire creating a mosaic of burnt and unburnt patches across the landscape. More than 130 traditional owners, Aboriginal rangers and ranger coordinators were involved in the planning, training and implementation of the fire program across five native title areas.

An agreement was also signed with the AWC that provides government funding for conservation partnerships on the Tableland pastoral lease in the central Kimberley, the Artesian Range in the central-west Kimberley and to address the problem of large destructive bushfires on 12 pastoral leases in the central Kimberley for the *Ecofire* project, which is built around regionally coordinated fire management.

DEC continued its feral animal control program targeting feral cattle in the north Kimberley, with approximately 2,000 feral cattle culled from pastoral leases, unallocated Crown lands and conservation reserves. Following a pig control and firearms training workshop held by DEC in 2011, the Bunuba Rangers at Fitzroy Crossing are now employed in pig control work across the Fitzroy Valley.

Targeted weed control has also been undertaken on the Mitchell Plateau, with wet season control works conducted by DEC and the Uunguu Rangers in January 2012. The Wunggurr Rangers have completed

fee-for-service weed control of taro at Mt Hart and the Bunuba Rangers have conducted control of the weed *Calotropis* along the Milliewindie Track and worked with DEC staff to control a variety of weeds in Geikie Gorge National Park. With each of these groups, planning is underway for an expanded wet season weed control program.

DEC also contributed funds and support to CSIRO to conduct research on the stinking passion flower (*Passiflora foetida*) and to control two Weeds of National Significance: rubbervine (*Cryptostegia grandiflora*) and mesquite (*Prosopis* spp.).

The framework for monitoring and evaluating the *Kimberley Science and Conservation Strategy* is complete and field survey work has started. Fieldwork as part of an ongoing monitoring program was undertaken from June to September, to investigate if altered fire regimes and cattle grazing influence the abundance and distribution of threatened mammals in the north Kimberley. Thirty-five sites—representing a gradient in geological substrates, vegetation types and disturbance history—were surveyed in the north and central Kimberley.

Under the nature-based tourism component of the strategy, visitor facilities have been improved at Piccaninny Creek and Mini Palms in Purnululu National Park, and work has started on the Mitchell Falls Road and the camp site near King Edward River.

The *Kimberley Science and Conservation Strategy* is available on the DEC website: www.dec.wa.gov.au/management-and-protection/land/major-initiatives/kimberley-science-and-conservation-strategy



A planigale found during a biological survey carried out by the Bunuba Rangers.



Prescribed aerial burning in sandstone and spinifex heaths in Prince Regent National Park.

Fire research underway in Great Western Woodlands

Fire research and monitoring being done in the Great Western Woodlands will provide a basis for adapting and improving fire management in the area recognised for its great biological richness.

Altered fire regimes are the most significant threat to biodiversity values of the woodlands, and the research is part of *A Biodiversity and Cultural Conservation Strategy for the Great Western Woodlands*, released in November 2010 to guide the protection and management of the region in the state's south-east.

The strategy's key priorities include raising public awareness of the area, creating voluntary partnerships to coordinate on-ground activities across the many land tenures of the region, implementing an integrated fire management program, and establishing a Great Western Woodlands Reference Group to provide advice on implementation of the strategy and management of the woodlands.

Other key priorities include creating training and employment opportunities for local Aboriginal people, better control of weeds and pest animals, and research to increase the knowledge base to guide management and use of the woodlands and their resources.

In 2010–11, DEC was allocated \$3.8 million over three years for the development and initial implementation of the strategy.

To address the threat posed by altered fire regimes, a Fire Management Plan for the Great Western Woodlands has been developed and on-ground fire management projects have started.

Significant progress was made towards establishment of a strategic fire access network that will assist in providing safe and timely access for bushfire suppression and fire management operations.

With the increased investment under the strategy a number of prescribed burns were undertaken in the woodlands for the purposes of protecting biodiversity and ecological processes.



Salmon gum and gimlet woodland in the Great Western Woodlands.
Photo – Aminya Ennis/DEC.



Entry sign at one of the main entrance routes to the Great Western Woodlands. Photo – Aminya Ennis/DEC.



Access upgrades completed at Peak Charles National Park. Photo – Ian Hughes/DEC.

Measures being undertaken include an investigation of the effects of fire on gimlet woodlands and the monitoring of planned and unplanned fire to identify the effects on environmental values. This research will provide a basis for adapting and improving fire management in the Great Western Woodlands.

A logo and colour theme have been developed for the Great Western Woodlands to assist efforts to raise awareness of the region.

Other projects aimed at creating greater appreciation and understanding of the Great Western Woodlands include the installation of entry signs at main entrance routes and information signs at key recreation sites.

A field guide and brochure about the woodlands' natural and cultural values are being developed. DEC is also working with local community groups to develop Great Western Woodlands education resources for teachers.

Recreation sites at Credo station and Peak Charles National Park are being redeveloped to improve recreational experiences. Access and parking at both sites and the walk trail at Peak Charles have been upgraded and further work, including interpretation signs, is planned for 2012–13.

The involvement and employment of Aboriginal people in conservation and land management is a key priority in the conservation strategy. DEC has formed a partnership with the Goldfields Land and Sea Council to fund the employment of staff in the council to involve Aboriginal people in the planning and management of the Great Western Woodlands.

The South Coast Natural Resource Management (NRM) and DEC have agreed to work in partnership to consolidate and standardise existing vegetation mapping for the Great Western Woodlands.

Work has started on the development of a pest animal and weed control plan to identify and map priority weed and pest animal populations in the woodlands and determine the most cost effective means of control. Eradication of some of the known weed infestations in the woodlands has started.

The Great Western Woodlands Reference Group met once in 2011–12 and provided valuable advice to the department on the implementation of the strategy.

More information about the strategy and the Great Western Woodlands is available on the DEC website: www.dec.wa.gov.au/greatwesternwoodlands

WA cementing its place as a premier ecotourism destination

The state government's ecotourism initiative *Naturebank* achieved a significant milestone during 2012 with the opening of the first two *Naturebank* operations.

Naturebank aims to provide low-impact, sustainable, nature-based tourism operations in the state's national parks by identifying sites that are suitable for sustainable ecotourism operations and then preparing them for development.

The program is managed through a partnership between DEC and Tourism Western Australia and will assist in making Western Australia a premier ecotourism destination.

Naturebank offers opportunities for suitably experienced business developers to establish ecotourism ventures offering exceptional experiences that will give visitors lasting memories and an appreciation of Western Australia's ancient landscapes and cultures.

Naturebank, which receives *Royalties for Regions* funding, will help encourage tourism operators to grow regional businesses by investing in ecotourism opportunities. *Naturebank* projects also provide employment and training opportunities in regional areas and stimulate businesses through the purchase of local goods and services.

The first two *Naturebank* sites to start operating are in Purnululu National Park and King Leopold Ranges Conservation Park.

Broome-based Kimberley Wild Expeditions developed a new safari camp at Kurrajong in Purnululu National Park, a World Heritage listed area recognised for its distinct cultural, geological and ecological features—particularly the Bungle Bungles massif, which attracts more than 26,000 visits a year.



Kurrajong Camp, Purnululu National Park.

Another WA-based tourism operator, Kimberley Wilderness Adventures, was the successful applicant for the Mt Hart Wilderness Lodge in the King Leopold Ranges. Situated north of the popular Gibb River Road adventure route, Mt Hart Wilderness Lodge is an ideal base from which to explore some of the major attractions of the Kimberley region.

During 2011–12, a *Naturebank* site in Margaret River, Wharncliffe Mill, was opened to expressions of interest and a site at Francois Peron National Park, in the Shark Bay World Heritage Area, was assessed and is being prepared for release.

Further information about Naturebank is available on the DEC website:
www.dec.wa.gov.au/parks-and-recreation/for-industry/naturebank

Mt Hart Wilderness Lodge, King Leopold Ranges Conservation Park.



Industry regulation reform program forges ahead

DEC's major reform project, *Re-Engineering For Industry Regulation and Environment* (REFIRE), is making good progress in streamlining approval processes for industry and improving the department's effectiveness and efficiency as a regulator.

DEC Environmental Regulation Division director Alan Sands said the program, launched in July 2010, had delivered wide-ranging improvements in the procedures, processes and assessments methodologies for works approvals and licences.

As part of the reform the work sections responsible for managing industry regulation were restructured and the Industry Regulation Licensing Branch, Industry Regulation Support Branch and Industry Regulation Compliance Branch were created.

"This will ensure that DEC's regulatory function is effective and sector-focused. The re-engineered licensing system provides legislative and regulatory support and an effective, focused compliance regime," Mr Sands said.

"This reform aims to remove duplication and overlap and to improve regulatory efficiency, consistency, quality and effectiveness. It also will have significant benefits for DEC's customers in having a clear and simple process to follow. REFIRE products include:

- a generic licence generating system
- sector specific licence templates
- premises risk appraisal tools
- licence/works approval decision documents
- policies
- officers' guides
- e-learning training modules.

Mr Sands said significant progress had been made on the development of an approvals applications package that includes publications for external users such as an industry regulation process guide and an overarching emissions assessment framework.

"This framework is supported by a number of technical annexes relating to specific emission types," he said.

DEC is working with the Office of the Environmental Protection Authority to ensure the framework complements approvals processes under both Part IV and Part V of the *Environmental Protection Act 1986*.

The Industry Regulation Information and Support document library and system was also established as part of the reform program and now includes a complete set of documents that are automatically uploaded to licence case files by the industry licensing system workflow.

Mr Sands said a further upgrade of the industry licensing system software had added new features and 'bug' fixes to improve ease of use and workflow to make it easier to track the progress of new licence and works approval applications, and to increase flexibility in reassigning applications to overcome issues arising from temporary unavailability of staff.



REFIRE team member Ruth Dowd, environmental officer Lauren Trott and REFIRE project manager Tony Wynne with the first licence issued using the templates developed as part of the REFIRE program.

Other organisational highlights

A big move for WA Herbarium

In a mammoth undertaking, the WA Herbarium's collection of more than 700,000 plant specimens was moved from the former WA herbarium building to the new facility at the purpose-built WA Conservation Science Centre.

Work to prepare the collection for the move started in 2008 and it took five months, from 30 May to 4 November 2011, to pack and move the 40,000 boxes containing the entire collection.

DEC Herbarium Collections manager Karina Knight said the specimens were packed and moved in an order that ensured they were available for research purposes as soon as possible after arrival at the new building.

"However, before this could be achieved, each box of specimens had to be loaded into the large freezers at the new facility and kept at -18° C for a week to ensure harmful insects that can destroy specimens were not brought into the new herbarium," she said.

"At the old herbarium, specimens were housed in open pigeonhole shelving, but the decision was made early in the planning process that they should be housed in boxes in the new herbarium.

"The main benefit of a box is that it affords better protection for the specimens from general handling and pest incursion, and allows more efficient use of the vertical space available.

"It is the first herbarium box design in the world that has a front entrance, as well as being shower and insect proof."



The Western Australian Herbarium is now housed in the purpose-built Western Australian Conservation Science Centre. Photo – Peter Nicholas/DEC.

The WA Herbarium houses the state's entire collection of plant specimens that are preserved indefinitely. The collection provides a core resource for knowledge of the state's flora and fungi, which contributes to, supports and services the research, conservation and decision-making activities of DEC.

Following completion of the move, DEC Director General Keiran McNamara thanked members of the WA Herbarium collections team for their outstanding efforts, saying they had gone above and beyond the call of duty.

"This significant project has been one of the main activities of the collections team, while continuing to maintain the herbarium and its services and all other curatorial duties," he said.

"Before that, the collections team was intimately involved in the design of the building—which is now one of the world's best herbaria in physical layout—and conditions for ensuring the safety of the collection and for facilitating research."

During the move, the entire collection was rearranged from a 19th century systematic arrangement into a modern 21st century arrangement, making the WA Herbarium one of the few herbaria in the world to have achieved this.



Herbarium staff members Meriel Falconer and Sue Carroll working in coolroom conditions at 13 degrees, pack plant specimens into boxes for the move to the new building.



Louise Biggs, Cheryl Parker and Meriel Falconer pack the first few boxes

DEC future leaders show the way

DEC's annual Graduation and Awards Ceremony was held in May 2012 at the WA Conservation Science Centre, with Environment Minister Bill Marmion and DEC Deputy Director General Parks and Conservation Jim Sharp on hand to congratulate the deserving and committed recipients.

The ceremony marked the achievements of participants in the department's *Mentored Aboriginal Training and Employment Scheme (MATES)*, *Regulatory Training Program*, *Pathways Program*, *Frontline Management Program* and *Scholarships Program*.

The MATES program celebrated its 10th anniversary. The MATES program started in 2002 to enable the department to address Aboriginal concerns regarding the transition to joint land management arrangements and the development of young Aboriginal people in preserving cultural heritage, caring for country and providing long-term employment and career opportunities with the department.

The original program proposal was to employ 18 trainees over six years to obtain qualifications in conservation and land management to enable them to be competitive for job vacancies as they arose. To date more than 80 trainees have graduated from the program with a further 16 expected to qualify during the next 18 months.

Ten employees graduated from certificates II and III in Conservation and Land Management in 2012 and were recognised at the ceremony. They were Timothy Champion, Jason Fong, Peter Lavern, Jeremy McGinty, Curtis Robinson, Victor Smith, Douglas Gerrard, Jordan Hayden, Gordon Reid and Chris Retsas.

Jason Fong received the *Aboriginal Trainee of the Year Award*. Minister Bill Marmion presented the award, which recognised Jason's outstanding work as a trainee in the Kimberley Region.

The *Aboriginal Trainee Supervisor of the Year*, awarded to the supervisor within the MATES program who has demonstrated the highest level of support and commitment to the development of trainees under their supervision, was awarded to Kimberley Region senior operations officer Bill Dempsey.

Aboriginal Trainee of the Year Jason Fong and Environment Minister Bill Marmion.



'Kwabalitch' is a Nyoongar word that means 'excellent' or 'good'. The *Kwabalitch Award* was established to recognise a MATES trainee with dedication, perseverance and a commitment to personal and professional development. Jeremy McGinty received the award for his commitment and passion for country and his dedication and willingness in furthering not only his own goals but those of his colleagues, family and the Dawang people he represents.

Regulatory Training Program—the *Regulatory Training Program* provides a competency-based training framework for environmental enforcement and investigation officers. These qualifications are the best-practice standard for environmental regulators and other staff involved in regulatory activities.

Graduates in 2012 were Cristina Angel, Cliff Bliss, Mark Brand, Matthew Broadbent, Pia Courtis, Danielle Eyre, Paul Fanetti, Lauren Fox, Tim Frances, Jessica French, Tanya Gilders, Sharon Glasgow, Robert Goodfellow, Chris Goodsell, Rebecca Griffiths, John Hall, Grant Hymus, Peter Knol, Sonya Krishnan, Chris Malley, Peter May, Sean McSevich, Tim Moore, Wayne Moroney, Jason Nelson, Marko Pasalich, Chris Phoebe, Jonathan Pridham, Rebecca Rosa, Suzanne Roworth, Dale Stanton, Damian Thomas, Lauren Trott, Brad Waghorn and Neville Welsh.

Pathways Program—DEC has a proud and strong culture of encouraging its staff on a path of continuous learning. The program aims to recognise the skills and knowledge of conservation employees and expand their professional experience and expertise.

Pathways Program graduates in 2011 were Zoe Air, Mitchell Bennett, Ross Bernardin, Daniel Biddulph, Dallas Brennan, Laurie Bryant, Roslyn Burnside, Jordan Cantelo, Raymond De Jong, Adam Edwards, Harry Everett, John Hordienko, Benjamin Kreplins, Jai Latham, George Laws, Lincoln Marissen, Laura Matison, Carolina Paice, Jeremy Preston, Danny Shilling, Shane Tyler, Mark Varley, Andrew Wall and Cenovito Zamudio.

Frontline Management Program—DEC's management and leadership framework identifies and develops current and future leaders, as well as addressing succession management in key DEC positions and the retention of corporate knowledge. The *Certificate IV in Frontline Management* graduates in 2012 were Matthew Broadbent, Jason Nelson and Matthew Swan.

Scholarships—each year, the department awards a number of scholarships to encourage DEC staff to expand their skills and qualifications through higher education.

This year the Science Scholarship in memory of Dr George Malajczuk was awarded to Wendy Chow, Cassidy Newland, Ricky Van Dongen and Sean Walsh.

The Leadership Scholarship in memory of Seamus Mulholland was received by Winston Kay, and the Women's Scholarship in honour of June Craig was awarded to Caron Macneall and Tina Runnion.

The Director General's Career Development and Study Assistance Scholarship provides support for undergraduate and postgraduate study and was awarded to Farah Adeeb, Vaughn Chapple, John Edwards, Lauren Fox, Craig Jaques, Cherie Kemp, Jessica Mann, Jelena May, Wendy Muir and Lucinda Peters.

MATES graduates with DEC Deputy Director General Parks and Conservation Jim Sharp (left) and Environment Minister Bill Marmion (centre).





Regulatory Training Program graduates with Environment Minister Bill Marmion (front, second from left).



Pathways Program graduates with DEC Deputy Director General Parks and Conservation Jim Sharp (left) and Environment Minister Bill Marmion (centre).



Scholarship recipients with DEC Deputy Director General Parks and Conservation Jim Sharp (third from left) and Environment Minister Bill Marmion (fourth from left).

Ten years of recognising champions of the environment

The City of Cockburn was named overall winner at the 2011 WA Environment Awards in recognition of its innovative and successful *Sustainability and Climate Change program*.

Presenting the award at a gala dinner in November 2011, Environment Minister Bill Marmion said the council was a standout entrant with its commitment to promoting sustainability in the local community.

“The City of Cockburn’s exemplary effort towards this goal includes a range of initiatives from the Sustainable Living Home Online website; Sustainable Renter’s Guide; *Dry Cell Battery Recycling program*; and the *Beyond Gardens—GardenWise seminar*,” Mr Marmion said.

“The high standard of achievement of the winners and finalists highlights the commitment, passion, drive and innovation of entrants to develop and implement projects. Their tireless work to protect and improve our environment sets a great example for others to follow.

“Much of the environmental work being done by the state government relies on community involvement and support—the awards are an excellent way to acknowledge work well done.”

There was a record 112 entries from across the state and the winners were selected from 46 finalists.

In the 10 years since the awards began, the program has steadily grown—a reflection of the respected status of the awards and the increasing awareness of the importance of environmental issues. In this time, the categories have been updated in line with emerging environmental and community priorities.



Environment Minister Bill Marmion presents the overall winner’s award to the City of Cockburn’s Engineering and Works Director Michael Littleton. Photo – Terrace Photographers Pty Ltd.

The winners of the 2011 *WA Environment Awards* were:

Overall 2011 WA Environment Awards Winner—City of Cockburn—*Sustainability and Climate Change* program

Biodiversity Conservation—City of Stirling—*Threatened and Endangered Species Protection and Habitat Restoration*

Bush, Land and Waterways—Chittering Landcare Group—Chittering Landcare Centre

Community Achievement—Metropolitan Category—South East Regional Centre for Urban Landcare

Community Achievement—Regional Category—Wellstead Historical and Heritage Committee

Corporate Business Leading by Example—St John of God Health Care—*Safeguarding our environment*

Environmental Education and Communication—Conservation Volunteers—*Rio Tinto Earth Assist*

Rivers, Estuaries and Wetlands—Regina Drummond—Brixton Street Wetlands, Kenwick

Government Leading by Example—City of Cockburn—*Sustainability and Climate Change* program

Resource and Waste Management—Murdoch University—Best Practice Recycling System at Murdoch University

Small Business Leading by Example—The Painted Fish

The 2011 *WA Environment Awards* were sponsored by: Publishers National Environment Bureau, Western Power, Swan River Trust, *Royalties for Regions*, the Packaging Stewardship Forum, Whiteman Park, Rheem and the Waste Authority.



The team from the City of Cockburn with the award for Government Leading by Example.
Photo – Terrace Photographers Pty Ltd.

Forest monitoring supports biodiversity protection strategy

Findings from the first five years of the *FORESTCHECK* monitoring program have provided support for the way in which biodiversity is being protected in Western Australian forests through formal reserves, informal reserves and the protection of habitat in areas subject to timber harvesting.

DEC Landscape Conservation program leader, Lachie McCaw, said the monitoring, which looked at both harvested and reference forest, found that most species groups were resilient to the disturbances imposed.

“Silvicultural treatments also had little impact on species richness; however, the species composition of communities was different for areas subject to different harvest treatments,” he said.

FORESTCHECK is an integrated monitoring system designed to support forest management in the south-west of Western Australia by providing information about changes and trends in key elements of forest biodiversity associated with management activities.

There are 48 *FORESTCHECK* monitoring grids, each two hectares in size, established at five locations in four jarrah forest ecosystems comprising:

- forest that had never been harvested or forest that had not been harvested for at least 40 years
- forest coupe buffers
- shelterwood and/or selective cut treatment areas, that is a silvicultural treatment that involves partially reducing in density the overstorey trees to help regenerate from the remaining mature trees
- gap release treatment areas, that are areas where an opening is made in the overstorey canopy to reduce competition and allow seedlings to grow.

Locations were chosen according to a range of environmental parameters including rainfall, evapo-transpiration and soil fertility and each grid was matched according to vegetation complex and the amount of time that had elapsed since a given silvicultural or fire treatment.

Each grid was assessed for attributes such as forest structure, soil condition and levels of leaf litter and coarse woody debris, as well as elements of biodiversity including vascular flora, vertebrate fauna (birds, mammals and reptiles), cryptogams (lichens, liverworts and mosses), macrofungi and invertebrate fauna.

The results of the first five years of monitoring, undertaken between 2001 and 2006, were published in a series of papers in a special edition of *Australian Forestry* in December 2011.

In summary, the results showed that:

- More than 2,500 species were recorded across all 48 monitoring grids.
- Few significant impacts were evident, and most species groups were resilient to the disturbances imposed.
- Harvesting resulted in an average increase of 18 per cent in soil bulk density (soil compaction) and more than 50 years may be needed for biological processes to reverse the increase.
- Harvesting methods had little impact on species richness, but species composition of communities was different for different harvesting methods.
- Cryptogams (especially lichens) were the species group most sensitive to disturbance, although recovery of species richness was nearly complete 10 years after disturbance.
- For all species groups studied, species compositions on grids harvested 40 or more years earlier were indistinguishable from that on grids that had never been harvested.
- Silvicultural disturbance (timber harvesting and associated burning) was associated with increased species richness for fungi on wood and terrestrial vertebrates, and decreased species richness of cryptogams.
- Time since the last (prescribed) fire had no long-term impact on any species group.

- Fox baiting had a greater impact on terrestrial vertebrates than did silvicultural treatments.
- Very few taxa were sufficiently widespread or sufficiently responsive to silvicultural disturbance to be of value as bio-indicators, demonstrating the superiority of biodiversity monitoring over bio-indicator monitoring.

Dr McCaw said the focus of *FORESTCHECK* was on timber harvesting and silvicultural treatments in jarrah (*Eucalyptus marginata*) forest but the program had potential for a much wider application.

Further information about *FORESTCHECK* is available on the DEC website:

www.dec.wa.gov.au/our-environment/science-and-research/landscape-conservation-research/forestcheck



The Dryandra moth (*Cartheae saturnioides*) is endemic to the south-west of WA. Photo – Richard Robinson/DEC.



The banjo frog (*Limnodynastes dorsalis*) has a distinct 'top or bonk' note heard in the wetter regions of the south west. Photo – Richard Robinson/DEC.



Cortinarius erythrocephalus is an uncommon fungus, but an important mycorrhizal partner for eucalypts and many understory shrubs. Photo – Richard Robinson/DEC.



Usnea scabrata is a common lichen found attached to the branches of many understory shrubs and small trees. Photo – Richard Robinson/DEC.

Stunning views from new Granite Skywalk

Visitors to the Albany area can enjoy a spectacular new sight-seeing experience following a revamp of the Castle Rock lookout in Porongurup National Park.

Opened in April 2012, the Granite Skywalk offers stunning panoramic views both of the park's granite domes that rise to 670m above sea level and the surrounding countryside out to the ocean.

Environment Minister Bill Marmion said the \$1.5 million skywalk included an upper lookout to replace the old one, which was past its use-by date.

"There is also a lower lookout to provide easier access for more people to enjoy the panorama," Mr Marmion said.

"Several handholds have also been installed to help people reach a ladder to climb to the upper lookout."

The Castle Rock day-use site has picnic tables, barbecues and toilets, and meets accessibility guidelines for people with disabilities.

The Minister said Porongurup National Park, just 48 kilometres north of Albany, was one of most distinctive parks in the state.

"The park features numerous walks and picnic areas and has an area of karri forest that is approximately 70 kilometres from the main karri belt between Manjimup and Denmark," he said.

"The karri understorey includes some of the very colourful and diverse shrubbery associated with this forest type."

The 2,600-hectare park contains 750 native plant species.

Further information about the Granite Skywalk is available on DEC's website:

www.dec.wa.gov.au/parks-and-recreation/431-touring-western-australia/6662-granite-skywalk-open





The Granite Skywalk at Castle Rock. Photos – Andrew Halsall.

Prototype mallee harvester developed

In a significant breakthrough in a long-running cooperative project, which DEC has been involved in from the start, a prototype mallee harvester was successfully developed and trialled.

The final development of the harvester was done under a grant from the state's *Low Emissions Energy Development* (LEED) fund, with investment by a range of other partners including Biosystems Engineering and the Future Farm Industries Cooperative Research Centre (CRC).

The prototype harvester is the first LEED fund-supported project to be completed. A total of \$1.5 million was provided to the Future Farm Industries CRC for the innovative project.

The mallee harvester achieved an average harvest rate of 38 tonnes per hour, almost double the initial milestone objective, and has attracted the attention of a number of companies including Airbus, General Electric and Virgin Australia, which have joined a consortium with Future Farm Industries CRC to develop a sustainable jet fuel from biomass.

Forestry companies in Brazil have also shown a strong interest and are likely to be the foundation for the commercialisation of the harvesting technology.

The successful development of the prototype mallee harvester has removed one of the major remaining barriers to the development of the mallee industry.

The success of such an industry, integrated with agriculture, has the potential to play an important role in biodiversity conservation through integrating biodiversity plantings as part of improved management of the southwest agricultural area at landscape scales.

DEC's native tree crops program aims to promote the broadscale planting of trees and other plants to rehabilitate land and conserve biodiversity. Benefits include increased habitat for native species, and improved management of water at site and landscape scales. Commercially viable revegetation integrated with agriculture is essential to drive the change required.

The development of a viable commercial system for harvesting mallee plantings is fundamental to the development of a mallee industry and for the biodiversity and other benefits such as revegetation brings.

In addition to mallee plantings being part of a salinity management package, they are potentially a drought-tolerant perennial crop. The development of the prototype harvester opens the way for a new generation of woody-crop harvesters that will help biomass become a competitive form of renewable energy.

The state's LEED fund was set up to support the development of new, low emission technologies and renewable energy supplies to reduce WA's carbon footprint.

For further information about DEC's native tree crops program see page 69.

For further information about the LEED fund see page 157.



The prototype mallee harvester was the first LEED-funded project to be completed. Photo – Richard Sulman/Biosystems Engineering.

Priority nature conservation projects

WA has eight of Australia's 15 biodiversity hotspots and is home to more than half of the country's 207 mammal species, including 25 that are unique to the state.

The state also supports hundreds of reptile species, more than 12,000 flowering plant species and hundreds of thousands of invertebrate species.

However, some of these distinctive plants and animals are under threat. *Phytophthora* dieback, pest animals and weeds are damaging the habitat of the 405 species of threatened flora and 233 species of threatened fauna that occur here.

These communities are also under pressure from disease, salinity, altered fire regimes, clearing of native vegetation, overgrazing and urban encroachment.

DEC Nature Conservation director Gordon Wyre said the department recognised these threats and took action to protect WA's biodiversity through specifically targeted projects.

"During 2011–12, \$3.95 million was allocated to a special biodiversity projects program for 37 priority projects," he said.

"These projects focused on invasive animal control, environmental weed control, threatened species and ecological communities' recovery, *Phytophthora* dieback management, biological survey and research, rangelands management and the *State Cane Toad Initiative*."

One of Australia's most biologically important cave systems has extra protection following a project to fence off the catchment areas of several caves on Mundrabilla Station on the southern Nullarbor.





Feral goat.



Rainbow lorikeet.

Invasive animal control

Pest animals pose one of the biggest threats to the state's biodiversity. Wild cattle, camels, horses, donkeys, goats and pigs destroy habitat and valuable ecosystems for native flora and fauna, while introduced predators such as cats and foxes prey on our vulnerable wildlife.

Controlling pest animal populations in both remote areas and sites closer to urban areas has been a high priority for DEC.

Highlights for the year included:

- 3,654 rainbow lorikeets and 2,062 little and eastern long-billed corellas removed from private property and Crown freehold lands
- 1,001 goats removed from Kalbarri National Park, Watheroo National Park, Pinjarrega Nature Reserve and Southern Beekeepers Nature Reserve through aerial control programs
- heat signature database established for pigs through an aerial infrared camera survey trial; other species recorded included cattle, horses, dogs, kangaroos and quokkas.

Environmental weed control

Of the estimated 1,350 species of environmental weeds in WA, 34 are listed as high priority under the state's 1999 environmental weed strategy.

These weeds are a threat to biodiversity because they compete with native plants for nutrients, water and habitat, and they suppress germination and survival of native seedlings.

Weeds also smother and displace food sources for native animals.

Highlights for the year included:

- 60 hectares of weeds controlled and five weeds species mapped in the Brixton Street Wetland, Ellen Brook Nature Reserve, Meelon Nature Reserve, Burnside Road nature reserve and Neaves Road Nature Reserve
- 61 hectares treated for weed control or eradication in Porongurup National Park.



Juvenile woylie.



Gilbert's potoroo. Photo – Dick Walker.

Recovery of threatened species and ecological communities

WA is home to 405 species of threatened flora, 233 species of threatened fauna and 66 threatened ecological communities. Protecting these fragile native plant and animal populations and promoting healthy ecosystems has been a major commitment for DEC.

Translocations of critically endangered plants and animals, survey and mapping, and fencing to protect existing populations of threatened flora and fauna have been just a few of the steps taken to increase the chances of survival of some of the state's rarest and most distinctive species.

Highlights for the year included:

- seed from 30 threatened flora plants collected, cleaned and stored in the Western Australian Threatened Flora Seed Centre
- 753 seeds germinated for threatened flora translocations
- 16 threatened flora translocation populations maintained
- 130 hectares fenced to protect the Nullarbor karst system
- 120 radio collars fitted to threatened species including numbats, woylies, boodies, Shark Bay mice and mala
- 307,000 hectares baited to control feral cats in Fitzgerald River National Park and Cape Arid National Park to protect the western ground parrot and other threatened species
- 1,008 hectares baited for feral fox control in the Central Wheatbelt to protect the black-flanked rock wallaby
- Gilbert's potoroo enclosure repaired to reinstate its predator-proof status after it was extensively damaged in storm-related flooding.

Phytophthora dieback management

Widely regarded as one of the biggest threats to biodiversity in WA, *Phytophthora* dieback is an introduced water-borne disease that spreads through water, soil and plant tissue, killing plants via their root systems.

The state's south-west corner offers perfect conditions for the disease to thrive because of the soil types, its susceptible native plant communities and the relatively high rainfall in the area. About 2,300 of the south-west's 5,700 flora species are susceptible to dieback.

Dieback was introduced more than a century ago but there are still areas of the state that are free of the disease and protecting them is a worthy investment in the fight against the spread of dieback.

Highlights for the year included:

- 175 soil samples collected for *Phytophthora* dieback testing from Fitzgerald River and Stokes national parks
- seven gates installed and six kilometres of tracks ripped to control access to areas at high risk of dieback infestation in Fitzgerald River National Park
- vehicle hygiene infrastructure upgraded at the Stokes National Park ranger station
- installation of additional geotextile membranes at Bell Track in Fitzgerald River National Park
- two metham sodium applications at Fitzgerald River National Park and nine fumigant trials conducted at Murdoch University for *Phytophthora* dieback control.

Biological survey and research

DEC scientists undertake research across the state, discovering biological patterns, describing rare flora and fauna, and delivering environmental data to underpin conservation strategies.

By studying, describing, monitoring and mapping the species and ecological communities of WA, DEC is better placed to understand what they require to survive and what needs to be done to conserve them.

Highlights for the year included:

- 151 quadrats surveyed along the greenstone ranges
- 15 papers published pertaining to flora taxonomy
- 56 new undescribed flora taxa collected
- 133 new flora taxa described
- 702 flora species collected for lodgment with the WA Herbarium.

DEC research scientist Chris Dunne.

Dr Dunne undertaking *Phytophthora* dieback control in Fitzgerald River National Park.



Rangelands management

The state government has acquired significant tracts of former pastoral land in the Midwest and Goldfields rangelands for conservation purposes, with the aim of restoring biodiversity and ecosystem health to degraded areas.

This is being done by controlling feral animals and straying stock from neighbouring properties, upgrading and maintaining infrastructure essential for effective management of remote areas, improving fire management, and undertaking biological surveys to learn more about biodiversity values.

Highlights for the year included:

- 592 kilometres of fire access road maintenance completed on Midwest rangeland properties
- 4,000 kilometres of aerial photography undertaken to identify weed infestations in the Goldfields Region
- 86 kilometres of stock exclusion boundary fencing installed on Midwest and Goldfields rangeland properties
- extensive infrastructure maintenance carried out at rangeland homesteads including Credo, Muggon, Thundelarra, Burnerbinmah, Dalgara and Karara
- 11,000 baits prepared and 4,055 aerial baits laid for wild dog control on Midwest rangeland properties.

Cane toads

The cane toad is Australia's most invasive pest animal. Despite efforts by the state government and community groups to slow the westward march of the cane toad, cane toads have continued to move across the Northern Territory and arrived in WA in February 2009.

Long before their arrival, DEC was fighting to prevent the entry and establishment of cane toads in the state by raising awareness of the cane toad threat and providing effective statewide coordination of initiatives.

This work was undertaken cooperatively with groups such as the Kimberley Toad Busters, Stop the Toad Foundation and the Department of Agriculture and Food.

DEC has continued this work, maintaining the fight against cane toads and preventing the establishment of new satellite populations via the transportation of goods into and within the state.

Highlights for the year included:

- 11 biodiversity surveys carried out to determine cane toad impact
- 7,000 kilometres of surveillance for cane toads undertaken
- 845 volunteer hours contributed in assisting with cane toad impact biodiversity surveys
- 5,969 cane toads disposed of at designated drop-off points
- 17,326 vehicles inspected at the Kununurra cane toad checkpoint
- 13 new cane toad drop-off points installed.





Awards to recognise excellence in nature conservation

Climate change research, new plant discoveries and management tools to help the conservation of Carnaby's cockatoo were just some of the projects recognised by special nature conservation awards introduced during 2011–12.

DEC Nature Conservation Director Gordon Wyre said the awards were introduced to acknowledge outstanding contributions by DEC staff to improve the effectiveness or efficiency of program delivery.

"I think it is particularly important to recognise some of the major achievements, given the difficulties and complexities of delivering biodiversity conservation in an environment where there are significant competing land uses and pressures," Mr Wyre said.

The Nature Conservation service is the largest of DEC's services, with about 880 staff working towards biodiversity conservation outcomes.

Mr Wyre said the awards, across four categories, were presented at the annual Nature Conservation Service Conference.

The winners of the inaugural director's excellence awards were:

Excellence in Leadership and Innovation

- Principal research scientist Colin Yates, for his contribution in leading scientific research and knowledge on climate change vulnerability and adaptation for WA.
- State Cane Toad Initiative coordinator Corrin Everitt, for her contribution in leading the program and adapting it to changing circumstances.

Excellence in Knowledge Discovery

- The WA identification team: Robert Davis, Steve Dillon, Michael Hislop and Johan Hurter, for their contribution in undertaking taxonomic work and discovering new plant taxa for WA, which now ranks as a world leader in the rate of discovery of new species.

Excellence in Demonstrating Best Practice

- Environmental impact assessment project coordinator David Pickles, for his contribution in advocating best practice and compliance in environmental impact management of mining activities in the Goldfields Region.

Excellence in Transfer of Knowledge and Communication

- Research officer Christine Groom, for her contribution to the research and development of management tools for the conservation of Carnaby's cockatoo.
- Regional ecologist Geoff Barrett, for his contribution in fostering and leading an innovative program of active adaptive management projects in the Swan Region.



DEC Nature Conservation Director Gordon Wyre (fourth from the left) with some of the award winners. Left to right: Christine Groom, Geoff Barrett, Colin Yates, Steve Dillon, Rob Davis, Johan Hurter and Mike Hislop.



Corrin Everitt.



David Pickles undertaking a banded iron formation rare flora survey.



Marine park ranger Stephen Goodlich and marine conservation officer Alison Sampey. Photo – Peter Nicholas/DEC.

PART TWO: SERVICE AREAS



A newly translocated silky eremophila (*Eremophila nivea*) thrives at a site in a nature reserve near Three Springs in DEC's Midwest Region. Translocations have increased the total number of individuals of this species in the wild from 614 to 1,070.

Nature Conservation



Nature Conservation

The conservation of WA's rich biodiversity is strategically coordinated through DEC's Nature Conservation service, which oversees a range of programs and activities. This service is built on scientific and technical knowledge accumulated over many decades, which continues to develop and grow. Ongoing processes of biological survey, specimen collection and classification are complemented by developing and implementing recovery plans for species and ecological communities under threat, identifying and acquiring land that supports representative ecosystems, managing areas for their conservation values, and promoting public awareness of the value and vulnerability of WA's natural areas.

The Nature Conservation Service is divided into the following strategic areas:

- building biodiversity knowledge
- establishment of the terrestrial and marine conservation reserve system
- effective management of the conservation reserve system
- recovery of threatened species and ecological communities and management of other significant species and ecosystems
- conserving landscapes and seascapes, integrating off-reserve and on-reserve conservation and managing threatening processes
- encouraging public understanding and support for biodiversity conservation and other DEC programs and activities.

Building biodiversity knowledge

Biological inventory

Terrestrial inventory

Surveys of threatened and priority flora, fauna and ecological communities were undertaken or coordinated by the department. Details are provided in the threatened species and ecological communities recovery section of this report (see page 42).

A working group was established to develop a consistent approach to reporting vegetation statistics across the state. Integration of different vegetation mapping products, including the regional forest agreement mapping, the statewide Beard-Hopkins mapping and detailed mapping on the Swan Coastal Plain will be considered in this process.

DEC is the lead agency for the coordination of biotic and abiotic data for wetlands, including the mapping of wetland type, extent and distribution in the landscape using the geomorphic wetland classification system. Wetland mapping of 460,000 hectares of the Midwest, encompassing the Cervantes-Eneabba and Cervantes South areas, was made publicly available. A further 100,000 hectares in the Cervantes-Coolimba coastal area were mapped and are being prepared for public release. A comparative study was also undertaken in this area to evaluate a proposed national wetland classification system. A survey of wetland aquatic invertebrates from this region will help DEC and the Department of Water advise on the impacts of proposed mineral resource development and plan for the sustainable use of groundwater.



DEC senior research scientist Dr Alan Kendrick counting fish in the Montebello Islands Marine Park.

Through DEC's Science Division, strategic terrestrial biological surveys continued. A further 150 sites were surveyed on three greenstone ranges in the Yilgarn continuing the documentation of significant diversity in these ranges.

The results of the Kimberley Islands Biodiversity Survey show that these islands are microcosms of the adjacent Northern Kimberley mainland with 74 per cent of mammal, 59 per cent of reptile, 70 per cent of frog, 69 per cent of bird and 56 per cent of plant species of the Northern Kimberley bioregion now known on the 24 islands sampled.

Marine inventory

DEC continued to focus on the development and progressive implementation of the *Western Australian Marine Monitoring Program* (WAMMP). WAMMP is determining the status and trends in the condition of the key biodiversity assets, human pressures on these assets, and DEC's management responses to these pressures, with particular respect to WA's marine parks and threatened marine fauna, such as turtles, sea lions (*Neophoca cinerea*) and dugong (*Dugong dugon*). The main objective of WAMMP is to obtain the information that is necessary to assess the efficiency and effectiveness of DEC's marine management programs so as to promote continuous improvement through an active adaptive management cycle. Systematic monitoring of coral, seagrass, invertebrate, mangrove and fish communities is an example of some of the work that is being undertaken in WA's marine parks.

The Western Australian Marine Science Institution (WAMSI) is a collaboration of state, federal, industry and academic organisations working together to provide independent marine research. During 2011–12, WAMSI's inaugural five-year program was concluded. The program encompassed six foundation research nodes focused on best-practice science for management. The Node 3 research program, led by DEC, included research into the biophysical and social environment of the Ningaloo area. It was undertaken by external science providers (such as CSIRO, the Australian Institute of Marine Science and local universities) to provide an enhanced knowledge base to facilitate more effective management of Ningaloo Marine Park and other coral reef marine parks in WA. The important findings of each study and their implications for management, along with a listing of all data resources and publications produced from the work, have been published in a report, which is available at: www.wamsi.org.au.

The state government has committed a further \$12 million to WAMSI, in particular to develop a research program that will inform and support the implementation of four marine parks in the Kimberley. A strategic research plan has been prepared by DEC and will be implemented in 2012–13.

Research projects to implement actions in approved marine park management plans are ongoing. Studies were completed on the interaction of fishing and climate change on reef fish populations in Ningaloo Marine Park and the regional bleaching of coral reefs, along WA's coastline, with the aim of better understanding this disturbance. Assessments of coral reef and fish community health in the Montebello Islands and Barrow Island marine parks are being undertaken to assess the effects of nearby dredging operations.

The assessment of sediment in-fauna of Walpole and Nornalup Inlets Marine Park continues, revealing a diverse and unique assemblage of animals. Investigations into the distribution patterns of marine biodiversity of the intertidal reefs along the metropolitan marine parks, and in the mangrove communities in Shark Bay Marine Park also continue and will help DEC to better manage these important areas.

Taxonomy and biotic collection management

A total of 7,033 specimens was added to the WA Herbarium collection, which now stands at 733,578, an increase of one per cent during the year. This is a low number compared with the average annual rate of increase, due to the need to repackage and move the entire collection to the new WA Conservation Science Centre. During the move, the collection was rearranged, updating it from a 19th century systematic arrangement to a 21st century arrangement. The WA Herbarium is now one of only a few herbaria in the world to have achieved this modernisation.

During the year, 1,090 specimens were loaned to other institutions and 1,157 specimens were received on loan from other herbaria. The WA Herbarium received 409 exchange specimens from other Australian and international herbaria.

The reference herbarium of vascular plants, which has 14,307 specimens representing 11,531 taxa, was used by more than 2,000 visitors during the year. At June 2012, the collection at the WA Herbarium comprised the following specimens from all major groups of plants, algae and fungi (Table 1).

Table 1: Specimens held at the WA Herbarium

Taxonomic group	Number of specimens (June 2012)	Increase since June 2011	
		number	percentage
Myxomycetes	815	60	0.01
Fungi	23,273	335	0.04
Lichens	16,291	18	0
Algae	23,134	61	0.01
Liverwort and hornworts	1,965	4	0
Mosses	6,677	1	0
Ferns and fern allies	3,634	33	0
Gymnosperms	2,024	11	0
Flowering plants	655,765	6,510	0.9
Total number	733,578	7,033	1.0



WA Herbarium specimen database

Records of all specimens incorporated in the WA Herbarium are entered into the WA Herbarium specimen database (*WAHerb*). During the year 7,033 specimen records were added to *WA Herb*, including 513 priority flora and 58 threatened flora. The total collection of priority and threatened flora comprises 45,273 specimens.

Flora data for WA

WA's vascular flora (flowering plants, ferns, cycads and conifers) now comprises 13,481 recognised species, subspecies and varieties (12,257 native and 1,224 alien). The census of WA plants maintained by the WA Herbarium as the authoritative reference for all plants of the state contained 22,754 names at the end of the year, representing 16,850 currently recognised species, subspecies and varieties of plants, algae and fungi (15,489 native and 1,361 alien). This was a net increase of 51 in the number of taxa recognised as occurring in the state. Sixty-one new names were formally published during 2011–12.

Herbarium volunteers

An extensive volunteer program at the WA Herbarium sees volunteers provide important skills and help in many curation activities. During the year, volunteer participation was reduced, as the move to the WA Conservation Science Centre saw the temporary closure of some volunteer programs. Despite the interruption, volunteers still contributed 6,370 hours to the herbarium, equivalent to 3.5 full-time staff. Volunteer facilities are greatly improved at the new herbarium and it is anticipated that volunteer contributions will grow in the coming years.

Resource condition monitoring

Under contract to Wheatbelt Natural Resources Management (NRM), DEC continued the condition monitoring component of the previous 'baselining' project to collate, interpret and present biodiversity data in the Wheatbelt.


The 1977–10 report on depth, salinity and pH trends of 101 wetlands included in the *South West Wetlands Monitoring Program*, conducted by DEC under Salinity Action Plan funding, was completed. Continuous water level and rainfall recorders were installed in several additional high conservation value wetlands under threat, as a precursor to salt and water balance modelling.

A research project continued on the ecological condition of wetlands of the agricultural zone, including monitoring groundwater, wetland water levels and water quality, and flora and fauna for 27 wetlands in relation to threats, such as secondary salinisation, climate change and a long history of catchment land-use practices. Reports on some of these wetlands have been published, some of which are available on DEC's website: www.dec.wa.gov.au/index.php?option=com_content&view=article&id=5867&Itemid=1817

Findings from a continental scale study of the population structure and growth of white cypress pine (*Callitris columellaris*) were published. The dataset used in this study included 10 sites from the rangelands of the Goldfields and Midwest regions, and nine sites from the Kimberley Region. Stand structures indicated a serious deficit of recruitment through much of the arid zone, in contrast to more regular regeneration in the tropical and temperate zones. Trees grew more rapidly in the tropical zone, but ring widths were surprisingly similar across rainfall and temperature gradients within climate zones. This suggests that patterns of growth may be influenced by genetic differences between tropical and southern populations.

Establishment of the terrestrial and marine conservation reserve system

The formal conservation reserve system comprises national parks, nature reserves, conservation parks, marine parks, marine nature reserves, marine management areas and miscellaneous conservation reserves referred to in the *Conservation and Land Management Act 1984* (CALM Act).



Two marine parks were formally created during 2011–12; Ngari Capes Marine Park in the South West, and Camden Sound Marine Park in the Kimberley.

For further information about these parks see page 3.

Desktop assessments were undertaken for several Crown land reserves in the Wheatbelt Region and recommendations were made for the inclusion of 39 Crown land reserves into the conservation reserve system as DEC-managed lands. Five on-ground assessments were completed of native vegetation remnants in the Wheatbelt Region that can be considered for inclusion in the conservation reserve system. Three of these were recommended for inclusion, comprising two private remnants and one Crown reserve.

A strategic conservation reserve acquisitions framework for native vegetation remnants in the Wheatbelt Region is in the final stages of completion. This framework will enhance the DEC Wheatbelt Region's ability to assess potential acquisitions for incorporation in the conservation reserve system in line with the goal of establishing a comprehensive, adequate and representative reserve system.

Further information about DEC-managed lands and waters is available in DEC's 2011–12 Annual Report: www.dec.wa.gov.au/annual-report-and-yearbook

Effective management of the conservation reserve system

Management planning for conservation reserves

A final management plan to support the establishment of the Camden Sound Marine Park in the Kimberley has been completed for publication, following the reservation of the marine park. The management plan outlines strategies for the marine park, including conserving one of the world's biggest humpback whale nurseries and breeding areas. The management plan for Ngari Capes Marine Park is nearing completion.

An indicative management plan for the proposed Eighty Mile Beach Marine Park was released for public consultation in late 2011 and a final management plan is at an advanced stage of preparation. This plan will be released after the park has been formally created.

A 10-year audit of the implementation of the Marmion Marine Park Management Plan has been completed by the Marine Parks and Reserves Authority Audit Committee with support from DEC.

Management plans are at an advanced stage of preparation under the Yawuru Indigenous Land Use Agreements for the joint management of Yawuru conservation lands in and around Roebuck Bay and Broome, including for the proposed subtidal Roebuck Bay Marine Park and intertidal conservation park. A draft management plan was released in 2011 for the Yoorrooyang Dawang jointly managed conservation parks in the east Kimberley. A draft management plan for the Ord River and Parry Lagoons Nature Reserves has been published.

Work continued on the development of the new recovery plan for the Toolibin Lake natural diversity recovery catchment. The review of recovery actions from the current recovery plan is being completed.

The Wongan Hills ecoscape conservation plan was one of the 12 Avon Catchment Council ecoscape projects funded through the National Action Plan for Salinity and Water Quality and the Natural Heritage Trust. The Wongan Hills area has ecosystems spanning the region's topography and significant biodiversity value. A Wongan Hills Business Plan (Prospectus) is being developed in conjunction with the review and updating of the ecoscape conservation plan. The project aims to build on previous investment and conservation planning, and develop a framework for potential future investment.



The Dryandra Woodland Management Plan was released. The updated plan will guide future decisions regarding the conservation of the woodland biodiversity including the internationally significant numbat population.

A list of approved management plans is available on the DEC website:
www.dec.wa.gov.au/index.php?option=com_content&view=article&id=104&Itemid=1931

Good Neighbour policy

The implementation of the department's *Good Neighbour* policy continued during 2011–12, including weed control, introduced animal control programs and fire management.

The Great Southern District within the Wheatbelt Region undertook kangaroo population control on DEC-managed lands in conjunction with neighbouring landholders around Toolibin Lake to better protect biodiversity assets including vegetation associated with the critically endangered ecological community, 'Perched wetlands of the Wheatbelt Region with extensive stands of living swamp sheoak (*Casuarina obesa*) and paperbark (*Melaleuca strobophylla*) across the lake floor'. Kangaroo population control was also necessary to aid the recovery of ecosystem functioning within the Ramsar-listed wetland.

The \$993,000 three-year *Caring for our Country* project continued, funding rabbit control to encourage regeneration and recovery of threatened flora. This included strategic rabbit baiting on private property and public lands adjacent to DEC managed lands. Adaptive management projects were implemented across a range of different land tenure types, including private property, to investigate the impacts of disturbance, including fire, on a selection of declared rare flora species.

The DEC Wheatbelt Region continued to work closely with NRM groups to develop conservation projects, including the South West Catchment Council's *Toolibin, Dongolocking, Tarin Rock Ecobridge Project*. This project aims to build an 'ecobridge' by strengthening the connectivity between the Ramsar-listed Toolibin Lake, the Dongolocking reserves and Tarin Rock Nature Reserve.

In the Kimberley Region, work with traditional owners, pastoral lease holders and non-government organisations to manage pest animals, implement prescribed burning programs and deliver biological survey programs has been successful in maintaining good neighbour outcomes. Projects undertaken include the construction of 30.5 kilometres of stock exclusion boundary fencing on former pastoral stations managed by DEC for conservation.

Fire and biodiversity research projects

Research continued into linkages between fire regimes and biodiversity in tropical savanna ecosystems of northern Australia. A study conducted in the Mitchell River National Park showed that populations of fauna were little affected by variations in post-fire interval or fire frequency. However, two larger mammals, the northern quoll (*Dasyurus hallucatus*) and the golden bandicoot (*Isoodon auratus*) increased their intake of large prey groups in recently burnt areas. This finding indicates that predation efficiency may increase in recently burnt savannas, and supports the hypothesis that introduced predators such as feral cats could have greater impact on native fauna in areas that are regularly grazed and burnt on a broad scale. Another study showed that invertebrate abundance was rapidly restored to pre-fire levels during the first wet season after fire, with no detectable change observed in invertebrate abundance or composition from one to three to four years post-fire. This suggests that the effects of fire on grass-layer invertebrate groups are short lived, and that food resource limitation is not a tenable explanation for fire-related declines among insectivorous savanna vertebrates. Work also began on collaborative projects with postgraduate students to study the fire ecology, population biology and genetics of Kimberley tree rats (University of Western Australia), and factors contributing to the persistence of mammals in the Artesian Range of the central Kimberley (University of Tasmania).

Two further studies were published describing vegetation dynamics in mallee and mallee-heath communities following fire on nature reserves in the south-western Wheatbelt. Results indicate that mallee-heath is a fire maintained community, whereas mallee communities are modified but not maintained by fire. Comparison of



plant functional types between mallee-heath and mallee communities reflected similar trends to plant species composition with increasing time since fire.

The Wheatbelt Adaptive Management Project *Restoring the Kwongan Vegetation in Tutanning Nature Reserve* continues to be implemented with three burns being monitored to assess the biodiversity of these areas, and also the encroachment of sheoak into heathland vegetation complexes, following fire. Biodiversity burns were completed at Barbalin, Dryandra Woodland and Boyagin Nature Reserve and a strategic protection buffer burn was carried out at Lake Magenta Nature Reserve

Further information on fire and the environment is available on DEC's website:
www.dec.wa.gov.au/management-and-protection/fire/fire-and-the-environment

Recovery of threatened species and ecological communities, and management of other significant species and ecosystems

Recovery of threatened species and ecological communities

The Threatened Species Scientific Committee's recommendations from 2011 for changes to the lists of threatened flora and fauna under the *Wildlife Conservation Act 1950* (WC Act) were gazetted on 17 February 2012.

DEC continued a joint project with the federal Department of Sustainability, Environment, Water, Population and Communities to prepare information sheets as the first stage in nominating changes to the list of threatened species under the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). DEC also implemented the memorandum of understanding with the federal Department of Sustainability, Environment, Water, Population and Communities to facilitate changes to the respective threatened species lists to better align the threatened species lists under the EPBC Act with the state lists under the WC Act.

The project has so far resulted in 81 changes to the list of nationally threatened species under the EPBC Act.

As part of the process of seeking to better align the federal and state lists of threatened ecological communities (TECs), the 'Claypans of the Swan Coastal Plain' was listed under the EPBC Act including the transfer of *Philotheca falcata* from the category of presumed extinct to critically endangered under the EPBC Act. The 'Claypans of the Swan Coastal Plain' incorporates four state-listed Swan Coastal Plain TECs and a priority 1 community, 'Claypans with shrubs over herbs'.

Flora

Six flora species were added to the state list of extant threatened flora: *Acacia leptoneura*, *Acrotriche orbicularis*, *Atriplex* sp. Yeelirrie Station (L. Trotter & A Douglas LCH 25025), *Caladenia luteola*, *Caladenia* sp. Quindanning (K. Smith & P. Johns 231) and *Conospermum galeatum*. One was added to the list of species presumed to be extinct: *Conospermum caeruleum* subsp. *contortum*. Three were deleted from the threatened species list: *Epiblema grandiflorum* var. *cyaneum* ms., *Marianthus mollis*, and *Stylidium merrallii*. Two were no longer considered to be threatened but were retained on the priority 4 list for monitoring purposes, while *Epiblema grandiflorum* var. *cyaneum* ms. was removed because it was no longer recognised as being a distinct taxon. *Banksia serratuloides* subsp. *perissa* and *Darwinia collina* were upgraded from endangered to critically endangered and *Typhonium* sp. Kununurra (A.N. Start ANS 1467) was downgraded from endangered to vulnerable. Three nomenclature changes were also endorsed.

A further 76 taxa were added to DEC's priority flora list, and 17 taxa were deleted from the list after further survey and taxonomic review demonstrated their adequate conservation status. At 30 June 2012, there were 405 extant threatened flora species listed, with 14 listed as presumed to be extinct, and 2,935 taxa listed as priority flora.



Recovery actions were implemented for a suite of threatened flora. Highlights included:

- A total of 241 species of threatened and priority flora comprising 512 populations were surveyed or monitored, 34 new populations of threatened flora and 55 new populations of priority flora were located (of note was the discovery of new populations of the critically endangered *Acacia vassalii*, *Conospermum galeatum*, *Daviesia bursarioides*, *Isopogon uncinatus*, *Lambertia fairallii*, *L. echinata* subsp. *echinata* and *Pterostylis sinuata*). In addition, new populations of the priority I species *Acacia dorsenna*, *Goodenia turleyae* and *Persoonia baeckeoides* were located.
- The new population of the critically endangered *Lambertia echinata* subsp. *echinata* discovered in Cape Le Grand National Park effectively doubled the known population size for this species.
- The new population of *Conospermum galeatum* (formerly a priority I species) was of particular note as it is the only known living population. The species is now listed as critically endangered.
- Volunteer members of the DEC-WA Native Orchid Study and Conservation Group collaborative Adopt an Orchid Project surveyed and monitored of 22 priority orchid species, with 70 populations monitored and four new populations discovered.
- Recruitment trials were conducted for several species including *Daviesia euphorbioides*, *D. microcarpa*, *Philothea basistyla*, *Stylidium amabile* and *Verticordia pityrhaps*. Of particular note were 84 new seedlings of *Daviesia euphorbioides* surviving the first summer following a trial disturbance in June 2011.
- Phosphite applications were carried out to control *Phytophthora* dieback for 20 threatened flora species including the critically endangered *Banksia montana*, *Darwinia collina*, *Lambertia echinata* subsp. *echinata* and *L. fairallii*.
- Fencing to protect plants from grazing was erected for several threatened flora species including *Acacia awestoniana*, *Banksia anatona*, *B. montana*, *B. oligantha*, *Caladenia melanema*, *Darwinia collina*, *Daviesia ovata*, *Eremophila glabra* subsp. *chlorella*, *Latrobea colophona* and *Leucopogon gnaphalioides*.
- Rabbit-proof fencing was installed at several locations to protect threatened flora species including *Caladenia drakeoides*, *Darwinia carnea*, *Daviesia euphorbioides*, *Grevillea pythara*, *Philothea basistyla*, *Tetratheca deltoidea*, *Thomasia glabripetala* and *Verticordia hughanii*.
- Rabbit control was undertaken for many threatened flora species including *Caladenia elegans*, *C. hoffmanii*, *C. wanosa*, *Conostylis dielsii* subsp. *teres*, *C. micrantha*, *Drummondita ericoides*, *Grevillea bracteosa* subsp. *howatharra* and *Leucopogon marginatus*.
- Weed control was undertaken for many threatened flora species including *Acacia volubilis*, *Banksia cuneata*, *Caladenia elegans*, *Daviesia cunderdin*, *D. euphorbioides*, *Lambertia orbifolia* subsp. *orbifolia*, *Myriophyllum lapidicola*, *Philothea basistyla* and *Tetratheca deltoidea*.
- "Have you seen this plant?" posters were developed for several threatened flora species including *Daviesia microcarpa*, *Eremophila lactea*, *Lambertia echinata* subsp. *echinata*, *Marianthus aquilonaris* and *Myoporum turbinatum* to raise awareness and encourage the reporting of new populations.
- Fire ecology plots were set up to collect fire response and ecological data to improve future management for a range of species, including *Beyeria lepidopetala*, *Conostylis micrantha*, *Conostylis dielsii* subsp. *teres*, *Eucalyptus beardiana*, *Lambertia echinata* subsp. *echinata*, *Leucopogon marginatus* and *Marianthus aquilonaris*.
- Surveys were undertaken into vegetation decline across the Great Southern District. The results indicate that the majority of vegetation collapses identified were the result of drought conditions experienced in 2010. The impact of dry conditions in 2010 was widespread and caused significant losses at several important locations including jarrah at the edges of its distribution and wooded wetlands like Yates Swamp in the Lake Bryde catchment.
- An *ex situ* seed orchard proposal is being developed for three sandplain declared rare flora (DRF) species (*Acacia volubilis*, *Daviesia cunderdin* and *Philothea basistyla*) which are poorly represented in the DEC seed collection as well as lacking translocation possibilities.

- Cryogenetic storage and *in vitro* cultivation of the critically endangered *Philothea basistyla* has been undertaken as a joint project with the Botanic Gardens and Parks Authority, resulting in 21 plants being secured in tissue culture from two populations and a further seven plants remaining to be established in culture. *In vitro* rooting trials are under way with preliminary results indicating this species may be intrinsically difficult to root (best average rooting result so far is 23 per cent).

Table 2: Flora translocations undertaken as part of the implementation of recovery and interim recovery plans in 2011–12.

Species	Translocated to
<i>Banksia brownii</i>	Infill/enhancement plantings at translocated population at Torndirrup National Park
<i>Banksia ionthocarpa</i> subsp. <i>ionthocarpa</i>	Infill/enhancement plantings at translocated population at Kalgan Plains Nature Reserve
<i>Banksia montana</i>	Infill/enhancement plantings at Benmore Seed Orchard
<i>Darwinia whicherensis</i>	Infill/enhancement plantings at Oates Road and Negus' Block translocation sites
<i>Gastrolobium papilio</i>	Infill/enhancement plantings at Oates Road and Negus' Block translocation sites
<i>Grevillea batrachioides</i>	Infill/enhancement plantings at Lesueur National Park
<i>Grevillea brachystylis</i> subsp. <i>grandis</i>	New translocation site planted at Taylors Nature Reserve
<i>Grevillea calliantha</i>	Infill/enhancement plantings at translocated population at Minyulo Nature Reserve
<i>Grevillea humifusa</i>	Infill/enhancement plantings at Hill River Nature Reserve
<i>Hemigenia ramosissima</i>	Infill/enhancement plantings at Birdwood Nature Reserve
<i>Leucopogon gnaphalioides</i>	New seed orchard site planted at site east of Kamballup
<i>Lambertia echinata</i> subsp. <i>occidentalis</i>	Infill/enhancement plantings at Oates Road and Negus' Block translocation sites
<i>Lambertia fairallii</i>	New seed orchard site planted at site east of Kamballup
<i>Petrophile latericola</i>	Infill/enhancement plantings at Oates Road and Negus' Block translocation sites
<i>Verticordia albida</i>	Infill/enhancement plantings at private property east of Three Springs



Threatened Flora Seed Centre

A total of 184 seed collections were banked at the Threatened Flora Seed Centre, 116 of which were collected during the past year. The majority of collections were from threatened plant species. Fifty-one threatened flora collections were made under targeted project funding.

Seedlings from 14 critically endangered species from 51 collections were provided for DEC translocation projects.

The centre currently holds seed collections from 77 per cent of the state's threatened flora and 25 per cent of the state's priority listed flora, in addition to providing safe storage for departmental seed collections for restoration purposes.

Investigations continued into determining appropriate germination protocols for native species, as did work on understanding seed longevity under current storage conditions. In addition, the Threatened Flora Seed Centre provided support and training in seed banking techniques to regional staff.

Although funding from the *Millennium Seed Bank Project* has ended, the partnership with the Royal Botanic Gardens, Kew, United Kingdom continues and a further 149 collections of mainly threatened species were duplicated for safekeeping at the Millennium Seed Bank.



DEC senior research scientist Dr Juliet Wege photographing tiny triggerplants near Eneabba where she discovered a new species, the little wildebeest (*Stylidium cornutum*).



Ranger Erin Biggs releases a brushtail possum during a Swan Coastal fauna monitoring exercise.



Parks and Visitor Services Officer Mathew Harding releases a chuditch in Julimar Nature Reserve.

Fauna monitoring in the Swan Region: a 2011 snapshot

Results from the Swan Region's 2011 fauna monitoring program showed an encouraging growth in numbers of native animals in small reserves being managed by DEC to improve habitats.

A strong presence of chuditch, brushtail possums and the endangered woylie were found in Julimar State forest in July 2011 when DEC staff worked with volunteers, members of the World Wildlife Fund and Department of Defence environmental officers in carrying out the monitoring.

Nature Conservation Officer Paul Tholen said this indicated that the delivery of 1080 baits via ground and aerial baiting had been successful.

"Fauna monitoring is important in helping DEC to determine the effectiveness of feral baiting programs, as well as other work being undertaken to improve habitats, such as removing invasive weeds and replanting degraded landscapes," he said.

"Not restricted to trapping alone, qualified field staff use spotlighting, bird calling, radio tracking, nest box monitoring, sand pads, sticky wickets and hair tubes to collect data on both native and introduced fauna that exist in our national parks and nature reserves."

In November 2011, a fauna monitoring exercise was completed in the Buller Nature Reserve to determine if a small remnant island surrounded by farmland was continuing to support a native animal population.

Records showed the presence of brushtail possums, echidna and bandicoots, four reptile species, three amphibian species and 26 species of birds. Despite being largely intact, the 300-hectare reserve suffers constant threat from dieback, weeds, feral animals (foxes, cats and rabbits) and unlawful human activity.

Paul said smaller reserves were important when it came to implementing 1080 baiting programs.

"The variety and abundance of animals in small reserves is comparable to that found in larger ones, but is arguably more important as fauna is restricted to isolated pockets of habitat amongst a sea of cleared paddocks," he said.



The department is a founding member of the newly formed Australian Seed Bank Partnership, a national network of conservation seed banks, working towards conserving Australia's plant species and building and sharing knowledge to support restoration.

Fauna

There were a total of 233 extant threatened fauna species and 18 presumed to be extinct fauna species at 30 June 2012, with a further 192 species on the department's priority fauna list. Changes to the schedule of threatened fauna included the addition of 24 species of fauna. These comprised 16 species of millipedes (*Atelomastix* species) with restricted distributions along the South Coast; three species of arboreal rodents from the Kimberley, *Conilurus penicillatus penicillatus*, *Mesembriomys gouldii gouldii* and *M. macrurus*; two sea snakes (*Aipysurus apraefrontalis* and *A. foliosquama*); the fairy tern (*Sterna nereis nereis*); a skink (*Lerista neviniae*) and Veski's plant louse (*Acizzia veski*) which is found only on one species of plant with a restricted distribution.

One species, the graceful sun-moth (*Synemon gratiosa*), had its conservation status regraded from endangered to vulnerable, a lower level of threat, following targeted surveys which identified new populations.

Recovery actions were implemented for many threatened fauna species during the year. Highlights included:

- Under the *Threatened Fauna Ark: saving Western Australia's threatened fauna* project, funded by the 2009–10 WA state NRM program, 12 species of threatened fauna—more than 350 individuals—were translocated to 17 different locations to establish new populations and boost existing populations.
- The Peak Charles National Park fauna survey was completed, replicating survey sites in the park that were last assessed during the biological survey of the eastern Goldfields between 1978 and 1982.
- Under the DEC-led *Geocrinia Frog Recovery Program*, monitoring during the year estimated at least 70 per cent of the Perth Zoo captive-reared white-bellied frogs (*Geocrinia alba*) that were released into the wild near Margaret River during 2010 survived. A further 31 juveniles and adults were released at the site during the 2011 breeding season. During the year, the zoo successfully captive-bred white-bellied frogs for the first time, paving the way for future translocations of this species and an increase in the number of extant occurrences.
- Preliminary surveys were conducted for the endangered Yinnietharra rock-dragon (*Ctenophorus yinnietharra*).
- Two new populations of western spiny-tailed skinks (*Egernia stokesii badia*) were discovered and one was relocated to more suitable habitat on the same freehold property.
- A statewide strategic plan for the conservation of marine turtles is being developed.
- In the Kimberley, flatback turtle (*Natador depressus*) nest monitoring continued on Eighty Mile Beach in partnership with traditional owners, pastoralists and volunteers. Threat abatement programs were implemented, including interpretive signage for visitor management and 24 kilometres of fencing to exclude cattle from nesting habitat. Flatback populations have also been monitored at Cape Dommert to determine population viability.
- A research program has been initiated to assess the current status of the Australian sea lion (*Neophoca cinerea*) by monitoring breeding colonies.
- Recovery actions continue to be successfully implemented for the following South Coast threatened birds: the western ground parrot (*Pezoporus flaviventris*), noisy scrub-bird (*Atrichornis clamosus*), western bristlebird (*Dasyornis longirostris*) and western whipbird (western heath) (*Psophodes nigrogularis nigrogularis*). In 2011–12, a translocation of the noisy scrub-bird from Bald Island to Angove water reserve was successfully completed.
- Survey for the Australasian bittern (*Botaurus poiciloptilus*) was undertaken across the South Coast in areas such as Lake Pleasant View, Waychinicup, Cheynes and Cape Le Grand wetland sites. The area around Cape Le Grand was found to be highly significant for the Australasian bittern.



Professor Stephen Garnett from Charles Darwin University (left), and DEC's Sarah Comer and Deon Utber with the photo and plaque presented to the Duke of Edinburgh.



A noisy scrub-bird.

Noisy scrub-bird anniversary a royal affair

A small bird found only on Western Australia's south coast captured royal attention in October 2011 during the Commonwealth Heads of Government Meeting in Perth.

Fifty years after he first campaigned for the protection of the endangered noisy scrub-bird, His Royal Highness The Duke of Edinburgh was in Western Australia when the anniversary celebrations were being held.

The bird was thought to be extinct before a small population was rediscovered at Two Peoples Bay near Albany in 1961. The Duke of Edinburgh actively promoted the conservation of the birds' habitat in 1962, which led to the creation of Two Peoples Bay Nature Reserve.

DEC South Coast Region ecologist and noisy scrub-bird program leader Sarah Comer said she and regional leader nature conservation Deon Utber were invited to meet Her Majesty The Queen and The Duke of Edinburgh at Government House, to coincide with 50th anniversary celebrations.

"The Duke of Edinburgh was instrumental in the creation of the nature reserve and has maintained a strong interest in the plight of the noisy scrub-bird ever since," she said.

"Deon and I, along with Stephen Garnett from Charles Darwin University, were honoured to meet The Queen and The Duke of Edinburgh and present them with a photo of a noisy scrub-bird and a plaque acknowledging his role in the conservation of this species.

"The Duke of Edinburgh was thrilled with the gift and said an original painting of a scrub-bird presented to him in 1990 was still one of his personal favourites.

"The Queen said The Duke of Edinburgh has always been proud of his role in the conservation of the bird."

In addition, DEC's South Coast Region and the South Coast Threatened Birds Recovery Team held a 50th anniversary celebration at Two Peoples Bay.

About 60 volunteers and staff who had been involved with noisy scrub-bird recovery gathered to celebrate the occasion, and enjoyed sharing anecdotes and a tour around Mt Gardner where several birds were heard calling.

"In the half century since the discovery of the tiny population at Two Peoples Bay, the species' prospects have improved, particularly since DEC and its predecessors began translocating the birds into new habitat in the 1980s," Ms Comer said.

"Translocations have helped facilitate the growth and spread of the scrub-bird population on the South Coast, but it is susceptible to predation by black rats, feral cats and foxes and is vulnerable to bushfires as it cannot fly more than a few metres, preferring to leap and climb."

During 2011–12, scrub-birds were successfully trapped on predator-free Bald Island and released into the Angove water reserve near Two Peoples Bay. The birds are trapped by being lured with taped recordings of their own calls.



- An extended trapping program was undertaken at Tutanning Nature Reserve to remove the remaining woylies. There was concern that without direct intervention this population would become extinct. These animals are being held at the Kanyana Wildlife Rehabilitation Centre for maintenance and a breeding program to retain an important genetic source for the future establishment of wild colonies.
- Boodies and mala bred in captivity were translocated from the Return to Dryandra enclosure to the Lorna Glen fauna recovery project in the Goldfields Region.
- Several recovery actions were undertaken to improve the understanding of the population dynamics and specific threats impacting upon the health of the black-flanked rock-wallaby (*Petrogale lateralis lateralis*) in the Wheatbelt. A complete population census of all extant Central Wheatbelt District rock wallaby populations has been completed. It is estimated there are about 150 individuals across seven populations, representing a decline of around 90 per cent since 2005. Enhanced local recovery programs are being developed for this vulnerable species. Genetic and toxicology studies have been undertaken as part of the Wheatbelt black-flanked rock-wallaby project. The preliminary results have indicated that there are no underlying health issues in the populations.
- The continued presence of black-flanked rock wallabies in Cape Le Grand National Park was confirmed through the use of remote cameras. Animals were translocated to the site in 2002–03 but, before this survey, had not been observed since 2004.
- During 2011–12, 65,563 new records were added to the *Fauna Survey Returns* system, with 3,774 of those for threatened or priority species. A further 1,020 new records were added to the *Threatened and Priority Fauna* database.

Recovery actions for the conservation of Carnaby's cockatoo continued, with funding provided through state and federal offset requirements, and additional funding through the state NRM program and federal threatened species funding. Projects undertaken during the year included:

- A University of Western Australia (UWA) PhD project began that aims to investigate roost-site fidelity and resource use by Carnaby's cockatoo on the Swan Coastal Plain. The project is the first in Australia to fit satellite tracking devices to black cockatoos.
- Thirty artificial hollows were placed at Coomallo Creek in an area where natural hollows were devastated by bushfire. The site is a key breeding site for Carnaby's cockatoo.
- A black cockatoo nesting health monitoring project began. The project is a collaborative effort between DEC, Murdoch University and Perth Zoo.
- The Great Cockey Count was again undertaken in collaboration with BirdLife Australia (formerly Birds Australia). The focus of the count remains the greater Perth metropolitan area but the survey has been expanded to include the entire distribution of Carnaby's cockatoo.

A study on the use of native proteaceous plants on the Swan Coastal Plain as a food source for Carnaby's cockatoo and how threatening processes (such as altered fire regimes and disease) influence the availability of these resources is being undertaken as a masters project at Edith Cowan University.

Table 3: Fauna translocations undertaken as part of the implementation of recovery and interim recovery plans in 2011–12

Species (common name)	Translocated from	Translocated to
Banded hare-wallaby	Peron Captive Breeding Centre	Faure Island Sanctuary
Bush stone-curlew	Perth Zoo, Caversham Wildlife Park	Wadderin Sanctuary
Dibbler	Perth Zoo	Waychinicup National Park
Gilbert's potoroo	Bald Island	Waychinicup National Park
Mala	Dryandra conservation area	Loma Glen conservation area
Malleefowl	Yongergnow Australian Malleefowl Centre	Wadderin Sanctuary, Badja Station, Tieline Reserve
Noisy scrub-bird	Bald Island	Angove water reserve
Numbat	Perth Zoo	Scotia Sanctuary (NSW)
Orange-bellied frog	Perth Zoo	Blackwood River National Park
Western ringtail possum	Wildlife rehabilitation centre	Karakamia Sanctuary
Shark Bay mouse	Northwest Island	Loma Glen conservation area
Spinifex bird	Barrow Island	Hermit Island
Sunset frog	Perth Zoo	Walpole area
Western brush wallaby	Wildlife rehabilitation carer	Wadderin Sanctuary
Western swamp tortoise	Perth Zoo	Twin Swamps Nature Reserve, Moore River National Park
White-bellied frog	Perth Zoo	Witchcliffe area
White-winged fairy-wren	Barrow Island	Hermit Island
Woylie	Wildlife rehabilitation centres, Tutanning Nature Reserve, Perth Zoo	Wadderin Sanctuary, Dryandra conservation area, Julimar State Forest, Whiteman Park, Margaret River area

Threatened ecological communities

The Threatened Ecological Communities Scientific Committee met twice during the year and considered possible amendments to the lists of priority ecological communities (PECs) and threatened ecological communities (TECs). There are currently 66 listed extant TECs, three listed as 'totally destroyed', and 296 PECs listed by DEC.



Highlights of work done to protect TECs and PECs are listed below. Some activities, such as weed control, fencing, development of pamphlets, recovery plans, and some surveys were completed with funding assistance from the federal government's *Caring for our Country* program.

- Environmental impact assessments advice was provided for 85 projects with the potential to affect threatened or priority ecological communities in locations throughout the state.
- A total of 305 occurrences of threatened or priority ecological communities were added to DEC's Threatened and Priority Ecological Community Database. New occurrence information was added to the database for six TECs and 30 PECs, assisting in resolving the status of the PECs, and providing improved information for land use planning.
- Boundary mapping of the following communities was refined:
 - Vine thickets on coastal sand dunes of Dampier Peninsula
 - Mount Jackson Range vegetation complexes (banded iron formation)
 - *Triodia* sp. Robe River assemblages of mesas of the west Pilbara
 - *Themeda* grasslands on cracking clays
 - Brockman Iron cracking clay communities of the Hamersley Range.
- Site visits were made to 115 occurrences of TECs and PECs. Data collected about habitat, composition, condition, threats and recommended recovery actions were added to the TEC and PEC database.
- Detailed hydrological and flora monitoring continued in three TECs and three PECs in the Wheatbelt Region to help determine land management actions required in the catchments. This included entering data from 13 transects into a new purpose-built database. *Tecticornia verrucosa* TEC in Lakeland Nature Reserve was fenced to protect it from grazing.
- Two priority and two threatened microbial communities in lakes in the Swan Region were resampled. Water quality samples were also collected by a UWA hydrogeologist to provide a snapshot of microbes that are adapted to different conditions. Invertebrate and water sampling was also undertaken. An old fence was replaced and a new fence erected around occurrences of 'Vegetation associations on ridges and slopes of the chert hills of the Coomberdale Floristic Region'.
- In the Swan Region, five transects and four quadrats were rescored to help determine fire response in a banksia woodland TEC and a granite shrubland PEC. Weed mapping was undertaken in three TECs and weed control was carried out in six reserves to benefit five TECs. Rubbish was removed and infill planting was undertaken after weed control in five reserves. This will benefit the vegetation in four TECs and two PECs. *Phytophthora* dieback was mapped in five TECs and signs about dieback hygiene controls and access were installed at two reserves to protect three TECs. Works to upgrade facilities for public use and education were undertaken at two reserves to benefit three TECs. Fencing works to control public access and introduced animals were carried out at 12 reserves to benefit eight TECs and three PECs. A 1.8m tall grazing exclusion fence was erected to protect 140 hectares of the Scott River Ironstone TEC, the largest known occurrence of this TEC.
- Thirty floristic quadrats were established in the Swan Region, and 26 in the South West Region to verify TECs present and identify any special land management requirements. Fifteen transects and 57 quadrats in threatened or priority ecological communities were monitored to determine response to fire. A report was completed on the fire response of the endangered TEC '*Melaleuca huegelii* – *M. systema* shrublands of limestone ridges' and implications for management.
- A pamphlet was jointly produced with the South West Catchments Council about the eight TECs that occur within the catchment council boundary.
- In the South Coast Region, the following six PECs were nominated and included on the PEC list:
 - *Melaleuca striata/Banksia* spp. coastal heath
 - *Melaleuca spathulata/Melaleuca viminea* swamp heath
 - *Banksia coccinea Shrubland/Melaleuca striata/Leucopogon flavescens* heath

- Albany Blackbutt (*Eucalyptus staeri*) mallee-heath on deep sand
- *Taxandria spathulata* heath
- *Allocasuarina globosa* assemblages on greenstone
- Landowners in the Albany peri-urban area were notified about the occurrence on their property of recently listed PECs that were identified through the Albany Regional Vegetation Survey. TEC recovery actions included rabbit baiting, fencing, phosphite application to control *Phytophthora* dieback, seed collection and monitoring of component species.
- In the Warren Region six newly located occurrences of a PEC were mapped, and 10 transects were installed throughout the community's range to monitor fire response. Twenty sites with two or three quadrats were established in another PEC and the monitoring program will determine the community's response to timber harvesting and fire.

Further information on threatened flora, fauna and ecological communities is available on the DEC website: www.dec.wa.gov.au/management-and-protection/threatened-species

Recovery planning

Twelve interim recovery plans for flora species were approved:

- Vassal's wattle (*Acacia vassalii*)
- *Andersonia annelsii*
- *Banksia pseudoplumosa*
- Carburnup king spider (*Caladenia procera*)
- *Grevillea acropogon*
- Large flowered short-styled grevillea (*Grevillea brachystylis* subsp. *grandis*)
- *Grevillea bracteosa* subsp. *howatharra*
- Edgar Range pandanus (*Pandanus spiralis* var. *flammeus*)
- Webb's moss (*Rhacocarpus rehmannianus* var. *webbianus*)
- *Ricinocarpus brevis*
- *Schoenia filifolia* subsp. *subulifolia*
- Hay River featherflower (*Verticordia apecta*)





Recovery plans were updated for three TECs: 'Sedgeland in Holocene dune swales', '*Corymbia calophylla* – *Kingia australis* woodlands on heavy soil' and 'Camerons Cave troglobitic community, Camerons Cave millipede and Camerons Cave *pseudoscorpion*'.

Two new fauna recovery plans were approved for the woylie (*Bettongia penicillata ogilbyi*) and the western spiny-tailed skink (*Egernia stokesii*). The woylie recovery plan has been submitted to the federal government for approval under the EPBC Act.

Further information on recovery planning is available on the DEC website:

www.dec.wa.gov.au/management-and-protection/threatened-species/recovery-planning-and-implementation

Wetland conservation

Ramsar wetlands

Twelve Western Australian wetlands are listed under the International Convention on Wetlands (Ramsar Convention). In 2011–12, the work of completing ecological character descriptions for all 12 Ramsar sites continued with final editing now required only for the Becher Point site to complete the state coverage. The Ramsar information sheets for these wetlands were also revised.

Table 4: Management plans for Ramsar wetlands in Western Australia

Ramsar Site	Management plan
Ord River Floodplain	Final draft: Ord River and Parry Lagoons Management Plan (DEC 2012)
Roebuck Bay	Draft: Roebuck Bay Ramsar Site Management Plan (Roebuck Bay Working Group 2009)
Eighty Mile Beach	Draft: Eighty Mile Beach Ramsar Site Management Plan (DEC 2011)
Forrestdale and Thomsons lakes	Finalised: Thomsons Lake Nature Reserve Management Plan (DEC 2005) and Forrestdale Lake Nature Reserve Management Plan (DEC 2005)
Peel–Yalgorup System	Finalised: Peel–Yalgorup System Ramsar Site Management Plan (Peel–Harvey Catchment Council 2009) Also: Finalised: Yalgorup National Park Management Plan 1995-2005 (DEC 2005) Finalised: Lake McLarty Nature Reserve Management Plan (DEC 2008)
Toolibin Lake	Finalised: Recovery Plan for Toolibin Lake (Toolibin Lake Recovery Team and Technical Advisory Group 1994) South West Wetlands Monitoring Program Draft: Review 2012 recovery plan for Toolibin Lake (Toolibin Lake Recovery Team and Technical Advisory Group)
Vasse–Wonnerup System	Finalised: Busselton Wetlands Conservation Strategy (WAPC 2005) Also: Draft: Swan Coastal Plain—South Management Plan (DEC 2012)
Lake Warden System	Final Draft: Esperance and Recherche Parks and Reserves Management Plan (DEC 2012)
Becher Point Wetlands	Finalised: Rockingham Lakes Regional Park Management Plan (DEC 2012)
Lake Gore	Final draft: Esperance and Recherche Parks and Reserves Management Plan (DEC 2012)
Muir–Byenup System	Finalised: Perup Management Plan (DEC 2012)



A foreshore and aquatic use plan has been developed for parts of the Ramsar-listed Lake Kununurra. Implementation of the plan will be overseen by a multi-stakeholder committee of which DEC is a member.

The Vasse-Wonnerup Ramsar wetland system at Busselton supports about 35,000 waterbirds each year. There is a long history of mass fish deaths during summer in the lowest reaches of the system. The frequency and severity of these incidents can be reduced by timely openings of the Wonnerup Inlet sandbar and two sets of Water Corporation floodgates on the estuary's exit channels. Careful management of seawater inflows and estuary water levels is needed to prevent adverse impacts on fringing vegetation, waterbirds and adjoining low-lying properties. The Vasse Estuary Technical Working Group arranges for summer opening of the sandbar at the wetland system mouth; for water level, water quality and fish monitoring; and for floodgate openings to release fish and manage water levels. This ongoing work was begun in 1997.

DEC provided logistic and technical support for research by Murdoch University's Marine and Freshwater Research Laboratory into the submerged aquatic plant communities, nutrient status and ecological health of the Vasse and Wonnerup estuaries.

DEC collaborated with the Department of Water and Geocatch NRM and other stakeholders in conducting a community wetlands forum in 2011 to discuss wetland management issues for the Vasse–Wonnerup Ramsar system. As a result, DEC has been involved in building collaborative research and management teams for improving ecological outcomes for the systems by introducing adaptive management processes that involve all stakeholders in education, on-ground management and targeted monitoring programs.

DEC continues to be an active partner with other states and the federal government in the development of a national wetlands policy about the implementation of international agreements. The development of toolkits for identifying, classifying and managing high ecological value aquatic ecosystems has progressed significantly.

Following the inaugural Wetlands Climate Change symposium, held in July 2010, the first climate change report card for aquatic ecosystems has been completed. Key points from the report card, *Climate Change and Western Australian Aquatic Ecosystems –Impacts and Adaptation Responses 2011*, included:

- The drying climate in the south-west has many freshwater species and ecological communities already at the limits of survival.
- Reduced rainfall, runoff and declining groundwater levels have resulted in reduced river flow, disconnected river pools, drying wetlands, and loss of unique cave fauna.
- Adaptation options must seek to increase the resilience of aquatic ecosystems, through reducing adverse impacts of human activities and managing the risks from climate change.

DEC continued to be the lead agency in coordinating proposals for possible nomination of nine wetlands for Ramsar listing. Candidate areas are Lake MacLeod, Lake Gregory, the Cape Range subterranean waterways, Lake Ballard, the Millstream pools, east Hamelin Pool (Shark Bay World Heritage area), the Ellen Brook swamps system, tributaries of the Lower Blackwood River (formerly Spearwood Creek) and Fortescue Marshes. DEC undertook work to progress ecological character descriptions, information sheets and management plans for these wetlands.

Further information on Ramsar wetlands is available on the DEC website:

www.dec.wa.gov.au/management-and-protection/wetlands/internationally-recognised-wetlands-ramsar



Dragonfly larva



Water sampling being done during the survey of aquatic invertebrates in the wetlands between Cervantes and Coolimba.

Research into wetland invertebrate biodiversity

A survey of invertebrates along the Jurien Bay coastline is helping DEC scientists gain a better understanding of potential impacts on wetland areas in the region.

DEC senior research scientist Adrian Pinder said little is known about the diversity and composition of aquatic invertebrates in the wetlands between Cervantes and Coolimba, although they are an important part of the biodiversity of the area.

"If we don't know what species are present, how they are distributed and what their ecological requirements are, it is difficult to plan for their conservation," he said.

"There are many pressures that affect aquatic invertebrates, including pollution, weed invasion, feral animal and stock damage, salinisation, groundwater abstraction and climate change."

The survey involves collecting samples of invertebrates from a range of representative wetlands including salt lakes, swamps, springs and samphire flats, then processing the samples in a laboratory.

Approximately 25 wetlands have been selected for samples to be collected and analysed. A report will be published in 2013.

Mr Pinder said the information from the project would be fundamental to understanding the nature of wetland environments in the region. Rich invertebrate populations are indicators of wetland health and provide food for waterbirds.

"Surveys such as this one can provide basic information on the distribution of aquatic biodiversity, and that allows us to help guide land use planning," he said.

Wetlands mapping and evaluation projects

During the year, the department added data to the statewide wetlands database, *WetlandBase*. This includes new wetland mapping for the area encompassing Cervantes, Jurien Bay, Greenhead and Eneabba in DEC's Midwest Region, covering an area of 460,000 hectares. This mapping information assists in wetland management and land and water planning processes, such as the Department of Water's investigations into groundwater-dependent ecosystems in the region, which partially funded this work.

DEC has also completed a project to refine wetland mapping and data in addition to conducting wetland evaluation for about 100,000 hectares of the coastal area from Cervantes to Coolimba. This will enable more accurate environmental impact assessments to be completed for the area. Funding was received through an offset package. Once endorsement processes are complete, the data will be publicly available.

Further information on wetland management is available on the DEC website:

www.dec.wa.gov.au/management-and-protection/wetlands/wetland-management-in-wa

The department maintains the boundaries, classifications and evaluations of wetlands mapped in its *Geomorphic Wetlands Swan Coastal Plain* dataset. These wetland values or areas can change, either through natural or anthropogenic processes, and the department has developed a process to modify this dataset in response to these changes. The department receives requests from external proponents such as environmental consultants, landholders and state and local government agencies, to modify wetland mapping in the dataset (management category, classification, or boundary reviews).

Further information on wetland mapping is available on the DEC website:

www.dec.wa.gov.au/management-and-protection/wetlands/wetlands-mapping

Management of marine fauna

During 2011–12, DEC attended 43 whale and dolphin incidents requiring a management response. These involved 45 individual animals of nine species— humpback whale (*Megaptera novaeangliae*), southern right whale (*Eubalaena australis*), minke whale (*Balaenoptera bonaerensis*), Gray's beaked whale (*Mesoplodon grayi*), melon-headed whale (*Peponocephala electra*), striped dolphin (*Stenella coeruleoalba*), spotted dolphin (*S. attenuata*), spinner dolphin (*S. longirostris*) and bottlenose dolphin (*Tursiops* spp.). One multiple stranding, of three striped dolphins, was recorded.

Twelve humpback whales and one southern right whale were reported entangled in fishing gear and marine debris. DEC's disentanglement team disentangled four of the whales, one freed itself before the team arrived and the fate of the others is unknown, distance or conditions having prevented intervention. Five of these incidents occurred in the latter half of the 2011 migration season and eight occurred in the early stages of the 2012 migration season. A three-year-old Swan River bottlenose dolphin calf was also disentangled from fishing line after eight weeks of monitoring and unsuccessful capture attempts.

A vessel collided with a humpback whale mother and calf off Fremantle. Both sustained injuries however their fate is unknown. The vessel sustained no substantial damage.

Fifteen humpback whales beached during the year. Three were stranded alive but in poor body condition and were euthanased.



There were 13 reported pinniped incidents, involving four species: Australian sea lion (*Neophoca cinerea*), New Zealand fur seal (*Arctocephalus forsteri*), sub-Antarctic fur seal (*A. tropicalis*) and southern elephant seal (*Mirounga leonine*). Three southern elephant seals went through their annual moult on the south-west coast and were still being sighted regularly in mid-2012.

A DEC officer attended the International Whaling Commission special workshop in Massachusetts, USA, on welfare issues associated with the entanglement of large whales. DEC provided nationally accredited large whale disentanglement training to staff of the New South Wales National Parks and Wildlife Service in Sydney in March 2012.



Humpback whale and calf. Photo – Doug Coughran/DEC.

Management of commercial activities involving wildlife

DEC ensured that wildlife-based activities that occurred during the year were licensed and managed in accordance with the WC Act, and were investigated to ensure compliance with legislation and the licences issued.

As part of nationally approved kangaroo management plans, aerial population surveys of kangaroos continued in June 2012 and were to be completed by October 2012. The south-west forest areas will be surveyed to provide a current population estimate for western grey kangaroos (*Macropus fuliginosus*). These surveys and submissions will provide information to assess the potential commercial harvest quotas for 2013.

Quotas and commercial harvests for 2011 were:

- western grey kangaroos—quota, maximum of 150,000; harvest, 93,445
- red kangaroos (*Macropus rufus*)—quota, maximum of 100,000; harvest, 25,876
- euros (*M. robustus*)—no commercial harvest during 2011.

Under the management plan for the commercial harvest and farming of crocodiles in Western Australia, the following maximum annual quotas apply, though these are seldom filled, especially for freshwater crocodiles:

- estuarine (saltwater) crocodiles (*Crocodylus porosus*)—quota, 520 eggs/hatchlings, 50 non-hatchlings; one juvenile and one adult received
- Australian freshwater crocodiles (*C. johnstoni*)—quota, 1,900 eggs/hatchlings, 200 non-hatchlings; none collected or received.

Regulation

Flora and fauna licensing

In 2011–12, there were 8,920 fauna licences (other than damage, but including non-commercial) issued during the year, a decrease of less than one per cent from the previous year. Continued interest in pet herpetofauna (reptiles and frogs) resulted in a nine per cent increase in licences issued, with 4,145 people currently licensed for up to three years to keep reptiles as pets. There was a two per cent decrease in avian fauna licences. The total number of flora licences and permits issued was 1,958, an increase of one per cent from the previous year. DEC issued 302 commercial purposes licences, 202 commercial producer licences and nurseryman licences, and 1,198 scientific or other prescribed purposes licences in 2011–12.

Incidents of prohibited reptiles being brought into or kept illegally in WA increased in 2011–12. Snakes were seized in Kambalda, Esperance and Bunbury and included eastern states pythons and four corn snakes, which are native to North America.

Damage and dangerous fauna licences

The department received reports of problem crocodiles in several parts of the Kimberley and the Pilbara. Nine licences were issued to remove saltwater crocodiles from the wild because they posed a threat to the public. Twenty dangerous fauna licences were issued for aggressive magpies (an increase of 82 per cent); eight dangerous fauna licences were issued for western grey kangaroos; and 11 dangerous fauna licences were issued for a range of species, mostly birds but including agile wallabies, red kangaroos, euros and western grey kangaroos, to mitigate the risk of aircraft strike at Kununurra, Derby, Karratha, Port Hedland, Exmouth, Denham, Laverton, Merredin, Bullsbrook, Perth and Jandakot airports.

Licences issued for the control of fauna causing damage included seven licences for emus; 369 licences for western grey kangaroos (an eight per cent decrease in licence numbers; however, the number taken remained constant); three licences for agile wallabies; seven licences for little corellas (a decrease of 36 per cent); 23 licences for western long-billed corellas (an increase of 57 per cent); 15 licences for ringneck parrots; four licences for galahs; and five licences for Australian ravens. In total 80 damage licences were issued for birds, a decrease of 11 per cent from 2010–11.

Further information is available on the DEC website:

Fauna licensing: www.dec.wa.gov.au/management-and-protection/animals/fauna-management/fauna-licensing.

Flora licensing: www.dec.wa.gov.au/management-and-protection/plants/flora-licensing



Table 5: Fauna and flora licences issued in 2011–12

Fauna Licences		No. of licences issued
Scientific		
Scientific collection (Reg 17)		636
Bird/bat banding (Reg 23)		127
Education and public		
To take (Reg 15) Marine interaction		252
To take (Reg 15) Other		173
To hold (Reg 16)		140
Avian fauna		
Keep and breed in captivity (Reg 12)		3,200
Deal (Reg 13)		38
Breed for commercial purposes (Reg 14)		0
Trap (Reg 11)		2
Species trapped commercially	Number	
Twenty-eight parrot (<i>Barnardius zonarius</i>)	246	
Red-capped parrot (<i>Purpuricephalus spurius</i>)	231	
Western rosella (<i>Platycercus icterotis</i>)	103	
Galah (<i>Eolophus roseicapilla</i>)	49	
Long-billed corella (eastern states species) (<i>Cacatua tenuirostris</i>)	7	
Little corella (<i>Cacatua sanguinea</i>)	10	
Keep in captivity (Reg 12A)		91
Herpetofauna (reptiles and amphibians)		
Keeping		2,579
Dealing		18
Farming		2
Taking		6
Removing		365
Emus (<i>Dromaius novaehollandiae</i>)		
Emu farming (Reg 14)		6
Dealing (Reg 8)		0
Dealing (emu eggshells Reg 13)		3
Processing (emu eggshells Reg 7)		2
Crocodiles		
Crocodile farming (Reg 14)		2
Skin dealing (Reg 10)		0
Processing (Reg 7)		2

Fauna Licences		No. of licences issued
Kangaroo		
Take kangaroos for sale (Reg 6)		450
Deal in carcasses (Reg 8)		18
Skin dealing (Reg 10)		8
Processing (Reg 7)		20
Exports interstate		
Skins of fauna (or other dead fauna)		26
Fauna (live)		315
Herpetofauna (reptiles and amphibians)		26
Export overseas		
Skins of fauna (or other dead fauna) from WA		3
Emu eggs or products (personal items) from WA		0
Fauna (avian) from WA (live)		2
Imports interstate		
Skins of fauna (or other dead fauna) into WA		2
Australian fauna (live)		217
Live exotic birds and other animals		164
Herpetofauna (reptiles and amphibians)		25
Total fauna licences		8,920

Flora Licences		No. of licences issued
Commercial purposes		302
Sandalwood (<i>Santalum spicatum</i>) (from Crown land)		0
Forest produce (from Crown land)		1
Commercial producers		202
Sandalwood (from private land)		24
Scientific/prescribed purposes		1,198
Permits to take declared rare flora		231
Total flora licences		1,958



Damage Licences	No. of licences issued	Total no. of each species authorised to be taken
Other Avian Fauna		
Australian raven (<i>Corvus coronoides</i>)	4	destroy 25
	1	trap/relocate 3
Baudin's cockatoo (<i>Calyptorhynchus baudinii</i>)	2	scare only
Carnaby's cockatoo (<i>Calyptorhynchus latirostris</i>)	2	scare only
Emu (<i>Dromaius novaehollandiae</i>)	7	destroy 230
Galah (<i>Eolophus roseicapilla</i>)	3	destroy 1,500
	1	scare only
Little corella (<i>Cacatua sanguinea</i>)	6	destroy 2,150
	1	scare only
Long-billed corella (western) (<i>Cacatua pastinator</i>)	23	destroy 13,200
Long-billed corella (eastern states species) (<i>Cacatua tenuirostris</i>)	1	destroy 50
	1	scare only
Red-capped parrot (<i>Purpureicephalus spurius</i>)	3	destroy 70
Twenty-eight parrot (<i>Barnardius zonarius</i>)	15	destroy 1,425
Welcome swallow (<i>Hirundo neoxena</i>)	1	trap & relocate 100
Waterfowl		
Eurasian coot (<i>Fulica atra</i>)	2	trap & relocate 205
Maned duck (<i>Chenonetta jubata</i>)	4	destroy 160
	1	scare only
	1	trap & relocate 200
Pacific black duck (<i>Anas superciliosa</i>)	1	destroy 50
Mammals		
Agile wallaby (<i>Macropus agilis</i>)	3	destroy 1,070
Euro (<i>Macropus robustus</i>)	4	destroy 300
Red kangaroo (<i>Macropus rufus</i>)	6	destroy 450
Western grey kangaroo (<i>Macropus fuliginosus</i>)	369	destroy 18,457

Dangerous Fauna Licences	No. of licences issued	Total no. of each species authorised to be taken
Agile wallaby (<i>Macropus agilis</i>)	1	scare only
Australasian shoveler (<i>Anas rhynchos</i>)	1	scare only
Australian bustard (<i>Ardeotis australis</i>)	1	destroy 15
	1	scare only
Australian hobby (<i>Falco longipennis</i>)	1	scare only
Australian kestrel (<i>Falco cenchroides</i>)	1	scare only
Australian magpie (<i>Gymnorhina tibicen</i>)	19	destroy 21
	1	scare only
Australian magpie lark (<i>Grallina cyanoleuca</i>)	1	destroy 1
	1	scare only
Australian pelican (<i>Pelecanus conspicillatus</i>)	1	scare only
Australian raven (<i>Corvus coronoides</i>)	3	destroy 42
	1	scare only
Australian shelduck (<i>Tadorna tadornoides</i>)	1	scare only
Australian white ibis (<i>Threskiornis molucca</i>)	1	destroy 50
	1	scare only
Banded lapwing (Banded plover) (<i>Vanellus tricolor</i>)	1	destroy 30
	1	scare only
Barn owl (<i>Tyto alba</i>)	1	scare only
Baudin's cockatoo (<i>Calyptorhynchus baudinii</i>)	1	scare only
Black Kite (<i>Milvus migrans</i>)	2	destroy 34
Black swan (<i>Cygnus atratus</i>)	1	scare only
Brown falcon (<i>Falco berigora</i>)	1	scare only
Carnaby's cockatoo (<i>Calyptorhynchus latirostris</i>)	1	scare only
Crested pigeon (<i>Ocyphaps lophotes</i>)	1	scare only
Estuarine (saltwater) crocodile (<i>Crocodylus porosus</i>)	1	destroy 3
	8	trap & locate 11
Eurasian coot (<i>Fulica atra</i>)	1	scare only
Euro (<i>Macropus robustus</i>)	4	destroy 170
Galah (<i>Eolophus roseicapilla</i>)	3	destroy 600
	1	scare only
Great cormorant (<i>Phalacrocorax carbo</i>)	1	scare only
Great egret (<i>Ardea alba</i>)	1	scare only
Grey butcherbird (<i>Cracticus torquatus</i>)	1	destroy 1
Grey teal (<i>Anas gracilis</i>)	1	scare only
Laughing kookaburra (<i>Dacelo novaeguineae</i>)	2	destroy 3
	1	scare only
Little black cormorant (<i>Phalacrocorax sulcirostris</i>)	1	scare only
Little corella (<i>Cacatua sanguinea</i>)	3	destroy 390



Dangerous Fauna Licences	No. of licences issued	Total no. of each species authorised to be taken
	1	scare only
Little Eagle (<i>Hieraetus morphnoides</i>)	2	scare only
Long-billed corella (western) (<i>Cacatua pastinator</i>)	1	scare only
Long-billed corella (eastern states species) (<i>Cacatua tenuirostris</i>)	1	destroy 300
	1	scare only
Maned duck (<i>Chenonetta jubata</i>)	1	destroy 12
	1	scare only
Osprey (<i>Pandion haliaetus</i>)	1	scare only
Pacific black duck (<i>Anas superciliosa</i>)	1	scare only
Peregrine falcon (<i>Falco peregrinus</i>)	1	scare only
Pink-eared duck (<i>Malacorhynchus membranaceus</i>)	1	scare only
Purple swamphen (<i>Porphyrio porphyrio</i>)	1	scare only
Red kangaroo (<i>Macropus rufus</i>)	5	destroy 220
Red-tailed black cockatoo (<i>Calyptorhynchus banksii</i>)	1	scare only
Richard's pipit (<i>Anthus novaeseelandiae</i>)	1	scare only
Square-tailed kite (<i>Lophoictinia isura</i>)	1	scare only
Straw-necked ibis (<i>Threskiornis spinicollis</i>)	1	destroy 50
	1	scare only
Swamp harrier (<i>Circus approximans</i>)	1	scare only
Tree martin (<i>Petrochelidon nigricans</i>)	1	scare only
Twenty-eight parrot (<i>Barnardius zonarius</i>)	1	scare only
Wedge-tailed eagle (<i>Aquila audax</i>)	2	scare only
Welcome swallow (<i>Hirundo neoxena</i>)	1	scare only
Western brush wallaby (<i>Macropus Irma</i>)	1	destroy 15
Western grey kangaroo (<i>Macropus fuliginosus</i>)	12	destroy 392
Whistling kite (<i>Haliastur sphenurus</i>)	2	destroy 9
	1	scare only
White-faced heron (<i>Egretta novaehollandiae</i>)	1	destroy 10
	1	scare only
Willie wagtail (<i>Rhipidura leucophrys</i>)	1	scare only
Yellow-billed spoonbill (<i>Platalea flavipes</i>)	1	scare only

Wildlife interaction licences

At 30 June 2012, 112 whale watching boat tour operators were licensed in Western Australia. While these tours were primarily focused on humpback whales (*Megaptera novaeangliae*), southern right whales (*Eubalaena australis*) were also part of whale watching activity in the lower south-west, particularly at Albany, Augusta and Esperance. Pygmy blue whales (*Balaenoptera musculus breviceuda*) were also regularly encountered adjacent to Cape Naturaliste.

DEC issued 95 boat-based and one beach-based dolphin interaction licences, three in-water dolphin interaction licences and two boat-based dugong (*Dugong dugon*) interaction licences. Thirty-eight boat-based Australian sea lion (*Neophoca cinerea*) and New Zealand fur seal (*Arctocephalus forsteri*) interaction licences were issued.

Fourteen whale shark (*Rhincodon typus*) interaction licences were current for the year.

Offences

During the year, DEC staff provided guidance regarding the legal requirements of parks and conservation legislation. There were 435 caution notices for minor offences and 552 infringement notices issued during the year (Table 6). Written reports were prepared for 64 offences under the WC Act and its Regulations, and the CALM Act and its Regulations. Action in 40 matters under both statutes was completed.

The unlawful taking of black cockatoos from the wild continued to be of concern. The unlawful taking, possession and keeping of reptiles also continued to be an issue.

Table 6: Number of reported offences in 2010–11 and 2011–12

	2010–11 reported offences	2011–12 reported offences
	Finalised figures	At 30.06.12
Total offences reported	1,279	1,051
Court convictions	28	9
Court dismissals	0	0
Infringement notices	802	552
Letters of warning	13	12
Caution notices	398	435
No further action	26	14
Pending	12	24
Withdrawn	0	5
Restitution		
Total court fines	\$15,700	\$4,700
Total court costs	\$2,327	\$849
Infringement penalties	\$60,245	\$40,260

Table 7: Offences under the Wildlife Conservation Act 1950 and Regulations and the Agriculture and Related Resources Protection Act 1976 that occurred in 2011–12

Charges	Reported offences	Convictions	Fines \$	Costs \$	Dismissed	Withdrawn	Letter of warning	Caution notice	No further action	Pending
<i>Wildlife Conservation Act 1950</i>										
Illegal taking or possession of protected fauna	21	4	2,500	244				7	5	5
Illegal importation, selling or taking for sale of fauna	15						2	11		2
Illegal taking of protected flora	4					1		1	1	1
Taking declared rare flora without the Minister's consent	4						3	1		
Offences against wildlife officers	3							2		1
Failing to comply with licence conditions	32	1	600	119				29		2
<i>Wildlife Conservation Regulations</i>										
Offences relating to the acquisition, possession, control and disposal of fauna	39	4	1600	486			2	23	1	9
<i>Wildlife Conservation Reptile and Amphibian Regulations</i>										
Offences relating to reptiles and amphibians										
Total	118	9	4700	849	0	1	7	74	7	20



Table 8: Offences under the Conservation and Land Management Act 1984 and Regulations that occurred in 2011–12

Charges	Reported offences	Convictions	Fines \$	Costs \$	Dismissed	Infringement notice	Letter of warning	Caution notice	No further action	Withdrawn	Pending	
<i>Conservation and Land Management Act 1984 and Regulations</i>												
Illegal taking or possession of forest produce	15		\$1,600			8		4	2		1	
Offences relating to marine parks and reserves	1								1			
Offences relating to the occupation of CALM land	1										1	
Offences against officers	2									1	1	
Offences relating to disease risk areas	7							7				
Offences relating to activities on State forest, nature reserves and national parks	907		\$38,660			544	5	350	4	3	1	
Totals	933	0	\$40,260			552	5	361	7	4	4	



Conserving landscapes and seascapes; integrating off- and on-reserve conservation and managing threatening processes

Biodiversity conservation legislation

The department continued to provide advice to the government on possible legislative improvements to the WC Act and alternatives for biodiversity conservation. Significant changes were made to the CALM Act during the year, as described on pages 5 and 113 of this yearbook. These amendments include a greatly enhanced ability for joint management of lands for conservation with indigenous groups and other land owners and managers. These joint management changes also provide an ability to manage private lands as if they were conservation reserves and so provide an opportunity to expand on the overall effectiveness of the conservation reserve system for biodiversity conservation.

Native Vegetation Framework

The *National Framework for the Management and Monitoring of Australia's Native Vegetation* (the Native Vegetation Framework or NVF) was published in 1999 to guide policies, programs, legislation and activities related to native vegetation conservation throughout Australia. The NRM Ministerial Council directed that the NVF be reviewed and revised. The revised NVF will link under the national biodiversity conservation strategy.

The department continued to participate in revising the NVF. The draft document has been cleared by the Senior Officials Committee to be considered by the Council of Australian Governments Ministerial Standing Council on Environment and Water in 2012–13 as *Australia's Native Vegetation Framework*.

Regional nature conservation plans

Each DEC region has prepared a five-year nature conservation regional plan that collectively provides the basis for improved integration and coherence of departmental activities and functions aimed at conserving Western Australia's biodiversity at a regional scale. These plans provide a focus for ongoing investment in priority areas for biodiversity conservation. The regional plans are five-year 'rolling' plans, which are annually reviewed and updated.

Managing system-wide threats

Altered hydrology management, including salinity

Secondary salinisation is one of many threats to biodiversity arising from the replacement of perennial native vegetation with annual cereal crops and pastures. Other hydrological threats include waterlogging and increased rates of sedimentation. During 2011–12, DEC continued its collaboration with the Future Farm Industries Cooperative Research Centre (CRC). Work with this CRC is generating new planning and decision-making tools that are being applied through the natural diversity recovery catchment program. The overall planning framework has been published, and there have been important advances in knowledge about the application of engineering techniques and revegetation to achieve conservation objectives. A draft review of the wetland monitoring program implemented in the south-west has been completed, and is proposed for finalisation and publication in 2012–13.

Further information on salinity management is available on the DEC website:
www.dec.wa.gov.au/management-and-protection/land/salinity

Natural diversity recovery catchments

The DEC review of the natural diversity recovery catchment program has been published and distributed. The program continued to slow degradation and recover high value biodiversity assets in the south-west identified as being at risk from altered hydrology, particularly salinity. Key activities for 2011–12:

- Following the large-scale integrated water management works at the Buntine-Marchagee natural diversity recovery catchment, activities are focusing increasingly on the management of fresh-brackish wetland assemblages on private land. An initial drilling program was conducted on these wetlands and, in the short-term, these wetlands will become the focus for revegetation. During 2011–12, 105,000 seedlings were planted over 61 hectares on sites adjoining the gypsum wetland complex, part of the naturally saline, braided channel.
- The recovery plan for the Drummond natural diversity recovery catchment was completed and has been endorsed by the department and the Conservation Commission. Hydrological investigations have continued in conjunction with UWA. This and other work will lay the foundation for a phase of more active management.
- After one of the driest years recorded at Lake Bryde in 2010, 2011 proved to be quite wet with regular summer rainfall and a significant runoff event in December. The main waterway was largely completed in 2010 and performed well during the December event with only minor damage to the outflow on one of the termination lakes within the nature reserve, and some minor over-topping on the bypass channel. The receiving wetlands at the end of the waterway filled. This provided an opportunity to monitor water flow and analyse capacity levels and behaviour of the waterway and receiving lakes.
- The wet conditions also gave vegetation at Yates Swamp the chance to recover. Several mature trees died due to the drought conditions in 2010 but many other trees have recovered and there are seedlings recruiting on the lake floor. The wet year also benefitted seedlings planted in the Lake Bryde catchment; more than 100,000 seedlings were planted and growth rates have been more than double in other years.
- In the Lake Warden natural diversity recovery catchment, the Lake Wheatfield gravity pipeline has been in operation for three years. Initial indications of a positive altered hydrological regime have been confirmed over the entire system, with target water levels in the central and western wetland suites remaining within the optimum minimum and maximum levels for the first time in more than a decade. As a result, there has been significant vegetation recruitment around the shores, while dune-systems previously threatened by constant wave action during flooded condition, have started to stabilise. Shorebird numbers are similar to those recorded in the 1980s, after almost none having been recorded in the last decade. The Lake Warden recovery plan is under review and a threat analysis for the new regime has been completed. The proposed phase two works (active pumping from lakes) has been placed on hold while the impacts of the gravity pipeline in conjunction with more average rainfall are fully tested. In the meantime, a gap analysis has identified new priorities for the next three years.
- Continuing dry conditions in the Muir-Unicup catchment enabled bathymetric surveys to be completed for Kulunilup Lake, Bokarup Swamp, Noobijup Lake and Cowerup Lake. These surveys complement the digital elevation model generated from a Lidar aerial survey. As part of the aerial survey, digital imagery over the catchment was obtained.
- Toolibin Lake remained dry, enabling staff to undertake work to maintain the groundwater control system and surface water control works. An audit was undertaken of the groundwater management system to investigate inadequacies of the aging system and future demands as identified by research. Staff also continued the detailed review of progress and drafted further parts of the revised recovery plan.
- DEC's work through the *Biodiversity and Water* program of the Future Farm Industries CRC provided new, important insights into the patterns of water use and growth in wetland plants. This information will help guide future research and management. In addition, strong links with UWA continued to bring additional students and researchers into the recovery catchment program.

Further information on natural diversity recovery catchments is available on the DEC website: www.dec.wa.gov.au/management-and-protection/land/salinity/recovery-catchments



Native tree crops/revegetation

The native tree crops program aims to promote and encourage the planting of trees and other plants to rehabilitate land and conserve biodiversity. The main focus is on biodiversity conservation through broadscale revegetation across the landscape. This level of revegetation is necessary to generate hydrological benefits at landscape scales that will help conserve biological assets on valley floors, particularly wetlands. Commercially viable revegetation integrated with agriculture is essential to drive the scale of change required. In addition to reducing salinity, mallee eucalypts have been shown to provide habitat for a range of native species, including some small mammals.

All field work has now been completed on the *Acacia saligna* complex of species and *Atriplex nummularia* subspecies for revegetation, with reports and other publications to be completed over the next 12 to 18 months. DEC work is now concentrated almost entirely on eucalypt mallees, particularly as belts integrated with agriculture. The department is the major contributor to the *Woody Crops* program of the Future Farm Industries CRC. This program aims to overcome the remaining impediments to commercial uptake of woody crops in the wheat growing regions of southern Australia.

A prototype mallee harvester has now been successfully developed with the assistance of a grant from the state's *Low Emissions Energy Development Fund* (see page 26 for details about this project). Although further development is required, this is a highly successful project with the design concept fully validated. The establishment of a viable commercial harvesting system for mallee plantings is a fundamental requirement for the future of the mallee-based industry and for the biodiversity and salinity reduction benefits such revegetation brings.

The design of mallee belts for optimum integration into agricultural systems has advanced considerably through a collaborative project funded by the federal Department of Resources, Energy and Tourism with the Curtin Fuels and Energy Technology Institute as the major partner. The inputs of DEC and other Future Farm Industries CRC partners to this project have shown that the addition of nutrients, even for early plantings, can significantly improve biomass production. Methods for passively engineering increased surface water flows to mallee belts are also producing promising results. During the next two years, the project aims to develop, and apply, water harvesting designs to new mallee plantings. This work has important implications for management of excess water in natural diversity recovery catchments.

The major challenge for the next 12 months is to continue research and development focusing on harvest and delivery of mallee biomass to small industries in the south-west where energy costs may be significantly reduced by conversion from oil and gas boilers to wood-fuelled boilers. Such projects, if successful, will be stepping stones to the production of biofuels, which represent a major opportunity for renewable energy at state and national scales.

Further information on the mallee industry program is available on the DEC website:

www.dec.wa.gov.au/management-and-protection/land/mallee-industry-research-and-development-program



Invasive species control

Western Shield

During 2011–12, the *Western Shield* program continued to implement broadscale fox and cat baiting for native fauna conservation and recovery. More than 3.9 million hectares of conservation reserves and State forest were baited, using more than one million poison baits. Corporate sponsorship was provided by ongoing sponsors Alcoa World Alumina, BHP Billiton, Worsley Alumina, Phillips River Mining, Tiwest Joint Venture and Western Areas NL.

Research on toxin and bait delivery mechanisms for cat control continued. Staff involved in *Western Shield* also continued to investigate other mechanisms and improvements for fox control.

The *Western Shield* program included delivery of fauna management training and training on the safe use of 1080 to DEC staff and external participants and also assisted with native fauna translocations and population monitoring.

DEC continued the program to redevelop database systems used to manage fauna survey and monitoring data, as well as data on 1080 use. The upgraded systems will make information easier to access and improve analysis and reporting capacity.

Further information on *Western Shield* is available on the DEC website:
www.dec.wa.gov.au/management-and-protection/programs/western-shield

Feral cats

A cat baiting trial is underway in the South Coast Region in areas including Cape Arid and Fitzgerald River national parks and the Two Peoples Bay and Mount Manypeaks nature reserves. The trial aims to test the effectiveness of the Eradicat™ bait in the south-west high rainfall zone. Previous use of the bait has largely been in arid areas and at smaller scales. Cats and native species are being monitored to provide information into this adaptive management project that will help refine methods for long-term operational use of the bait.



Cane toad hotline goes WILD

The cane toad hotline is now ringing to a different tune after switching to a new number in May 2012.

DEC's volunteer Wildcare Helpline is being used to assist people with enquiries about suspected cane toad sightings.

DEC State Cane Toad Initiative program coordinator Corrin Everitt said the new hotline number, 1800 44 WILD (9453), is staffed by volunteers, seven days a week.

"The volunteers are available to provide advice and guidance to anyone who believes they may have seen an invasive pest in WA, in an area where they are not commonly seen," she said.

"Previously, anyone who had a cane toad enquiry was directed to the Pest and Disease Information Services line at the WA Department of Agriculture and Food.

"Operating under a new central number will improve efficiency and avoid double handling of information between different organisations."

The cane toad hotline has been busy since cane toads first crossed the WA-NT border in early 2009, and last year alone the hotline received more than 120 enquiries about cane toads.

Ms Everitt said with cane toads moving further into the state, the department continued to receive calls about suspected hitchhiker cane toads.

"The invasive pest is very good at hiding in small spaces so it's important for people to remain vigilant and thoroughly check their vehicle, caravan and camping equipment if they are travelling through areas where cane toads are known to live," she said.

"We also strongly encourage residents to call the cane toad hotline to confirm that the animal they have sighted is actually a cane toad and not a native frog.

"Up to two-thirds of suspected cane toads turn out to be native frogs so it's important for people to phone us and have the animal correctly identified."

State Cane Toad Initiative

Cane toads (*Bufo marinus*) are a declared pest under the *Agriculture and Related Resources Protection Act 1976*. Under the *Cane Toad Strategy for Western Australia*, DEC is the lead agency responsible for cane toad management, supported by the Department of Agriculture and Food (DAFWA) in the areas of quarantine and biosecurity. Key activities included:

- working with the community groups Stop the Toad Foundation and the Kimberley Toad Busters to focus field efforts to reduce the spread and impact of cane toads
- identifying high-risk freight and establishment zones
- presenting cane toad information sessions to schools and community groups
- assisting with cane toad-related research projects, including a University of Sydney project investigating the use of taste aversion to teach native predators to avoid cane toads
- maintaining databases of sightings and the distribution of cane toads
- producing WA Cane Toad Update newsletters
- distributing cane toad identification information and advice for managing cane toads in backyards in the east Kimberley
- maintaining 'live' cane toad drop-off points throughout the east Kimberley
- carrying out Kimberley biodiversity surveys in conjunction with Aboriginal groups
- continuing the Kimberley Bush Ranger Cadet program to increase community understanding of the impacts of cane toads and methods of control.

More information on cane toad management is available on the DEC website:
www.dec.wa.gov.au/management-and-protection/animals/cane-toads

Feral pigs, goats, camels, cattle and wild dogs

DEC undertakes a range of pest animal control programs in WA, often in partnership with DAFWA, biosecurity groups and NRM groups. These programs target foxes, wild dogs, feral goats, pigs, cattle and camels.

Throughout the year, DEC took part in cooperative management of feral pigs in the south-west. DEC conducted feral pig control activities, including monitoring, trapping and poisoning. Surveys for feral pigs were undertaken in the Toolibin Lake and Lake Bryde natural diversity recovery catchments, Dongolocking reserve complex, Lake Magenta Nature Reserve, and in DEC's Warren Region. More than 40 pigs were removed from Kalbarri and Lesueur national parks through a combination of aerial control and baiting programs. A pig control/eradication program has been developed for the Fitzroy catchment in the central Kimberley. The effectiveness of feral pig control efforts is being undermined by the release of pigs into forest and reserve areas by recreational shooters wanting to hunt pigs.

Feral goat control activities continued with the aim of minimising the impacts of these animals on native vegetation. Feral goat control continued on Dirk Hartog Island National Park, with 622 goats destroyed in two separate aerial operations. A further 10 goats were fitted with radio collars to assist in finding goats during control operations. A total of 1001 goats were removed from Kalbarri and Watheroo national parks and Southern Beekeepers Nature Reserve through aerial control programs.

Wild dog aerial baiting programs continued in DEC's Pilbara, Midwest, Wheatbelt and Goldfields regions. A total of 11,000 baits were prepared and 4,055 aerial baits laid for wild dog control on DEC-managed former pastoral stations. In the Wheatbelt and Goldfields regions contract doggers implemented a range of ground-based controls.

In the Pilbara Region, camel control was undertaken in Karlamilyi National Park and on adjacent unallocated Crown land.

In the north Kimberley, the feral cattle removal program has been expanded with funding under the *Kimberley Science and Conservation Strategy*. In September and October 2011, a 21-day shoot was conducted on DEC-



managed lands, unallocated Crown land and Theda and Doongan stations. This shoot removed 2,855 feral cattle from DEC-managed lands and 3,244 feral cattle and 298 wild horses from pastoral leases in the conservation corridor area. In addition, 700 cattle were removed from the King Leopold Ranges Conservation Park, 439 cattle were culled from Purnululu National Park with an additional 600 plus mustered and removed by neighbouring pastoralists, and 30.5 kilometres of stock exclusion boundary fencing was erected on former pastoral stations managed by DEC. An assessment of cattle carrying capacities in the north Kimberley has been completed to help in estimating the intensity and duration of feral cattle culling required to improve habitat value in priority areas. Cattle mustering programs were undertaken in Millstream Chichester and Karijini national parks in DEC's Pilbara Region.

Invasive birds

A program for the control of invasive rainbow lorikeets continued in the Perth metropolitan area to reduce competition with native species for nesting sites and food, and to prevent the risk of disease to native bird species. The program was implemented by the department, with help from fruit growers and other affected land managers. During the year, 1,447 pest rainbow lorikeets were removed from the metropolitan area. A control program also continued on introduced white corellas, which are causing infrastructure damage and nuisance complaints in urban areas and potentially compete with native birds for nest hollows. A total of 1,039 introduced corellas were removed from the metropolitan area, and 113 were removed from Busselton. A training program was run by DEC in the Bunbury area to enable local contractors to implement a control program for introduced corellas using the latest techniques.

Management of environmental weeds

Weed management on DEC managed lands was prioritised in each region according to the policy outlined in the *Environmental Weed Strategy for WA* (1999). During 2011–12, work continued on a species-based prioritisation project that aims to prioritise weeds and weed occurrences for control in each of DEC's nine regions. The project enables weeds to be assessed based on their invasiveness, impacts, potential and current distribution and feasibility of control. The results from these assessments will also potentially help other land managers.


In addition to the DEC region-based weed risk assessments, a database of 300 of the most serious environmental weeds in the Swan Region, available online via the department's Florabase website, has been updated and maintained.

DEC is also developing an asset-based prioritisation system for weed control. This process aims to maximise the efficiency and effectiveness of weed control efforts through a consideration of biodiversity and other values at risk from environmental weeds to be combined with an assessment of available resources, so that appropriate management actions can be applied by each DEC region.

The incorporation of weed mapping as an integral component of managing the threat of weeds in natural ecosystems continued. During 2011–12, four training workshops were held in the Swan Region and maps of the distribution of weeds in 32 reserves in the region were made available.

Work continued on a PhD project towards understanding the cause of blackberry (*Rubus* sp) decline in the south-west of WA. This project is a collaboration between Murdoch University, CSIRO and DEC, and aims to investigate the organisms causing blackberry decline, and to ascertain what risks might be involved and the potential for using these organisms for biological control of this weed. Restoration of decline sites along the Warren and Donnelly rivers is being undertaken by Warren Catchment Council in conjunction with DEC and CSIRO with funds from the federal Biodiversity Fund.

The main environmental weeds targeted for management by DEC in 2011–12 included silver wattle (*Acacia dealbata*), ruby dock (*Acetosa vesicaria*), bridal creeper (*Asparagus asparagoides*), tagasaste (*Chamaecytisus palmensis*), rubber vine (*Cryptostegia grandiflora*), rough tree fern (*Cyathea cooperi*), Paterson's curse (*Echium plantagineum*), African lovegrass (*Eragrostis curvula*), Geraldton carnation weed (*Euphorbia terracina*), hesperantha



(*Hesperant hectares falcata*), Victorian tea-tree (*Leptospermum laevigatum*), African boxthorn (*Lycium ferocissimum*), cape tulip (*Moraea flaccida*), date palm (*Phoenix dactylifera*), blackberry, harlequin flower (*Sparaxis bulbifera*), *Tamarix* sp., verbesina (*Verbesina encelioides*), *Watsonia* sp., arum lily (*Zantedeschia aethiopica*) and Bathurst burr (*Xanthium spinosum*).

DEC's Wheatbelt Region researched weed invasion at Lake Magenta following scrub rolling and a fire.

DEC's Swan Region continued research into environmental weeds that are invading native plant communities. The focus of the research projects ranges from understanding plant biology, through to selection of appropriate management actions to minimise the impacts of environmental weeds to flora and ecosystem values. The environmental weeds being researched include Geraldton carnation weed, *Watsonia meriana*, *Watsonia borbonica*, black flag (*Ferraria crispa*), yellow soldier (*Lachenalia reflexa*) and harlequin flower. In addition, DEC has started investigating the resilience of tuart woodland to weed invasion following autumn prescribed burns.

During 2011–12, DEC continued efforts to eradicate rubber vine, a recognised weed of national significance, in the Kimberley. DEC participates in the West Kimberley Steering Group for rubber vine with the project funded by DEC and managed by the Rangelands NRM. The Aboriginal rangers for reserve 31165, next to Lake Argyle, have been implementing a range of strategies in collaboration with DAFWA to control rubber vine infestations and reduce their rate of spread. Across the Kimberley, nature conservation officers have implemented weed control for a range of species including hyptis (*Hyptis suaveolens*), prickly acacia (*Acacia nilotica*), passion vine (*Passiflora foetida*), bellyache bush (*Jatropha gossypifolia*), grader grass (*Themeda quadrivalvis*) and parkinsonia (*Parkinsonia aculeata*).

DEC's Goldfield Region has been working with stakeholders associated with the Great Western Woodlands, and co-ordinating activities across the three relevant DEC regions (South Coast, Wheatbelt and Goldfields) to identify areas of weed infestation, mapping extent and documenting a risk-based control strategy for weed incursions. The pest plant and animal management plan, scheduled for completion in 2012–13, is intended to be implemented across tenures and across the variety of government agencies, mining enterprises and pastoralists responsible for land management in the project area. DEC engaged with local shires and the community regarding the control of cacti species, major infestations of which occur off DEC-managed lands. Former pastoral leases have received significant attention for the ongoing control and containment of pastoral weeds inherited when these stations were purchased by the government for conservation. Weeds include Bathurst burr, caltrop (*Tribulus terrestris*), double gee (*Emex australis*) and buffel grass (*Cenchrus ciliaris*).

During 2011–12, DEC's South Coast Region worked in partnership with the Friends of the Porongurup Range to continue control of environmental weeds in and around the Porongurup Range. The long-running project targets species such as blackberry, valerium (*Valerian* sp.), dolichus pea (*Dipogon lignosus*) and introduced acacias.

More information on control of invasive plant species is available on the DEC website:
www.dec.wa.gov.au/management-and-protection/plants/invasive-plants



Phytophthora dieback management

The following achievements were made in 2011–12 in the management of *Phytophthora* dieback attributed primarily to *Phytophthora cinnamomi*:

- During the year DEC's project to advance eradication and containment strategies for *Phytophthora* dieback, with assistance from the state NRM program was successfully concluded. DEC has successfully eradicated one infestation in Cape Arid National Park. This is believed to be the first management scale eradication and cost approximately \$50,000 for about 0.5 hectares. DEC is continuing to monitor the site and hopes to demonstrate permanent eradication has been achieved. DEC has also successfully contained a larger spot infestation in more difficult terrain in the Fitzgerald River National Park at a cost of less than \$500,000, building on past containment success on the Bell Track infestation in the park. These on-ground results have been achieved with the development of new techniques for the management of *Phytophthora* dieback that should have broad applicability for other *Phytophthora* dieback infestations and will be used by DEC in future eradication/containment projects.
- The above-mentioned projects successfully demonstrated that the cost of *Phytophthora* dieback prevention is significantly lower than the costs of containment or eradication.
- The Vegetation Health Service (VHS) processed more than 2,100 diagnostic samples collected by the department's disease interpreters, private contractors and land managers from across the south-west of Western Australia. In addition to *P. cinnamomi*, isolates of 10 previously described *Phytophthora* species and several undescribed species were identified in association with dying native flora. The VHS continued to work in partnership with the Centre for *Phytophthora* Science and Management to DNA-sequence more than 90 historical and recent Western Australian isolates from the VHS culture collection, bringing the total tested to 703. This ongoing program has so far identified 12 *Phytophthora* taxa that are also known from overseas, and at least 15 previously undescribed *Phytophthora* species, as well as several unique Western Australian isolates that are considered to be *Phytophthora* hybrids. The description of one more of the new *Phytophthora* species discovered in WA natural ecosystems was published, bringing the total of published *Phytophthora* species to 10.
- The 'green card' hygiene system continues to be used in DEC's South Coast Region to ensure all operations on DEC-managed lands are conducted using appropriate hygiene procedures to prevent accidental introduction or further spread of *Phytophthora* dieback. The 'green card' hygiene training program has been further developed for other DEC regions across the south-west of WA.
- Access controls were upgraded in several national parks in the South Coast Region to reduce the risk of *Phytophthora* dieback introduction and spread.
- Assessment and mapping of *Phytophthora* dieback were conducted in the South Coast Region in Stokes and Fitzgerald River national parks. New *P. cinnamomi* infestations in Fitzgerald River National Park discovered through these surveys led DEC to close a number of access points to contain these outbreaks.
- Aerial application of phosphite continued in vegetation in the south-west to protect threatened flora and ecological communities, including the 'Montane thicket of the eastern Stirling Range' threatened ecological community in Stirling Range National Park.
- Seed was collected from several threatened flora populations at risk from *Phytophthora* dieback.
- *Phytophthora* dieback management was improved in the Moora District with the construction of wash-down facilities and improved signage in Lesueur National Park.
- A detailed risk assessment of the threat of *Phytophthora* dieback was undertaken of the Fitzgerald River National Park and is being used to develop a *Phytophthora* dieback management plan for the park.

Fire management on unallocated Crown land and unmanaged reserves

DEC continued its targeted fire preparedness works on 89 million hectares of non-metropolitan and non-townsite unallocated Crown land and unmanaged reserves through the installation and maintenance of firebreaks, vegetation modification in strategic buffers, and wind-driven open edge prescribed burning and large-scale block ignition using aircraft. A specific focus continued in the Kimberley, Pilbara and Goldfields regions.

Kimberley Science and Conservation Strategy

The government's *Kimberley Science and Conservation Strategy* was released in June 2011, with an implementation budget of \$63 million over five years and a commitment to ongoing funding for key initiatives. The strategy provides the framework to conserve the Kimberley's unique natural values and provide new opportunities for Aboriginal employment and nature-based tourism. Details of the progress made under the strategy during 2011–12 can be found on page 7.

The *Kimberley Science and Conservation Strategy* is available on the DEC website at:
www.dec.wa.gov.au/management-and-protection/land/major-initiatives/kimberley-science-and-conservation-strategy

Great Western Woodlands

A *Biodiversity and Cultural Conservation Strategy for the Great Western Woodlands* was released in November 2010. During 2011–12, DEC progressed implementation of the strategy using \$3.8 million allocated by the government over four years to better manage and protect the area. A reference group met during the year to provide advice to DEC on the management of the Great Western Woodlands and the implementation of the strategy. For more details about work undertaken see page 10.

Prescribed burning was undertaken in unallocated Crown land at Forrestania, east of Hyden as an operational scale trial involving fire mosaics across the landscape. Weather conditions and fire behaviour were documented in detail during burning operations, and monitoring sites established to examine plant community responses to fire. Floristic composition and vegetation structure in gimlet (*Eucalyptus salubris*) woodlands at different ages after fire have been studied to provide an understanding of how woodlands develop over time. Techniques for determining the age of stands based on tree growth rings have been identified. Better knowledge of the age structure of semi-arid woodlands will aid in understanding the role of fire in these ecosystems, and in determining whether current fire regimes are compatible with long term conservation of woodlands.

A *Biodiversity and Cultural Conservation Strategy for the Great Western Woodlands* and further information about the woodlands are available on the DEC website at:
www.dec.wa.gov.au/management-and-protection/land/major-initiatives/the-great-western-woodlands

Net Conservation Benefits program

In February 2012, the allocation of \$23.43 million for four major projects was approved as part of the *Net Conservation Benefits* program from funds provided by the Gorgon Joint Venture partners following agreement with the state government prior to the approval of the Gorgon project. The projects will deliver long-term conservation benefits to WA in areas with similar values to Barrow Island Nature Reserve. The four projects are:

- \$8.5 million over seven years for the Dirk Hartog Island National Park ecological restoration project—DEC will also contribute another \$4.8 million.



- \$5.7 million over five years for systematic conservation of western Pilbara fauna—the WA Museum will contribute another \$1.2 million.
- \$7.19 million over five years for managing the conservation significance of coral reef ecosystems in the Pilbara/Ningaloo region (Pilbara Marine Conservation Partnership, CSIRO's *Wealth from Oceans Flagship* program and UWA)—CSIRO and UWA will contribute another \$4.22 million.
- \$2.04 million over five years for a decision support system for prioritising and implementing biosecurity on Western Australia's islands—DEC and James Cook University will contribute another \$1.94 million.

Assessment of land resource use impacts on biodiversity conservation

During 2011–12, the department had a significant role in providing advice to proponents and decision-making authorities on a range of major resource and other development proposals affecting DEC-managed lands. These proposals included Rio Tinto's rail duplication project, Sandfire Resources' Degruusa copper mine, development proposals in the Mount Manning area, BHP Nickel West's nickel disseminated sulphide project (excision from Wanjarri Nature Reserve), Cedar Woods Pty Ltd's Mangles Bay Marina and Bemax's Happy Valley mineral sands project.

Advice was also provided on the assessment and ongoing management of a large number of development projects, including several new projects in the Kimberley, Midwest, Pilbara, Goldfields and South West regions. Projects affecting significant conservation values outside DEC-managed lands included Pluton Resources' Irvine Island project, Woodside's Browse LNG development at James Price Point, Fortescue Metals Group's Cloudbreak expansion, Crosslands Resources' Jack Hills expansion project, Sinosteel Midwest Corporation's development at Weld Range, Tiwest's Dongara mineral sands project, Toro's Wiluna uranium mine and Grange's Southdown magnetite project. This involvement included contributing to the development and implementation of environmental conditions for mining development proposals and expansions of rail and other infrastructure by mining companies. This aimed to protect the conservation and other values of DEC-managed lands and to conserve biodiversity while assisting in the timely assessment of proposed developments.

DEC also assisted the Conservation Commission and the Minister for Environment by providing advice on mining tenement applications over reserved lands under Section 24 of the *Mining Act 1978*.

Banded iron formations

The Karara Mining proposal on the Karara/Blue Hills/Mungada Ridge banded iron formation (BIF) system was approved in July 2009 subject to 995 hectares of the Mungada Ridge being reserved for conservation purposes and protected from any future development. Implementation of the Karara project is underway and DEC has initiated the process to establish the Mungada Ridge area as a class 'A' nature reserve.

A collaborative study with Karara Mining has been completed that investigated patterns of genetic diversity to provide baseline information for future management of the threatened species *Acacia woodmaniorum*, that occurs on a few *banded iron* hills in the Karara area. A second project is being undertaken in collaboration with Karara Mining and the University of Western Australia to provide a genetic basis for guiding seed collections for post mining restoration to ensure restored populations will persist at altered sites, and that restored populations can adapt to changing future environmental conditions.

The distribution of flora of conservation significance on the BIF ranges continues to be identified through further surveys of BIF and non-BIF habitat associated with development proposals. Currently, there are five development proposals in the approvals process located on BIF within the Yilgarn Craton.

Table 9: Technical wetland advice provided in 2011–12

Type of technical wetlands advice provided	Number received and processed
Wetland management plan review	8
Environmental impact assessment advice	6
Planning and development proposals	11
Drainage advice	1
Native Vegetation Conservation Branch advice	8
Strategic policy development advice	4
Modification requests for wetland mapping	29
Other	6

Provision of wetlands planning and development advice

The department provides technical advice on wetland values and classifications after a proposal has been identified as potentially affecting a wetland of high conservation value. DEC processes these requests in accordance with land-use planning or environmental impact assessment guidelines and timelines. Requests for technical advice are received from internal and external stakeholders.

Applications to clear native vegetation: assessment and activity

Under the EP Act, clearing of native vegetation is an offence unless it is done under the authority of a clearing permit or is subject to an exemption.

Under Section 20 of the EP Act, the chief executive officer (CEO) has delegated decision-making on clearing applications to the Department of Mines and Petroleum for either of the following activities:

- an activity under an authority granted, or a requirement imposed, under the *Mining Act 1978*, the *Petroleum and Geothermal Energy Resources Act 1967*, the *Petroleum Pipelines Act 1969* or the *Petroleum (Submerged Lands) Act 1982*; or
- an activity under a government agreement administered by the Department of State Development.

DEC’s clearing permit system database recorded details of all clearing permit applications and decisions made during the year for DEC and the Department of Mines and Petroleum, and forms the basis of the published records available on DEC’s website.

DEC received 544 applications to clear native vegetation in 2011–12 and made 492 decisions. Under the delegation from DEC, the Department of Mines and Petroleum received 289 applications and made 296 decisions. Tables 10 and 11 provides details on clearing application decisions for 2011–12.

The total number of clearing permit applications received was relatively consistent at about 600 per year in the first five years of the clearing provisions being contained in the EP Act. However, this number has steadily increased over the past three financial years, with 689 applications received in 2009–10, 758 applications in 2010–11 and 833 in 2011–12.

Initially, a target timeframe of 90 days was set for a decision to be made, consistent with the previous 90-day ‘notification’ process under the *Soil and Land Conservation Act 1945*. Under current target timeframes, 80 per cent of applications are to be decided within 60 calendar days of receipt, and the remaining 20 per cent to be decided within 90 calendar days.



Table 10: Permit areas granted to clear under Section 51C of the EP Act

Purpose	Area (ha)
Mineral production	6207
Railway construction or maintenance	2538
Mineral exploration	1942
State agreement	1582
Geotechnical Investigations	1248
Building or structure	1034
Pastoral diversification	843
Water/gas pipeline installation	785
Extractive industry	467
Road construction or maintenance	401
Timber harvesting	393
Fence line maintenance	344
Horticulture	172
Dam construction or maintenance	149
Miscellaneous	59
Hazard reduction or fire control	59
Petroleum production	52
Grazing and pasture	50
Apiculture	27
Restoration	23
Infrastructure maintenance	11
Industrial	9
Drainage	8
Recreation	5
Stockpile	4
Petroleum exploration	1
Landscaping	<1
Aquaculture	<1
Cropping	<1
Total	18,413

Table 11: Areas refused a permit to clear under Section 51C of the EP Act

Purpose	Area (ha)
Cropping	20
Horticulture	9
Extractive industry	7
Grazing and pasture	2
Building or structure	1
Total	39

DEC has progressively reduced its backlog in processing applications since 2007, and since December 2009 has had no applications older than 90 days until this financial year. The large increase in the number of applications received in 2011–12 has resulted in 10 of DEC's 492 decisions being made after 90 days.

During 2011–12, 75 per cent of decisions on clearing applications were made in 60 calendar days, 23 per cent within 90 days and two per cent of decisions took longer than 90 days. The ongoing timely delivery of decisions by DEC corresponds to the risk-based approach to assessments that is based on sensitivity of the environment, magnitude of impact/s and urgency of the clearing, DEC's ongoing monitoring of its performance and continual improvements to processes. Quarterly reports are published of DEC's performance in achieving timeframes for all native vegetation clearing decisions.

Further information on approvals performance is available on the DEC website:
www.dec.wa.gov.au/regulatory-performance-and-reporting

Table 12 shows the number of decisions made by DEC for each quarter in 2011–12 and includes the percentage of applications that were decided within target timeframes. Statistics are also provided on how many decisions were subject to 'stop the clock' and the mean time (in days) that applications were in 'stop the clock'.

'Stop the clock' may only be used where there is legislative power or a requirement to do so, such as where the CEO requires more information from the applicant before making a final decision; where the CEO has been notified by the EPA that a proposal has been referred and that the CEO is constrained in making a decision on the application; or where the applicant has requested in writing that the process be put on hold.





Table 12: Timeframes for DEC decisions on clearing permit applications/decisions

	Jul–Sep 2011	Oct–Dec 2011	Jan–Mar 2012	Apr–Jun 2012
No. of applications carried over from previous periods	101	130	125	141
No. of applications received	144	122	142	136
No. of decisions that were subject to 'stop the clock'	43	56	54	49
Average time in 'stop the clock' for decisions in days	67	89	101	64
Average time for decision in days (excluding time in 'stop the clock')	40	45	48	44
No. of decisions on applications	115	127	126	124
No. of outstanding applications at end of quarter	130	125	141	153
Percentage of applications that were finalised within benchmark timeframe				
60 days (80% of applications to be finalised)	82	77	72	69
90 days (20% of applications to be finalised)	16	21	26	28
>90 days	2	2	2	3

Monitoring and compliance of native vegetation clearing

During 2011–12, DEC continued its program of using remote sensing imagery to identify vegetation change and, based on the analysis of this imagery and inspection of the land, determined whether unauthorised clearing was likely to have occurred. Clearing incidents identified because of the monitoring program, or complaints received, were investigated and progressed according to DEC's Enforcement and Prosecution Policy.

The program focused compliance resources on selected geographic areas. Native vegetation at 140 sites was analysed using imagery to assess compliance with the clearing legislation, which also included an analysis of 87 refused applications.

In 2011–12, there were 193 new clearing complaints, 67 investigations were completed and 126 remain under investigation. Clearing incidents were given priority for investigation according to the environmental impact and the circumstances of the clearing.

DEC conducted an analysis of the clearing permit system database to identify clearing permit decisions involving a fauna or flora permit condition. The analysis included a review against permit conditions to determine whether the required actions resulted in the prevention or mitigation of environmental harm or achieved an environmental benefit. DEC also carried out inspections of clearing permit decisions to monitor compliance. A total of 51 reviews of clearing permit decisions were conducted during 2011–12.

Vegetation conservation notices

Vegetation conservation notices may be given under section 70 of the EP Act if the CEO suspects, on reasonable grounds, that unlawful clearing is likely to take place, is taking place or has taken place on any land. In 2011–12, one vegetation conservation notice was given, which required the person bound by the notice to undertake specified measures to repair or mitigate the environmental harm caused by clearing.



Encouraging public understanding and support for biodiversity conservation and other DEC programs and activities

Southwest Australia Ecoregion Initiative

The department continued to be a member and co-chair (with WWF-Australia) of a consortium of government agencies, non-government organisations, and community representatives seeking to develop a biodiversity conservation strategy for Western Australia's south-west. The consortium (the Southwest Australia Ecoregion Initiative) continued to work with James Cook University, Gaia Resources and local scientists to use sound scientific principles to undertake a systematic conservation planning process.

Under a *Caring for our Country* program grant, a strategic plan was completed during the year and a report prepared for the federal government. A series of roadshow presentations were conducted to promote the plan to regional conservation planners.

Public participation programs

Environmental Community Grants

The third round of funding under the Minister for Environment's four-year, \$6 million community grants program was distributed in 2011–12, with a record 164 grants awarded to community groups and individuals in July 2011. Applications opened for the fourth funding round in February 2012.

More information on the Environmental Community Grants program is available on the DEC website: www.dec.wa.gov.au/community-and-education/community-programs

Healthy Wetland Habitats

Healthy Wetland Habitats is a voluntary off-reserve conservation program run by DEC that provides technical and financial assistance to private land managers for the management of wetlands of high conservation value on the Swan Coastal Plain. Management action planning and funding of up to \$10,000 are offered to eligible landholders with high conservation value wetlands to help in managing their wetland habitats under a voluntary management agreement.

During 2011–12, 12 new expressions of interest were received. One management action plan and funding agreement for \$9,640 were developed in association with the owners for conservation management works, representing a total wetland area of 7.5 hectares. Six applications are being assessed.

A review of the program targeted a 13,508-hectare area in the eastern Swan Coastal Plain. A geographical information search identified 230 private properties mapped with conservation management category wetlands in the cities of Armadale and Gosnells and the Shire of Serpentine-Jarrahdale. The landholders of the 97 conservation management category wetlands were invited to consider applying to the *Healthy Wetland Habitats* program through a targeted mail-out.

Annual monitoring and review of 19 landholder agreements resulted in a review and redraft of the voluntary management agreement format and contents.

Further information about *Healthy Wetland Habitats* is available on the DEC website:

www.dec.wa.gov.au/management-and-protection/wetlands/managing-wetlands-on-your-property



Provision of private land biodiversity conservation support and advice

Roadside conservation

The Roadside Conservation Committee (RCC) is administered through DEC with funding support from Main Roads WA. The RCC seeks to facilitate best practice management of remnant vegetation in transport corridors through raising awareness, liaison and cooperation. The RCC met four times during 2011–12.

During the year the RCC:

- coordinated workshops on roadside vegetation values for the works crews of the Shires of York, Goomalling and Quairading
- conducted roadside vegetation surveys in the Shires of Woodanilling, Boyup Brook and Moora. This included undertaking volunteer training in survey and mapping techniques
- in conjunction with DEC's GIS section, used the results of roadside vegetation surveys to develop roadside conservation value maps, and presented these maps with accompanying reports to the shires of Merredin and Denmark
- held displays at the Dowerin Field Days, Wagin Woolarama and the WA Local Government Association Transport and Roads Forum to increase community awareness of roadside conservation and engage with stakeholders
- undertook surveys of 11 roads nominated by the public with five declared as new Flora Roads
- published an article in the *Land for Wildlife* newsletter, *Western Wildlife*, about *Flora Roads*, roadside surveys and roadside conservation.

More information about the RCC is available on the DEC website:

www.dec.wa.gov.au/management-and-protection/conservation-on-other-lands/roadside-conservation

Wetlands Coordinating Committee


DEC continued to chair and provide executive officer support to the state's Wetlands Coordinating Committee. The committee was actively involved in the implementation of the *Wetlands Conservation Policy for Western Australia* (1997).

The committee also continued to establish, undertake and endorse a range of activities and projects relating to the strategic coordination and implementation of state government management actions for wetlands in WA. These included preparing a revised guideline for the determination of wetland buffer requirements; continuing work on a guide to managing and restoring wetlands; and endorsing several wetland mapping projects in the Midwest.

Urban Nature

The *Urban Nature* program provides technical advice and on-ground support to land managers working to protect, manage and restore biodiversity in DEC's Swan Region and beyond.

Working with more than 61 stakeholders from community groups, private landholders, local government, DEC, state agencies and universities, *Urban Nature* conducted more than 140 on-ground activities to facilitate best practice bushland management. Much of the work involved adaptive management and research trials, and liaison with land managers to implement the results of those trials in 15 high-priority sites. Work continued on a collaborative study by *Urban Nature* and the Centre of Excellence for Climate Change and Woodland and Forest Health. The study examines how the flora and fauna of long-unburnt tuart woodland responds to fire, and aims to develop and implement adaptive post-fire management actions. The results of this study are informing the development of long-term fire management guidelines.



Weed management trials have been initiated to facilitate the recovery of native wild rose (*Diplolaena andrewsii*) across its range on public and private lands. Technical support for managers of the threatened communities of clay-based wetlands continues with the delivery of an annual workshop and field day and the development of a flora identification tool for officers managing these wetlands.

Training and technical support for bushland management have been provided through eight workshops and field days, 12 presentations, six newsletter articles, and one conference abstract. About 1,900 copies of the quarterly newsletter *Bushland News* were distributed to support community involvement in bushland conservation and management. Work has begun on an interactive communication tool for community conservation groups that will eventually be published on the internet.

More information about the Urban Nature program is available on the DEC website:
www.dec.wa.gov.au/management-and-protection/programs/urban-nature

Land for Wildlife

The *Land for Wildlife* (LFW) program is a non-binding voluntary management agreement between the department and private land managers. During 2011–12, 81 new properties were registered with LFW bringing the total area of sites to 317,863 hectares. DEC staff visited 111 properties, of which 76 were new properties, and 35 were formally revisited for stewardship matters. During these visits, staff recorded 133 occurrences of rare or threatened fauna, flora or ecological communities. Seventy-two landholders resigned from LFW during the year, mainly due to property sales, leaving 1,976 properties registered.

LFW supported 29 funding applications by landholders. Support included provision of the voluntary management agreements, GIS maps, project development and letters of support.

Four editions of *Western Wildlife* were produced, and LFW staff contributed to 18 articles for print media, gave one radio interview, organised 23 displays at agricultural shows or similar, and gave 43 talks at workshops, seminars, schools or other groups. Staff also worked with the Carnaby's cockatoo recovery program to identify suitable habitat in the Wheatbelt and ascertain what management conservation assistance is required by landholders.

Further information about LFW, including the LFW annual reports, is available on the DEC website:
www.dec.wa.gov.au/management-and-protection/conservation-on-other-lands/land-for-wildlife

Nature Conservation Covenants

The *Nature Conservation Covenant* program assisted private landowners with the conservation of bushland of high nature conservation value by placing a protective covenant on the land's title, and by providing management advice and assistance through incentives and a stewardship program. At 30 June 2012, covenants were cumulatively established over 185 titles and 15,680 hectares of land, including a number of threatened species and ecological communities. A further 46 are in negotiation.

In 2011, the program received funding from *Caring for our Country* for a *Protected Areas on Private Lands* project, which was completed in December 2011. It has also received funding for another project to operate from January 2012–June 2013. Both projects operate cooperatively with similar projects being undertaken by Wheatbelt NRM and WWF-Australia and focus on increasing the number of covenants in the poorly reserved Avon Wheatbelt bioregion. Over the course of the two projects, 17 new covenants were assessed and of these, 11 covenants have been or will soon be registered.

Further information about the *Nature Conservation Covenant* program is available on the DEC website:
www.dec.wa.gov.au/management-and-protection/conservation-on-other-lands/covenant-program



Animal ethics

The administration of the *Animal Welfare Act 2002* and Regulations was transferred to DAFWA as of 1 July 2011. Under the Act, DEC operates as a scientific institution pursuant to corporate licences issued by DAFWA. DEC is required to carry out all activities involving the use of vertebrate animals in accordance with the seventh edition of the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes*.

DEC's Animal Ethics Committee (AEC) met six times during the year to review new applications and annual reports. In assessing applications, the committee ensures that activities involving native fauna are undertaken to a consistent standard and meet animal welfare requirements. A set of documents has been developed to help proponents prepare applications and the AEC assess them. Documents include standard operating procedures on topics such as minimising disease risk, translocation, monitoring and euthanasia. Standard operating procedures are updated and reviewed as new techniques are developed or procedures improved.

The AEC maintains a register of projects in accordance with the conditions of DEC's licence to use animals for scientific purposes. A comprehensive database stores details of the projects, staff affiliations and competencies.

During 2011–12, the AEC assessed and approved more than 238 items, consisting of 20 new applications, 15 amendments to existing projects, 21 project renewals for existing projects, 147 annual reports and 35 unexpected animal death reports. Projects covered the matters of translocations, surveys, monitoring, feral animal control, research and education. At 30 June 2012, all annual reports had been received and 137 projects were current and active.

The AEC has assessed applications on behalf of the Australian Wildlife Conservancy (AWC) since 2001. DEC also assesses applications for the WA Museum, the Centre for Whale Research and the Department of Fisheries. It has memoranda of understanding with the following institutions for jointly managed projects: UWA, Murdoch University, Edith Cowan University, University of Queensland and James Cook University.



Porongurup National Park. Photo— Samille Mitchell/DEC

Sustainable Forest Management



Sustainable Forest Management

Sustainable Forest Management service ensures the provision of economic, social and cultural benefits from State forest and timber reserves, while conserving biodiversity, maintaining soil and water values, and sustaining health, vitality and productive capacity of the forest for current and future generations.

Consistent with the statutory purpose of State forest and timber reserves as defined in the CALM Act, under this service DEC provides for forest management on an ecologically sustainable basis. This includes implementing government policies, and providing for the harvesting, regeneration and growth of forest products in accordance with the *Forest Management Plan 2004–2013* (FMP).

In 2011–12, this service:

- prepared an end-of-term audit of performance report of the FMP
- provided support to an expert panel review of silviculture practices for the south-west forests of WA
- finalised an amendment to the FMP raising production levels of karri bole logs other than first and second grade sawlog from 117,000 to 160,000 cubic metres averaged annually for 10 years
- prepared and published a three-year (2011–13) indicative timber harvest plan
- undertook a review of public firewood collection areas
- started integrating Woodstock™ forest planning software with other resource modelling and inventory systems, which have also been upgraded
- undertook the evaluation, approval and monitoring of over 50 disturbance operations exceeding 8,990 hectares within State forest and timber reserves to ensure compliance with the environmental outcomes sought in the FMP
- implemented effective fire management for the protection of values on State forest and timber reserves in the south-west
- undertook preliminary work on 10 indicative fauna habitat zones and designed and established the final locations of 11 fauna habitat zones, covering more than 2,400 hectares of State forest
- undertook the detection and mapping of *Phytophthora* dieback disease on 15,900 hectares of DEC-managed land to inform the planning and management of disturbance operations and the prioritisation of disease treatments
- continued to work to improve modelling of the rate of spread of *Phytophthora* disease in south-west landscapes.

Further information about the FMP 2004–2013 is available on the DEC website:

www.dec.wa.gov.au/management-and-protection/forests/forest-management-planning/forest-management-plan-2004-2013

Implementation of approved forest management plans and government policies and programs

Forest Management Plan 2004–2013

The FMP continued to be implemented and work relating to the remaining land category changes proposed in the FMP continued. It is proposed to create the new reserves through legislation.



Consultation begins on new forest management plan

Consultation on a new forest management plan, which will cover about 2.5 million hectares in the state's south-west, began in November 2011.

Environment Minister Bill Marmion said the plan would set out, in a transparent manner, the principles and rules by which the state's forests and timber reserves would be managed.

"This includes the forests and timber reserves in the state's south-west, extending from Moore River to the south Coast," Mr Marmion said.

"It is important that input from key stakeholders is obtained early in the consultation process. Initially, this will be with government agencies.

"Consultations on the plan will then move to key stakeholder groups such as the Conservation Council of WA and Forest Industries Federation of WA.

"The non-statutory consultation process will help ensure the views of key stakeholder groups are considered so that biodiversity is conserved; ecosystems are sustained; and the social, cultural and economic benefits valued by the community are given full consideration."

The Minister said the Conservation Commission of WA (the proponent) and DEC were working collaboratively in rolling out the consultation process. Discussions have been held with the Environmental Protection Authority, which will be required to assess the plan.

The current 10-year plan, *Forest Management Plan 2004–2013*, is due to expire at the end of 2013 and the new 10-year plan will come into force in 2014.



An end-of-term audit was released in March 2012. The audit meets the requirements of both Ministerial Condition 2-2 and Action 32.3 of the FMP. An EPA report and recommendations on the end-of-term audit was released in June 2012.

The end-of-term audit is available on the DEC website:

www.dec.wa.gov.au/index.php?option=com_docman&task=doc_download&gid=7155&Itemid=

DEC continued to maintain the spatial and measurement datasets required to sustainably manage State forest and timber reserves.

DEC continued to facilitate the implementation of the *Wungong Catchment Environment and Water Management Project* for the Water Corporation.

Preparing the next forest management plan

The next FMP is scheduled to take effect in 2014. The plan is being prepared by DEC on behalf of the Conservation Commission of Western Australia and is progressing well. An environmental scoping document for the plan was released on 30 April 2012 for public comment. Consultation was undertaken with peak industry and conservation groups, local government, universities and key government agencies from November 2011 and this will continue through to March 2013.

Supplementary and background information was prepared to support the release of the *Draft Forest Management Plan 2014–2023* for public consultation.

Community forest inspection program

Community forest inspections provide community representatives with the opportunity to inspect first-hand the systems and processes that are in place to manage the harvest of native forest trees from State forest, and to note compliance with existing management systems and processes.

Members of the voluntary conservation movement, representatives from local government, and staff from the Forest Products Commission (FPC) and DEC inspected harvesting in the Warren Region in December 2011.

The South West Region continued to address community concerns associated with harvesting at Helms, west of Nannup.

Inventory, assessment and modelling of natural resources

A wide range of technical services related to the inventory, assessment and modelling of natural resources was provided within DEC and to the FPC, Conservation Commission and external clients. Major areas of activity were:

- gathering and analysing of timber inventory data to assist the FPC, DEC and the Conservation Commission in planning, managing and monitoring timber production in State forest and timber reserves
- interpreting digital images of State forest acquired between 2009 and 2011 to map forest characteristics and stratify areas for timber inventory
- updating the existing jarrah (*Eucalyptus marginata*) inventory with measurement of a selection of inventory plots
- undertaking vegetation mapping to inform silvicultural decisions, old-growth forest assessments, disease impact predictions and the protection of poorly represented vegetation complexes
- undertaking field measurement programs to monitor the yields and silvicultural standards realised in timber harvest operations, with enhanced data processing

- providing specialist services to DEC divisions, the FPC, other government agencies, natural resource management groups and external clients (services included aerial photography, photo-interpretation, photogrammetry, vegetation and disease mapping surveys, and database design and development)
- deploying and integrating modelling software and developing natural resource models to support the next FMP
- upgrading and developing forest resource management systems to support the next FMP.

Maintenance and enhancement of biodiversity and other values of forests

The Sustainable Forest Management service undertakes measures to sustain, or where possible enhance, biodiversity and other forest values. Staff provide information about and maps of *Phytophthora* dieback occurrence to enable operations to be undertaken with the lowest risk of spreading the disease. Staff are also responsible for implementing an approvals, monitoring and compliance management system, and setting standards for the management of a range of forest values.

DEC's Regional Services Division delivers other sustainable forest management outcomes, and the Science Division undertakes research to enhance management of biodiversity, ecosystem health and vitality, and soil and water values.

Health and vitality in natural landscapes

Mapping the presence of symptoms of the plant disease caused by *Phytophthora cinnamomi* was carried out during the year to determine areas suitable for protection. Hygiene requirements were specified for activities likely to result in the movement of soil (and, as a consequence, *P. cinnamomi*) on lands managed by DEC. An area of 15,036 hectares was mapped to assist the planning of roads and timber harvesting operations undertaken by the FPC. This included 7,815 hectares previously mapped that were checked for further spread. Mapping and hygiene planning were undertaken on a further 863 hectares for DEC's purposes, and 96 hectares for external parties.

Integrated planning support

The maintenance and enhancement of biodiversity and other values across landscapes required a high level of integrated planning within DEC in 2011-12. This outcome was supported through:

- planning support to Regional Services Division to guide the selection and management of public firewood and flora harvesting areas
- monitoring and collating information about areas burnt by bushfire and prescribed fires across the forest to support integrated fire planning and reporting
- assisting the Regional Services Division to evaluate the biodiversity assets at risk from disturbance when assessing proposals for roads, utilities and other infrastructure.

Management of soil disturbance in timber harvesting

The FMP provides for increased protection of soils during timber harvesting by introducing soil damage risk periods based on a trafficability index and prescribing measures to be applied in each risk period to protect soil during timber harvesting. The department continued to manage an approvals process for access during moist soil conditions. Authorisation of access to harvest areas during winter and spring was based on consideration of the risk associated with soil attributes. Access was not granted to areas with an inherently high risk of soil disturbance.



Implementation of fauna habitat zones

An initiative of the FMP is the introduction of approximately 280 indicative fauna habitat zones, of at least 200 hectares each, in State forest and timber reserves. Design, analysis, survey and liaison work were undertaken for 10 indicative fauna habitat zones adjacent to proposed disturbance activities, and the location of 11 fauna habitat zones was finalised. The zones cover a gross area of more than 2,400 hectares of State forest.

Management system for approvals, monitoring and compliance

All operations in State forest require consideration and approval from DEC.

Departmental staff monitored the compliance of operations with the conditions of approval and environmental management standards. Where non-compliance in timber harvesting operations is identified, DEC may issue the proponent with an incident report (IR) for minor issues, a works improvement notice (WIN) if the non-compliance can be rectified by further field operations, or a management letter (ML) if it cannot. In 2011–12, staff issued three WINs and two MLs; no IRs were issued. One WIN related to a soil and water issue, two WINs and two MLs related to systems and process issues. Of the three WINs and two MLs issued in 2011–12, one WIN and one ML have been closed with satisfactory outcomes. The remaining two WINs and one ML remain open. Of the WINs, MLs and IR previously issued that remained open, one IR was satisfactorily resolved and two WINs and two MLs remain open.

Forest monitoring

Eleven *FORESTCHECK* monitoring grids in DEC's Blackwood District were assessed in 2011–12 to provide information about the response to silvicultural treatments on forest structure and biodiversity, including vascular flora, macrofungi, lichens and bryophytes, birds and other terrestrial vertebrates.

Results from the first five years of *FORESTCHECK* monitoring were published in a series of 10 scientific papers in a special edition of *Australian Forestry* in December 2011.

Monitoring of the outbreak of gum-leaf skeletoniser (*Uraba lugens*) in the southern jarrah forest continued. The density of gum-leaf skeletoniser populations declined from the very high level observed in 2010 and defoliation was less severe and extensive than in the previous summer.

A major experimental study, *Project Vesta*, that quantified changes in fire behaviour in open eucalypt forest with increasing fuel age was finalised. A series of papers presenting analysis of fire behaviour, flame characteristics and new fire behaviour models were published in international scientific journals. Field data collected during the 2011–12 fire season verified that new fire behaviour models developed from *Project Vesta* are more accurate than existing models, particularly under severe burning conditions.

Forest auditing

The department undertakes audits of forest management practices and operations to ensure compliance with the FMP and associated guidance documents.

Three audits were undertaken during 2011–12 relating to monitoring of native forest harvesting and managing associated disturbance from native forest harvesting. The audits covered the management and rehabilitation of basic raw material pits, monitoring of native forest harvesting, and coupe management and environmental protection.

Managing and rehabilitating basic raw material pits

Basic raw materials pits supply material for the department's own purposes in recreation and native conservation activities and facilitate the supply for timber harvesting undertaken by the FPC. An objective of the FMP is to promote the rehabilitation of areas where basic raw materials have been extracted.

The *Guidelines for the Management and Rehabilitation of Basic Raw Material Pits* (2008) cover the management and rehabilitation of areas quarried for basic raw materials on DEC-managed lands. The aim is to establish consistent standards by providing guidance on site selection and planning, operational procedures, rehabilitation works and revegetation requirements. Pit management plans detail pit management and rehabilitation.

The audit assessed the effectiveness of the procedures in context of the guidelines to manage and rehabilitate pits. Pits used by the FPC for harvesting operations and by DEC were sampled. The audit found that there was a high level of compliance with specifications across the three regions, that the guideline was being used consistently and that the majority of pits inspected had pit management plans in place.

Native forest harvesting—monitoring of native forest harvesting

Timber harvesting operations in State forest and timber reserves in the area of the FMP are approved and monitored by DEC in accordance with guidance documents that specify a range of requirements relating to silvicultural outcomes, protecting soil and water values and demarcating informal reserves not available for timber harvesting. Field monitoring of these operations is undertaken by regional and district staff.

The audit examined the DEC processes for monitoring native forest timber harvesting operations in the Swan, South West and Warren regions and ensuring compliance. Monitoring is actively undertaken across these regions; however, some improvements have been suggested.

Native forest harvesting—coupe management and environmental protection

The FPC conducts harvesting operations on DEC-managed land where compliance is required with a range of environmental standards, as detailed in the FMP and associated guidance documents. This audit assessed a sample of these environmental management and protection elements in selected active and completed coupes in jarrah and karri forest.

Planning/pre-harvest checklists

Planning/pre-harvest checklists must be completed by the FPC and approved by DEC before timber harvesting can begin.

Table 13: List of coupes sampled

Coupe	Status	Forest
Bowelling	Active	Jarrah/wandoo
Ellis Creek	Complete	Jarrah
Bristol/Mungalup	Complete	Jarrah
Upper Capel	Complete	Jarrah
Hunt (2 coupes)	Dormant	Jarrah/wandoo
Chandler	Complete	Jarrah
Iffley	Complete	Jarrah
Meribup	Dormant	Jarrah
Dombakup (2 coupes)	Complete	Karri



All coupes sampled had correctly completed planning/pre-harvest checklists for each relevant harvesting operation.

Coupe demarcation

Management boundaries, including coupe, river, stream, travel route and diverse ecotype zones, must be identified and demarcated before harvesting starts. The management boundaries of 11 coupes were assessed and all reserve boundaries were correctly demarcated.

Table 14: Summary of coupe demarcation

	Stream zone	Diverse ecotype zone	Other reserves	Total
Length assessed (m)	16,704	5,495	3,097	25,297
Length correctly marked (m)	16,704	5,495	3,097	25,297
Percentage correct	100	100	100	100

Protecting water—informal reserves

Informal reserve boundaries should be protected during all phases of the harvesting operation.

Table 15: Summary of incidents

	Stream zone	Diverse ecotype zone	Other reserves	Total
Length assessed (m)	16,704	5,496	3,097	25,297
No. of minor incidents	3	1	0	4
Length of minor incidents (m)	65	5	0	70
No. of major incidents	0	0	0	0
Length of major incidents (m)	0	0	0	0
Percentage of edge protected intact	99.6	99.9	100	99.7

The management boundaries of 11 coupes were sampled for compliance. No incidents were recorded in nine coupes. Three minor incidents totalling 65 metres were recorded in two coupes. These incidents involved machine activity crossing into stream zones. Stream zones were demarcated at or above the prescribed width requirement. One minor incident totalling five metres was recorded in a diverse ecotype zone.

Phased logging

In all second-order catchments in the intermediate and low rainfall zones of multiple-use jarrah forest subject to harvesting, at least 30 per cent of each second-order catchment has a retained basal area of greater than 15 square metres per hectare for a period of at least 15 years after harvesting of the remainder of the catchment.

Areas were sampled in the field and had been retained as specified.

Identifying habitat retention

To ensure the sustained availability of suitable refuge hollows for fauna after timber harvesting two types of habitat trees are retained and one example of ground habitat per hectare. The two types of habitat trees are:

- five primary habitat trees per hectare—trees that have a moderate to high probability of bearing hollows
- six to eight secondary habitat trees per hectare—trees that have a lower probability of bearing hollows at the time of tree marking, but provide for the sustained availability of hollows through time (these trees also contribute the structural diversity in the coupe).

Table 16: Habitat retention

Habitat trees						
No. of coupes assessed	Area sampled (ha)	No. of primary habitat trees	No. of secondary habitat trees	Average no. of primary habitat trees / ha	Average no. of secondary habitat trees / ha	Average no. of all habitat trees / ha
9	52	421	312	8.1	6	14.1

Ground habitat			
No. of coupes assessed	Area sampled (ha)	Number of habitat logs	Average number of habitat logs / ha
9	52	45	0.9

In the nine coupes sampled, the average number of primary habitat trees was above the required retention rate, as was the retention rate in each of the nine coupes. The required standard for retention of secondary habitat trees was achieved in five of the nine coupes sampled. For ground habitat requirements, five coupes achieved the required retention rate and four coupes recorded below this rate.

Protecting crop trees

Marked crop trees are required to be protected from damage during harvesting operations.

Damage is defined as:

- exposure of more than 100 square centimetres of cambium
- felling, breaking or uprooting of a crop tree
- removal of more than 30 per cent of the crown.

As well as avoiding physical damage, all debris created by a harvesting operation should be removed from the base of crop trees.

Table 17: Crop trees assessment

No. of coupes assessed	No. of crop trees assessed	No. of crop trees undamaged	No. of crop trees damaged
10	1,128	1,095	33
	(100%)	(97%)	(3%)

All of the coupes assessed were below the allowable five per cent limit for crop tree damage. The highest level of damage recorded was four per cent and the lowest one per cent.



As well as avoiding physical damage, all debris created by a harvesting operation should be removed from the base of crop trees. This task is commonly known as 'tops disposal' and is designed to protect crop trees from fire damage. All woody material greater than 75 millimetres in diameter must be removed at least one metre from the bole of the crop tree.

Table 18: Crop trees tops disposed and not disposed

No. of crop trees assessed	No. of crop trees tops disposed	No. of crop trees not tops disposed
1,128	1,042	86
(100%)	92%	(8%)

Only two coupes, both karri thinning operations, achieved the compliance level of 95 per cent. The highest level of completed tops disposal in the 10 coupes assessed was 96 per cent and the lowest level was 86 per cent.

Protecting soil

When extraction is completed in any feller's block, and prior to machinery leaving, interceptor banks and drains must be constructed across all extraction tracks and disturbed firebreaks with exposed soil to minimise the risk of erosion. The minimum size and angle of banks is set and the prescribed spacing is dependent on the slope and soil type.

Table 19: Erosion control

No. of coupes assessed	No. of coupes meeting specification	Length of extraction track assessed (m)	Length of track meeting specification (m)	Length of track not meeting specification (m)
9	9	10,732	8,10,732	0
	(100%)	(100%)	(100%)	(0%)

All nine coupes assessed achieved 100 per cent compliance with erosion control measures.

Rehabilitating landings

There is an annual program in place to rehabilitate landings. At the completion of harvesting, landings are ripped and scarified and then seeded and fertilised when conditions are right.

Preparation work for landing rehabilitation, ripping and scarifying, had been undertaken in most completed coupes sampled, except where products still remained on the landings.

Protecting threatened flora

Before any activity is undertaken on DEC-managed land resulting in the clearing of native flora, field searches must be conducted to determine whether threatened flora is present.

Records of field searches for the presence of threatened flora populations were available for all coupes assessed.



Protecting threatened fauna

Areas planned for harvesting are assessed in a desktop study against a matrix that determines the probability of habitats of threatened fauna occurring, supplied from the *Fauna Distribution Information System*. Databases containing records of known habitats, populations and sightings are also consulted.

Printouts from the fauna distribution database were available for all coupes sampled.

Adaptive management

DEC continued to contribute to the coordination and implementation by the Water Corporation of the *Wungong Catchment Environment and Water Management Project*. This adaptive management trial in the 12,845-hectare Wungong Catchment aims to increase water availability by managing vegetation density.

The care and maintenance program initiated in 2010–11 continued into 2011–12. This involved follow-up treatment for coppice control on 25 hectares of minesite rehabilitation planted with exotic eucalypts across Chandler and Mundlimup forest blocks. Treatment to control woody weeds also continued in areas of the catchment to be converted back to the native forest structure.

On 5 June 2012, a draft silviculture guideline, *Silvicultural Treatment of Native Forest to Enhance Streamflow and Groundwater Reserves in the Wungong Catchment (Treatment Area 4)*, developed jointly by the department and the Water Corporation, was released for public comment.

Information sessions with schools, universities and environment and community groups continued throughout the year.



Forest management plan amendment

In October 2011, the *Forest Management Plan 2004–2013* was amended to raise the harvesting level of karri other than first and second grade sawlogs.

Environment Minister Bill Marmion said the average annual karri other bole volume had been raised from 117,000 to 160,000 cubic metres per year averaged over the 10-year life of the plan.

Mr Marmion said the new harvest level was consistent with the availability of the resource and would allow for improved forest management, including thinning of young karri regrowth and using prescribed burning for protection against bushfires.

“Thinning of young karri forest, essential for improving growth of remaining trees, has produced more timber than expected when the current plan was prepared,” he said.

“The Conservation Commission and the EPA have supported the amendment.

“In its advice to the EPA in 2009, the Conservation Commission concluded there should be no negative impact in the short term from continued harvesting in regrowth areas and noted that the health of the karri regrowth forest could be impacted in the long term if karri regrowth thinning was scaled back.

“The EPA mid-term audit of the *Forest Management Plan 2004–2013* stated that the new harvesting level may be of some benefit to the forest.”

Under the amendment, first and second grade karri sawlog harvest levels remained at 54,000 cubic metres per year averaged over 10 years.

More than 1,500 submissions were received during public consultation on the proposed amendment.

Provision for harvesting, regeneration and growth of forest products

Silviculture guidelines

An expert panel review of silviculture practices in the south-west forest was undertaken, and its findings were presented to DEC in December 2011. The panel's findings provided the basis for a review of the jarrah, karri and wandoo silviculture guidelines. The expert panel report is available on the DEC website: www.dec.wa.gov.au/index.php?option=com_docman&task=doc_download&gid=7496&Itemid=

Monitoring procedures to assess protection levels for growing stock and habitat trees, and for the assessment of tree marking, continued to be implemented and improved following feedback from field operational staff.

Training continued through the delivery of briefings and through informal coaching in the application of silvicultural practices and the implementation of monitoring procedures.

Monitoring of areas subject to timber harvesting and associated treatments

Monitoring was undertaken in areas subject to commercial timber harvesting, silvicultural treatments and forest disturbance activities under the direction of the FPC. In the 12 months to December 2011, 8,820 hectares of native forest were harvested with the following silvicultural or management objectives.

Table 20: Silvicultural objectives

Forest type	Silvicultural objective	Area cutover (ha)
Jarrah (<i>Eucalyptus marginata</i>)	Release of regeneration (gap)	310
	Establishment of regeneration—eastern jarrah (shelterwood)	1,470
	Establishment of regeneration—western jarrah (shelterwood)	1,310
	Promote growth on retained trees (thinning)	420
	Single tree selection (retention in <i>Phytophthora</i> dieback areas)	670
	Selective	1,960
	Subtotal	6,140
Karri (<i>E. diversicolor</i>)	Establish jarrah/karri regeneration	10
	Establish regeneration (clearfall karri)	460
	Establish regeneration (partial karri clearfall)	0
	Promote growth on retained trees (thinning)	850
	Subtotal	1,320
Wandoo (<i>E. wandoo</i>)	Establishment of regeneration	30
	Promote growth on retained trees (thinning)	0
	Subtotal	30
Other/any forest type	Other (mining and clearing for utilities)	1,360
	Total	8,850



Table 21: Trends in the area of native forest harvested

	Jarrah forest (ha)	Jarrah/wandoo forest (ha)	Karri forest	
			Clearfelled or cut to seed trees (ha)	Thinned (ha)
1976–77	32,320	1,170	2,610	-
1977–78	26,020	740	4,450	-
1978–79	25,540	530	2,710	-
1979–80	25,150	860	2,110	60
1980–81	22,930	1,440	2,080	180
1981–82	24,680	610	2,180	320
1982–83	23,740	330	990	190
1983–84	21,540	580	1,490	260
1984–85	20,010	1,440	2,360	500
1985–86	22,640	650	1,590	340
1986	19,340	1,150	1,090	490
1987	17,180	1,380	1,310	700
1988	23,400	490	1,180	840
1989	15,130	200	1,510	910
1990	12,960	100	1,560	340
1991	10,910	-	1,920	230
1992	13,990	30	1,540	310
1993	14,250	40	1,630	80
1994	14,050	50	1,440	-
1995	17,830	30	2,410	-
1996	22,320	50	1,300	60
1997	18,240	60	1,870	60
1998	19,250	60	1,970	320
1999	14,200	50	1,890	360
2000	20,570	10	1,310	70
2001	15,760	*	1,380	120
2002	13,260	30	700	350
2003	8,520	-	720	485
2004	8,860	-	330	920
2005	6,220	30	460	1,070
2006	8,440	300	400	1,130
2007	8,120	60	560	1,000
2008	7,280	0	390	660
2009	8,990	10	740	920
2010	4,520	0	400	1,220
2011	7,500	30	470	850

*Total includes small areas of other forest types cleared for mining or landings



Mountain biking is a popular activity in many Western Australian parks.

Parks and Visitor Services

Parks and Visitor Services

Public involvement, visitation and appreciation of the natural environment on DEC-managed lands and waters is a major responsibility of the department. This includes:

- preparing and implementing management plans in accordance with the CALM Act
- preparing and implementing recreation site development plans
- providing, managing and maintaining appropriate access, recreation opportunities and visitor facilities
- protecting natural areas, visitors and facilities from bushfire
- training departmental staff and volunteers
- working with local visitor centres and commercial tour operators
- involving Aboriginal people in park management
- involving Aboriginal people in the provision of visitor facilities and services
- providing visitor information, and designing and initiating educational and interpretive activity programs that enrich visitor experience and help develop greater community awareness and support for parks, natural areas, astronomy, nature-based tourism, and recreation services and policies
- undertaking scientific, visitor and social research, in cooperation with other research institutions
- providing services to the Conservation Commission and the Marine Parks and Reserves Authority (MPRA).

This work is carried out by staff around the state, with the support of thousands of volunteers as well as local visitor centres, tourism operators, and local community organisations.

Planning for management

During 2011–12, the Minister for Environment approved management plans for Lane Poole Reserve and proposed reserve additions, Millstream Chichester National Park and Mungaroo Range Nature Reserve, Shannon and D'Entrecasteaux national parks, Perup, Dryandra Woodland, and Shark Bay terrestrial reserves and proposed reserve additions. This brings the total number of current terrestrial management plans prepared under the CALM Act to 52. The Minister for Environment also approved an amendment to the Fitzgerald River National Park management plan.

A further seven terrestrial management plans are currently being prepared: these are for the proposed Murujuga (Burrup Peninsula) National Park, Yanchep and Neerabup national parks and reserve, Leeuwin-Naturaliste capes area, Ord River and Parry Lagoons nature reserve, Yoorrooyang Dawang proposed conservation parks, Barrow group nature reserves, and Tuart Forest National Park.

During 2011–12, the draft management plans for the Barrow group nature reserves and Tuart Forest National Park were released for public comment.

The public contributed to the content of the management plans through public and stakeholder workshops and meetings, formal advisory committees, newsletters and invitations to comment on draft plans. Aboriginal people were also engaged through the involvement of Aboriginal native title representative bodies and Aboriginal park councils.



At 30 June 2012, there were:

- 52 statutory terrestrial management plans in place
- seven final terrestrial management plans in preparation
- six draft terrestrial management plans in preparation
- nine statutory marine management plans in place
- one marine indicative management plan in preparation
- one marine indicative management plan released for public comment.

Further information about management planning is available on the DEC website: www.dec.wa.gov.au/landmanagementplanning

Acquisition and administration of protected areas

Reserve acquisition

The formal process of adding land to the state's system of protected areas continued throughout the year.

DEC purchased 10 parcels of land of high conservation value, covering about 19,000 hectares for future addition to the conservation reserve system.

Details of these acquisitions are available in the department's 2011–12 annual report which is available on the DEC website: www.dec.wa.gov.au/annual-report-and-yearbook

Other programs and processes led to the acquisition of lands (such as land ceded to the state as a condition of subdivision, land acquired from negotiated exchanges, and reserves no longer required by other agencies and organisations) suitable for inclusion in the conservation reserve system.

Work continued on the implementation of tenure changes proposed in the *Forest Management Plan 2004–2013* and towards the implementation of outstanding tenure recommendations in other management plans.

DEC also continued its role of providing advice on land proposals referred from other organisations, such as the Department of Regional Development and Lands, and advised on issues including the use or disposal of unallocated Crown land and surplus Crown reserves.

Leasing activities

DEC has lease arrangements for a wide range of purposes. At 30 June 2012 there were 253 current formal arrangements for uses on lands managed by DEC including recreation, tourism accommodation, utilities and sawmills. The formal arrangements comprise 186 leases, 38 written agreements, eight licences, 18 memoranda of understanding and three sawmill site permits.

DEC entered into 29 formal agreements in 2011–12, which mainly involved the renewal of agreements for existing uses.

Major achievements were:

- a new lease for the management and operation of the Mt Hart Wilderness Lodge Homestead in the King Leopold Ranges Conservation Park

- a new lease and licence for the new water treatment plant at Mundaring to allow for future expansion of the C.Y. O'Connor pipeline
- a new lease for an ecotourism camp in Purnululu National Park
- a new lease to the City of Rockingham to allow for recreational diving on the sunken vessel, Saxon Ranger, within the Shoalwater Islands Marine Park.

During the year, a number of other formal arrangements expired and, at 30 June, were at various stages of being renewed.

Apiary site management

At 30 June 2012, there were 3,299 current apiary site permits, of which 1,656 were on lands managed by DEC, with 882 located on State forest, 100 on timber reserves, 379 on national parks, 221 on nature reserves, 63 on conservation parks and 11 on other lands vested in the Conservation Commission.

During 2011–12, 912 apiary site permits were processed, comprising:

- 23 authorities transferred between beekeepers
- 16 site permits from applications to occupy new or previously cancelled sites
- six site permit relocations
- 761 site permit renewals
- 106 site permit cancellations.

At 30 June 2012, there were 124 applications being processed.

The Beekeeping Consultative Committee met twice during the year to discuss issues including DEC's pool of sites; feral bee baiting program; feral bee strategy; use of chemicals by beekeepers on Crown land; fast tracking applications; size and site plan of an apiary; beekeepers handbook; conditions booklet, surveillance program; code of conduct; lands vested in other agencies; Beekeeping Policy 41; beekeeping guidelines; maps to be provided to beekeepers on CD; clearing permits; beekeeper alert e-newsletter; new apiary forms; DEC updated apiary web pages; draft management plans for public comment; apiary sites at Mt Gibson; *Phytophthora* dieback; DEC district apiary assessment form; green card training; and apiary sites in reservoir protection zones.

The committee is convened by DEC and comprises industry, government and beekeeping groups.

Further information about apiary management and permits is available on the DEC website: www.dec.wa.gov.au/beekeeping

Park presentation and resource protection

DEC aims to provide high-quality visitor services and facilities that are planned, designed, developed and managed in a sustainable way.

Capital works

The capital works program for Parks and Visitor Services aims to improve and maintain recreation and tourism assets in national parks, conservation parks, State forest and other reserves across the state. Works are typically associated with the construction, upgrading and maintenance of roads, day-use and camping facilities, and ensuring visitor safety. Works are also undertaken to protect environmental, social and landscape values at these sites.

During the year, capital works funding was spent on park improvements and roads. A description of projects undertaken in each DEC region is provided in the Regional activities section (see page 128).



Roads

DEC has continued work on developing a road asset management system for its 37,000-kilometre road network. This project will assist in identifying high priority road improvement works, planning strategic road requirements, managing identified road hazards, and identifying present and future funding requirements.

The initial stage—collecting all inventory-related information and condition assessments for strategic roads and bridges—is complete. During 2011–12, DEC continued rectifying road data against databases from Landgate and Main Roads WA to ensure DEC road information is accurate.

DEC continues to work closely with other agencies, such as Landgate, Main Roads WA, the WA Local Government Association, and the FPC, in developing policies and interagency agreements to ensure that appropriate standards and user requirements are met and the road information flow is logical and efficient. DEC will continue its collaborative work with local government authorities and Main Roads WA on inter-regional road construction and maintenance work across agency boundaries.

Recreation planning and design

DEC prepared visitor services plans, master plans, concept plans and site development plans for many projects around the state. These documents assist with strategic planning decisions and funding applications, and enable capital works projects to be built to a high standard.

During 2011–12, planning for visitors was completed for Torndirrup National Park and started for Cape Le Grand National Park and Dryandra Woodland. Plans were completed for upgrading visitor access and facilities at Peak Charles National Park, Gregories and South Gregories in François Péron National Park and at Logue Brook Dam. Site selection and design are underway for four new camps on the Munda Biddi Trail.

The master plan was completed and site design continued on the *Fitzgerald River National Park Improvement Project* on the south coast. Construction drawings were prepared for a number of sites.

Planning and design were undertaken on components of Royalties for Regions projects, including low-cost in-park camping, *Naturebank* and park visitor infrastructure. Work was undertaken on site plans for low cost in-park camping facilities at Martins Tank in Yalgorup National Park, Potters Gorge in Wellington National Park, Kurrajong campground in Cape Range National Park and Nanga in Lane Poole Reserve. Site assessment was undertaken and design guidelines were being developed for nominated *Naturebank* sites around the state, including New Island Bay in Cape Le Grand National Park. Development of site plans started for park visitor infrastructure for the Loop and Z Bend in Kalbarri National Park and the Gap precinct in Torndirrup National Park.

Design and/or construction documentation drawings were prepared for many small structures such as boardwalks, toilets, steps and lookouts, including toilets for Kurrajong and Martins Tank campgrounds, a new viewing platform at Hamersley Gorge in Karijini National Park and camping shelters on the Munda Biddi Trail.

Planning, training and design advice for recreation were provided as needed and the recreation planning and management course was delivered in May 2012. Advice was given on numerous projects associated with DEC, and staff represented the department on working groups including the Coastwest Technical Assessment Group.

Visual impact assessment, recommendations, guidelines and specialist advice were provided for a number of proposals throughout the year. A visual landscape study was prepared for the Mount Manning, and Helena and Aurora ranges. Expert advice continued to be provided on visual landscape planning relating to development proposals along the Leeuwin-Naturaliste coastline.

Visitor communication and management

Interpretive planning and design

Interpretation project plans were prepared for all major site developments with interpretive facilities. Interpretation plans prepared as part of the *Kimberley Science and Conservation Strategy* included: Tunnel Creek National Park, and Munurru on the King Edward River. Sign plans were produced for Baden Powell campground (Lane Poole Reserve) and Kurrajong campground (Cape Range National Park). Kurrajong, Wallardi and Bellburn campground redevelopments (Purnululu National Park), and Gregories and South Gregories campgrounds (François Péron National Park).

DEC continued to meet regional needs for signs and displays for visitors to DEC-managed areas. Designs were prepared for 371 projects with the majority now installed in parks and reserves throughout the state.

Interpretive projects of note were shelter panels for the Great Western Woodlands; trailside signs for Walyunga National Park; and Swan coastal marine sign system implementation. Work completed in partnership with other agencies included the design and installation of the Forrestdale Lake deck with interpretive wall sculpture, in collaboration with the City of Armadale; Forum Advocating Cultural and Ecotourism (FACET) newsletter design; Pinjar off-road vehicle area; and Kalamunda Mountain Bike Circuit.

Community liaison, consultation and advisory services

Consultation with special interest groups, agencies, individuals and Aboriginal communities is a key aspect of site developments and their interpretation on and off DEC-managed areas.

DEC staff worked with the Miriuwung-Gajerrong Park Council and established a signature sign system for identification and interpretation of jointly managed lands. Sign concept planning was undertaken for the Yawuru lands and waters around Broome. Consultation progressed with the Bunuba Park Council for the Geikie Gorge National Park visitor centre display and Jandamarra story interpretive panels for Tunnel Creek National Park. DEC staff worked closely with the Bunuba people in staging the play *Jandamarra* in Windjana Gorge National Park in July 2011.

DEC worked with Murdoch University on trailside signs for a banksia woodland walk trail; and in networking, workshops and conferences with FACET, WA Museum and Interpretation Australia association. DEC was a major sponsor of the Museums Australia and Interpretation Australia 2011 National Conference *At the Frontier—Exploring the Possibilities*, held in November 2011 in Perth.

Advice was given to local authorities, special interest groups and community groups across the state on the planning, design and production of signs. This included the Friends of Piesse Brook in Kalamunda National Park.

DEC is committed to providing access for people with disabilities and developing a culture of recognising the needs of people with disabilities. During 2011–12, DEC audited the accessibility of facilities around the state and provided information to the You're Welcome website (www.accesswa.com.au) being developed by the Disability Services Commission.



Jandamarra was a spectacular sight in Windjana Gorge. Photo – Matt Scurfield/Bunuba Films

Jandamarra returns to Windjana Gorge

Windjana Gorge came alive with sound and light in July 2011 when the play *Jandamarra* was staged at Windjana Gorge National Park for five nights.

Jandamarra is a true story about a Bunuba tribesman who led the Bunuba resistance against the colonisation of their land by pastoralists in the 1890s.

The production was mounted and run by Bunuba Films, a small independent Aboriginal company from Fitzroy Crossing with no permanent staff or infrastructure, in collaboration with playwright Steve Hawke and with assistance from DEC West Kimberley District staff.

With audiences averaging 460 people a night over the five nights, the spectacular show was well supported. Each evening Bunuba elder and Bunuba Films director June Oscar welcomed the audience and invoked the spirits of the country.

Pre-show dance performances were presented by the Bunuba Yilimbirri dancers, the Ngarinyin dancers from Mowanjum Art and Cultural Centre in Derby, a Bunuba women's group and the Wangkatjunka dancers. On the final night, singer-songwriter Paul Kelly gave an unforgettable performance, supported by Danny Marr from Fitzroy Xpress, and other local performers.

Fine arts, food and arts and crafts stalls from the Fitzroy Valley community helped create a festival atmosphere and make the event more than a theatrical performance.

“Staging the play at Windjana Gorge was a really special thing. That’s where the battle happened,” Ms Oscar said.

“That’s where the story was able to come alive, and to liven up that country again, and to be able to work with DEC, who were fantastic, and how nothing was difficult, or impossible with them, they worked with us, Bunuba Films, and Bunuba community, and I think it was really a win, win, win, for everybody.”

Guided interpretive programs

Guided interpretive programs continued to be provided regularly in major areas throughout the state. These included the *Nearer to Nature* program, which is conducted in Perth's regional parks and at the Perth Hills Discovery Centre near Mundaring, Yanchep National Park, Penguin Island Conservation Park and the Perth Observatory. Regional guided experiences were provided at Geikie Gorge National Park, guided observation of dolphins at Monkey Mia Reserve in the Shark Bay World Heritage area, the Valley of the Giants and Coalmine Beach near Walpole, Barna Mia in Dryandra Woodland and Perup – Nature's Guesthouse near Manjimup. DEC regional staff also continued to respond, where appropriate and available, to requests for specific presentations and guided experiences in local areas.

Further information about park presentation, facilities and activities is available on the DEC website: www.dec.wa.gov.au/parks-and-recreation

Aboriginal liaison, consultation and heritage

DEC places a high priority on liaising, consulting and working with Aboriginal elders, traditional owners and other interested stakeholders to enhance management of DEC-managed lands and waters. DEC's Aboriginal Heritage Unit helps implement these activities. During the year DEC liaised or worked with a wide range of individuals and organisations including:

- elders and the wider community from Quairading on a range of projects such as salinity and rare plants on DEC-managed lands, including Badjaling Nature Reserve
- elders in local Aboriginal communities regarding traditional land use and protocols
- completion of infrastructure in Badjaling Aboriginal Community
- elders conducting Welcome to Country for DEC events
- with groups in the south-west on significant site management
- DEC staff in Exmouth to identify cultural needs and future support programs
- Moora Aboriginal Community Group regarding future aspirations and joint management opportunities
- Balga Senior High School support group to contribute to their cultural education program content
- South West Aboriginal Land and Sea Council, including Noongar elders and community members, on customary activity programs
- Narrogin Aboriginal community elders to establish a stronger partnership with DEC
- Fairbridge and the Department of Corrective Services to establish a cultural support mentoring program
- DAFWA and Friends the Environment to develop a memorandum of understanding
- Department for Child Protection (Mandurah District Office) to establish a relationship with DEC and explore a potential training and mentoring partnership for youth in the Noongar community
- the Governor of Western Australia for cultural exchange.



Planning and relationship building

DEC places a high priority on building external and internal relationships with Aboriginal and non-Aboriginal groups, individuals and organisations. In 2011–12 this included:

- providing ongoing cultural advice and assistance to DEC staff regarding Aboriginal consultation and involvement on DEC-managed lands and waters
- providing links between DEC regional and district staff and Aboriginal communities
- maintaining ongoing relationships with a range of agencies and organisations such as NRM groups and officers, DAFWA, the cities of South Perth, Canning and Joondalup, National Green Jobs Corps, Peedac (an organisation providing training and employment opportunities for Aboriginal people), Dumbartung Aboriginal Corporation and Marr Moorditj Training Inc. regarding potential training and employment partnerships for Aboriginal people
- organising the biennial DEC Aboriginal Employee Workshop
- providing cultural advice, mentoring and support to community groups and school such as Mooditj Noongar Community College
- continuing to build on a positive working relationship with the South West Aboriginal Land and Sea Council through its memorandum of understanding with DEC
- involvement in formally establishing the DEC Aboriginal Employee Reference Group and implementing the terms of reference
- ongoing work with the Department of Corrective Services to deliver Aboriginal programs at Acacia, Bunbury and Albany prisons
- continuing liaison with the Gnulla Maaman Moort Boodja men's group to progress joint land management initiatives with DEC.

Education and training

DEC continues to deliver Aboriginal education programs to DEC staff, schools (day-care to secondary), community groups and special interest groups. Programs provided during 2011–12 included:

- cultural protocol workshops at Walyunga National Park for DEC staff
- ongoing assistance to DEC staff in organising Welcome to Country ceremonies for events
- training for DEC staff on the correct protocol for acknowledgment of traditional owners at DEC meetings and events
- facilitation of cross cultural awareness training
- exploration of further learning and training opportunities for DEC staff in the areas of heritage site training and native title.

Business management

Providing accurate park information, promoting responsible behaviour by visitors and providing services to the tourism industry are important functions of DEC.

Rediscover Parks

During 2011–12, DEC distributed about 21,000 copies of the *National, marine and regional parks in Western Australia—a visitor's guide to the state* throughout the state and at selected interstate events. The booklet outlines the features, facilities and activities available at more than 100 DEC-managed parks and reserves, and other important visitor information.

In November 2011, DEC attended the Perth 4WD and Adventure Show and presented information about parks and visitor facilities.

In March 2012, a DEC *Rediscover Parks* display at the Perth Caravan and Camping Show provided an excellent opportunity to showcase the new campground booking system, new electronic trail guides, *EveryTrail*, and to promote online sales of park passes and present other useful information, including various attractions such as the Tree Top Walk, to potential park visitors.

DEC continued to support and engage the recreation and tourism industries through a variety of activities, including:

- quarterly meetings with DEC's Tourism Industry Reference Group to assist with communication between DEC and the nature-based tourism industry. With support from the recreation and tourism sectors, a strategic review of the reference group was undertaken. This has culminated in a more results-driven approach for the group
- provision of editorial assistance to Tourism WA as well as various independent organisations in the park-related content of their publications to ensure accuracy and variety of content
- participation in planning for the addition of the Great South West Edge to Tourism Australia and Parks Australia's *National Landscapes* program
- a rolling series of *Free Park Days* initiated in 2010, with free public entry into selected parks (Beedelup, Cape Le Grand, Cape Range, D'Entrecasteaux, Gloucester, Kalbarri, Nambung, Millstream Chichester, Karijini, Porongurup, Walyunga and Yanchep national parks as well as the Tree Top Walk)
- in conjunction with Parks Forum (Australia), major sponsorship of the FACET Rediscover Parks Conference held at Yanchep National Park in September 2011
- significant progress on developing a new parks-focused *Rediscover Parks* website
- additional electronic park guides as part of DEC's strategy to utilise smart phone applications. DEC's electronic park guides can be found at www.everytrail.com/partner/dec
- the DEC Campgrounds website (www.dec.wa.gov.au/campgrounds), providing details for more than 110 camp sites around the state. In 15 months of operation, more than 7,000 bookings were made through a trial online booking system for popular sites in Cape Range, Purnululu and Beelu national parks, and at Lane Poole Reserve, Dwellingup.

Healthy Parks, Healthy People

The *Healthy Parks, Healthy People* program continues to be an important component of raising community awareness of the health benefits of parks. It also provides focus for public participation and community involvement strategies on DEC-managed lands. During 2011–12, DEC continued to pursue cross-promotional opportunities with non-government health organisations and other partners. Activities included:



- a walking event at Joondalup, which was well supported, as were restoration projects in the cities of Cockburn and Gosnells
- providing support to Leave No Trace (Australia) and Parks Forum in promoting the *Great Australian Bushwalk* as an integral part of *Hello Parks Week*. These events will be delivered annually to facilitate consistent and collaborative planning and promotion.

Park passes and fees

Park passes were distributed at 80 points around the state including DEC offices, selected national parks and 43 independent retail outlets.

Table 22: Breakdown of pass distribution 2011–12

Type of park pass	Number distributed	Change from 2011-11
Holiday	9,538	Increase 38%
Annual local	7,076	Increase 29%
Annual all	5,647	Increase 40%
Annual all concession	3,879	Increase 65%
Goldstar	363	Decrease 65%*

Note: Includes sales and passes sent to DEC offices but not yet sold

* The big decrease is the result of a high number of expired passes being returned from DEC offices

In 2011–12, DEC approved 224 requests for entry fee waivers. The value of foregone revenue was about \$86,770 based on estimated visitor numbers of 21,410 (see Table 23 for regional breakdown of the estimated number of visitors). DEC approves fee waivers to support aged and infirmed visitors, disabled groups, carers, educational groups, community service groups and not-for-profit organisations.

Table 23: Fees waived 2011–12 by region

Region	Swan	Midwest	Pilbara	Kimberley	Warren	South Coast
Number of visitors	11,836	4,856	1,827	45	627	2,219

Further information about park passes and fees is available on the DEC website: www.dec.wa.gov.au/parks-and-recreation/for-visitors/park-passes-and-fees



Photo – Tourism WA

Whale shark tourism on the rise

The whale shark tour industry in the Ningaloo Coast World Heritage Area attracted a record number of visitors in 2011.

Visitor statistics showed nearly 17,500 passengers were transported to the Ningaloo Marine Park during the 2011 season, compared to 14,286 during the 2010 season.

The whale shark watching season traditionally runs from early March to July/August each year.

Environment Minister Bill Marmion congratulated operators—who are licensed by DEC—and the tourism industry, for recording another best-ever season.

“The strength of the whale shark tourism industry has not only met the challenges of the global economic downturn, but it has also shown a great capacity to demonstrate that nature-based tourism and conservation management are complementary,” Mr Marmion said.

“The number of tours increased by 11.8 per cent from the 2010 season and there was a similar rate of contact with whale sharks during the tours. The increase in visitors swimming with the whale sharks is a reflection of highly successful co-operative marketing efforts in raising awareness of the Ningaloo region as an exciting holiday destination.

“The World Heritage listing of the Ningaloo Coast World Heritage earlier in 2011 further affirms Ningaloo’s position as one of the State’s most significant attractions.”

The number of tour passengers increased 22.4 per cent in 2011 from 2010, and 130 per cent from 2006. The total number of whale shark tours at Ningaloo in 2011 was 994 (up from 889 last year).

The visitor statistics were collected from logbook data submitted by the operators.



Commercial operations and events

Commercial operations licences

DEC licenses commercial operations to monitor and manage the commercial use of DEC-managed lands and waters pursuant to the CALM Regulations. The *Commercial Operator Handbook* details licence conditions applicable to commercial operators conducting such activities.

At 30 June 2012, 312 commercial operations licences were current for activities in marine and terrestrial reserves, comprising 275 general 'T' class licences, and 37 'E' class licences for operations where the numbers of licences granted are restricted. The number of commercial operations licences decreased from 324 licences at 30 June 2011.

DEC recognises two commercial operator accreditation programs. Accreditation is required for most classes of licences and assists in raising standards in the tourism industry. There are 71 operators who have accreditation through Ecotourism Australia (Eco Certification with business and environmental components), an increase from 38 in 2010–11, and 90 operators who are accredited with the Australian Tourism Accreditation Program (business certification), an increase from 89 in 2010–11.

In December 2011, the Ministers for Environment and Tourism announced the implementation of the recommendations from the *Review of Nature Based Tourism*. A key finding of the review is to provide greater certainty and flexibility to commercial tour operators while ensuring a high level of commitment to environmental performance. Recommendations included lengthening the duration of commercial operations licences from 10 years to 15 years, a requirement for all licence holders to achieve recognised tourism accreditation, and unrestricted licences being available for up to 10 years (previously five) depending on the level of appropriate accreditation being achieved by the licence holder.

Major recommendations regarding licences and tourism accreditation have been implemented. Tourism concessions granted by way of a lease or a licence will also have key performance indicators that can be audited to demonstrate a commitment to best practice standards. The requirement for accreditation for all licence holders is consistent with Tourism WA's recently adopted requirement that tourism operators have accreditation to be able to take part in the agency's marketing and promotion activities.

Further information about commercial operation on DEC-managed lands and waters is available on the DEC website: www.dec.wa.gov.au/parks-and-recreation/for-industry/commercial-operations-licensing

Naturebank

The *Naturebank* program involves the identification and preparation of suitable sites on DEC-managed lands for appropriate sustainable ecotourism initiatives. This program is a partnership between Tourism WA and DEC. Eight sites have been identified as potential *Naturebank* sites. These include:

1. Purnululu National Park, World Heritage area (Kimberley) *
2. Windjana Gorge National Park (Kimberley) *
3. François Péron National Park: Shark Bay World Heritage area (Midwest) *
4. Wharnccliffe Mill, Bramley National Park (South West) *
5. Cape Le Grand National Park (South Coast) *
6. Millstream Chichester National Park (Pilbara)
7. Mt Hart Wilderness Lodge (King Leopold Ranges Conservation Park, Kimberley)
8. Yoorooyang Dawang Regional Park (Aboriginal land close to Kununurra, Kimberley).

* *Naturebank* site assessments and clearances funded through *Royalties for Regions* program.

In 2010, the state government announced *Royalties for Regions* funding of \$5.2 million over four years to support the preparation of five of the eight *Naturebank* sites and, in some cases, the provision of infrastructure to assist in the development of commercial ecotourism accommodation facilities.

For details about *Naturebank* sites that have been assessed, advertised or allocated during 2011–12, please see page 12.

Further information about *Naturebank* is available on the DEC website:
www.dec.wa.gov.au/parks-and-recreation/for-industry/naturebank

Legislation and policy for parks and visitor services

Legislation

The *Conservation Legislation Amendment Act 2011* (CLA Act), which amends the CALM Act and the WC Act, was passed by Parliament on 13 September 2011. The CLA Act provides a mechanism for joint management of lands and waters between DEC and other landowners, or those with a vested or other interest in the land, and helps to establish joint management frameworks required for the state to meet its legal obligations under the Burrup and Maitland Industrial Estates Agreement, the Ord Final Indigenous Land Use Agreement and the Yawuru Agreements. The CLA Act also aims to fulfil long-standing aspirations of Aboriginal people to be involved in the management of land, and to carry out traditional activities 'on country' in conservation reserves.

Sections 3–39 and 41–46 of the CLA came into operation on 14 March 2012. These sections amended the CALM Act to:

- establish legal frameworks to enable joint management of lands and waters between the department and other landowners, or those with a vested or other interest in the land, including Aboriginal people
- introduce a new management objective to protect and conserve the value of the lands and waters to the culture and heritage of Aboriginal people.

The remaining sections of the CLA Act will be proclaimed in 2012–13. These sections will amend the CALM Act and the WC Act to enable Aboriginal people to undertake certain acts for customary purpose on reserves and other lands.

Amendments to the CALM Regulations, the WC Regulations, and the Forest Management Regulations to support these legislative changes are being drafted. They will focus on managing activities undertaken by Aboriginal people for customary purposes and address other consequential amendments as required.

The CALM Regulations were amended on 30 September 2011, increasing fees for the Tree Top Walk and Geikie Gorge National Park boat trips. Work has also continued on new regulations for the management of moorings in marine reserves.

Policy

During 2011–12, the development, review or final drafts of policies in the following areas continued:

- memorials, merchandising, organised group activities
- cave and karst features protection and management
- commercial filming
- mooring
- non-Aboriginal cultural heritage.

Further information about legislation and policy is available on the DEC website:
www.dec.wa.gov.au/about-us/about-dec/policies-and-legislation



Recreation activities and trails

DEC co-ordinates the management of outdoor recreation activities consistent with the protection of natural and cultural values on the lands and waters it manages.

During 2011–12, DEC continued to work closely with the Department of Sport and Recreation, Outdoors WA and other key stakeholders on important recreation initiatives. In partnership, DEC and the Department of Sport and Recreation developed and released a community e-learning CD on basic trail maintenance techniques.

DEC continued to work with the Department of Corrective Services with crews from Bunbury and Pardelup regional prisons assisting in the development of the Munda Biddi Trail.

Bibbulmun Track

DEC continued its strong partnership with the Bibbulmun Track Foundation in 2011–12. Foundation volunteers have contributed almost 17,000 hours towards maintenance and support of the Bibbulmun Track, including working with DEC staff in undertaking repairs and upgrades to camp sites along the length of the trail.

In the 2011 *Western Australian Tourism Awards*, the Bibbulmun Track won the Silver Medal in the Tourism Attraction category.

Near Collie, the 16-kilometre Wellington National Park spur trail, linking the Bibbulmun Track to the park trail network and Wellington Dam, was completed. The trail has been designed primarily for school groups and includes two new group-use camp sites.

In partnership with Verve Energy, DEC realigned the trail around the Grasmere expansion of the Albany Wind Farm close to Torndirrup National Park. Two new camp sites, Muttonbird and Sandpatch, were built and the Hidden Valley camp site was decommissioned. DEC continued with maintenance and improvements along the Bibbulmun Track as part of the capital works program. Some major accomplishments included:

- four camp sites (Giants, Murray, Chadoora, and Mount Dale) refurbished
- eight steel and timber bridges constructed
- a trail tread stabilisation trial implemented on the south coast.

Further information about the Bibbulmun Track is available on the DEC website:
www.dec.wa.gov.au/parks-and-recreation/tracks-and-trails/bibbulmun-track

Munda Biddi Trail

The partnership between DEC and the Munda Biddi Trail Foundation continued to strengthen. The Munda Biddi Trail Foundation was a finalist in the Adventure Tourism category of the 2011 *Western Australian Tourism Awards*. The trail continues to gain increased media exposure with numerous articles published in local and state papers and magazines such as *Australian Geographic* and *Scoop Traveller* during 2011–12.

Munda Biddi Trail Foundation volunteers have contributed around 2,000 hours in maintenance and support, and regularly inspect the cycle trail between Albany and Manjimup.

Following a survey of Munda Biddi Trail users between Mundaring and Nannup (about 550 kilometres), it was estimated there were almost 10,000 visits to the trail per year, with the number of visit days on the trail totalling more than 26,000 and about \$1.52 million being spent in association with this trail use.

Planning and development for the remaining length of the trail between Manjimup and Denmark has continued, with the 74-kilometre section between Albany and Denmark completed and opened in May 2012. Four camp sites have been prefabricated for the section between Northcliffe and Denmark.

The *Royalties for Regions* program has contributed \$2.5 million through the South West and Great Southern development commissions for trail construction. DEC committed an additional \$1 million to the project. A further \$500,000 was received by the Munda Biddi Trail Foundation through *Royalties for Regions*, for a community development program to support communities along the trail to become 'cycle tourism ready' in preparation for the trail's completion through to Albany in 2013.

Further information about the Munda Biddi Trail is available on the DEC website:
www.dec.wa.gov.au/parks-and-recreation/tracks-and-trails/munda-biddi-trail

Motorised recreation

During 2011–12, DEC continued to promote the responsible use of public lands by four-wheel drivers and other visitors in, or on, motorised vehicles by working with the WA Four-wheel Drive Association, Track Care WA, the Recreational Trailbike Riders' Association of WA and Motorcycling Western Australia. With members of these groups, DEC has formed a Motorised Recreation Working Group, with the aim of developing motorised recreation management guidelines and track classification systems for both four-wheel drive and trail-bike tracks.

Track Care WA and the WA Four-wheel Drive Association actively supported DEC through a track and rangelands adoption program. Through this, a number of projects have been successfully undertaken in partnership, including track stabilisation, clean-up projects and track classification audits.

In collaboration with the Recreational Trailbike Riders' Association, DEC continued developing and improving trails for family and novice riders in the gazetted off-road vehicle areas at Pinjar and Gngara. A pilot trail network is also being developed in the Perth Hills District.

Further information on four-wheel driving and DEC is available on the DEC website:
www.dec.wa.gov.au/parks-and-recreation/for-visitors/four-wheel-driving



Photo – Samille Mitchell/DEC



Community involvement

DEC continued to enlist community support as well as provide meaningful and interesting opportunities for volunteers to take part in conservation activities.

The *Department of Environment and Conservation Volunteer Strategy 2011–2016* has been adopted and includes strategies to enable volunteers and groups to be increasingly self-managed where the necessary skills, knowledge, experience and qualifications are demonstrated. The strategy also reinforces the fundamental principle that volunteering is not a substitute for paid work.

In 2011–12, a total of 3,838 volunteers contributed 457,557 hours of support to projects across WA.

Table 24: Community involvement volunteers

Year	Number registered	New projects	Number of volunteers contributing	Number of hours
1999–00	3,800	12	1,400	121,000
2000–01	4,499	26	1,600	190,000
2001–02	5,683	20	2,500	217,000
2002–03	5,160	32	3,150	264,000
2003–04	6,100	30	2,700	355,000
2004–05	7,600	28	4,000	422,000
2005–06	8,230	6	3,882	470,600
2006–07	9,726	8	3,250	406,000
2007–08	7,784	9	3,439	424,500
2008–09	9,558	7	4,004	426,200
2009–10	11,082	23	3,038	451,040
2010–11*	12,759	27	3,602	436,216
2011–12	14,604	51	3,838	457,557

* Figures vary from those reported in the 2010–11 Yearbook as additional data became available after publication of the Yearbook



Parks and Visitor Services Director Peter Sharp with DEC Volunteer of the Year award winner Louise Hopper.

Volunteers' commitment celebrated

Dedicated Kaarakin Black Cockatoo Rehabilitation Centre volunteer Louise Hopper was one of three individuals to be recognised with a DEC Volunteer of the Year award in December 2011.

Ms Hopper, who is studying veterinary nursing, notched up more than 4000 volunteer hours in looking after more than 500 injured endangered black cockatoos, of which over 100 had been successfully rehabilitated and released back into the wild.

Her efforts to help the black cockatoos included hand-rearing more than 20 orphaned baby black cockatoos, a task which requires round the clock attention, and driving thousands of kilometres to rescue birds and transfer them between veterinary clinics and other wildlife rehabilitators.

Nominations for awards were invited from DEC volunteer group peers and coordinators across WA and from the 3,838 volunteers active in the past year. There were 57 nominations for individuals or groups.

Three individuals and one group received Volunteer of the Year awards and five individuals and five groups received Outstanding Service awards.

Winners came from a wide range of programs including wildlife rehabilitation, the WA Herbarium, campground hosting, Munda Biddi Trail and Bibbulmun Track maintenance teams and various community groups.

Deputy Director General Parks and Conservation Jim Sharp and Parks and Visitor Services Director Peter Sharp praised the efforts of the volunteers and acknowledged their contribution to many DEC programs.

"The level of commitment is impressive, and in some cases it has continued for over 20 years. Each person involved in volunteering at DEC is providing an outstanding service to conservation in WA—many projects would simply not be possible without volunteers," Jim Sharp said.



Volunteers

The annual Volunteer of the Year and Outstanding Service awards function to acknowledge the important support DEC receives from its volunteers was held in December 2011 at the WA Conservation Science Centre. This celebration continues to reinforce the importance of the vital contribution of DEC volunteers.

Ongoing projects such as the *Campground Host Program* (CHP), Bibbulmun Track Foundation (office support and track maintenance), *Wildlife Rehabilitators* program, *Wildcare Helpline*, honorary CALM officers and projects at the WA Herbarium, all contribute to the protection and care of the environment. The CHP has continued to attract volunteers to the program with 89 new hosts joining this year, making a total of 395 across the state.

A major review of the *Wildcare Helpline* program commenced, including updating all training manuals and systems. Revised governance of the Reptile Remover and Animal Control Agents groups has been instigated to establish best practice standards, issue resolution procedures and to formalise communication networks.

The DEC volunteer rewards system was reviewed, with improvements to come into effect from July 2012. A quarterly newsletter to all DEC-registered volunteers has been well received and will continue to offer cross promotion of volunteering opportunities, advertise new projects, and to celebrate volunteer achievements.

Other major groups such as Conservation Volunteers Australia (CVA), the Department of Corrective Services and four-wheel drive clubs continued to work closely with DEC field staff to provide training opportunities, as well as to rehabilitate and enhance the natural environment. In particular, the CVA *Earth Assist* project, sponsored by Rio Tinto and supported by DEC and the Department of Education, continued to be a remarkable collaborative effort especially beneficial to young people.

Across the state, 51 new projects were registered with the Community Involvement Unit during 2011–12. New projects included:

- survey and maintenance on Mundaring's Powerline Track for four-wheel drives
- weed removal (Indian water fern) in Millstream Chichester National Park
- feral goat control in Cape Range National Park
- marine science research and monitoring at various sites across the state
- whale shark monitoring at Coral Bay
- wetlands mapping across the state.

During 2011–12, DEC continued to provide training programs to more than 700 DEC volunteers with support from specialist services in DEC and external agencies. Training included the Campground Host Forum; safe work practices as part of DEC's corporate induction; risk management; basic fire awareness; first aid; cross cultural awareness; the basic wildlife rehabilitators' course (at regional and metropolitan locations); advanced and special topics for wildlife rehabilitation; and *Wildcare Helpline* evaluation and training. Volunteers attended training in various locations including Perth, Busselton, Manjimup and Kalgoorlie.

During 2011–12, the *Minimum Standards for Wildlife Rehabilitation in Western Australia* was reviewed and amended. The standards set out the minimum requirements for native animals in all stages of rehabilitation and is the definitive resource for the field.

Further information about volunteer programs is available on the DEC website:
www.dec.wa.gov.au/community-and-education/volunteer-programs

Regional parks

Planning and estate management

DEC continued to work with the City of Bunbury, Department of Planning and the WA Planning Commission regarding interim management arrangements for the proposed Preston River to Ocean Regional Park in Bunbury.

Advice continued to be provided on land-use planning and development proposals affecting regional parks. Major projects included the proposed Roe Highway extension (Stage 8) affecting Beeliar Regional Park, the proposed Keane Road strategic link affecting Jandakot Regional Park, and the proposed Mangles Bay tourist precinct.

DEC continued to manage Araluen Botanic Park, with the Araluen Park Foundation contracted to deliver park management and visitor and ancillary services.

Conservation works

- Work continued on the rehabilitation of land in Beeliar Regional Park and community-based conservation programs associated with the Fiona Stanley Hospital and Health Precinct.
- Prescribed burning was completed at Churchman's Bushland in Wungong Regional Park, Paganoni Swamp and Lake Coo loongup in Rockingham Lakes Regional Park, Woodman Point Nature Reserve in Woodman Point Regional Park, Lake Kogalup in Beeliar Regional Park, Araluen Botanic Park and Stinton Cascades Nature Reserve.
- Fire rehabilitation works programs were developed for Memorial Drive in the Rockingham Lakes Regional Park following a bushfire in February 2012.
- The water supplementation program at Thomsons Lake Nature Reserve in Beeliar Regional Park continued to be implemented in conjunction with the Water Corporation to maintain water in the lake for a longer period in early summer and improve waterbird habitat.
- DEC continued to contribute to environmental restoration works associated with the installation of the Gngangara branch sewer by the Water Corporation in Yellagonga Regional Park.
- The 2010–15 midge management partnership for Yellagonga Regional Park continued with the Cities of Joondalup and Wanneroo.
- The removal of introduced animals continued as part of conservation works in the regional park networks.
- Numerous weed control and revegetation projects were undertaken at various sites, including:
 - North Lake, Thomsons Lake Nature Reserve, the Spectacles wetlands and Mount Brown in Beeliar Regional Park
 - Greenfield Street Bridge, Masons Landing, Urban Forest and the Billabong in Canning River Regional Park
 - Popeye Lake and Glendalough South in Herdsman Lake Regional Park
 - Port Kennedy Scientific Park, Paganoni Swamp, Lake Coo loongup, Lake Walyungup and Cape Péron in Rockingham Lakes Regional Park
 - O'Kane Court and John Graham Reserve in Woodman Point Regional Park
 - Luisini Winery (in conjunction with the National Trust) and Drivers Place in Yellagonga Regional Park.



On-ground park improvements

- At Lesmurdie Falls in Mundy Regional Park, trails were realigned and the timber steps on the Valley Loop trail were replaced. A new design for the walk trail from Palm Terrace car park to the Foot of the Falls has been completed to provide assisted wheelchair access.
- Work on upgrading pathways was completed at Yellagonga and Herdsman Lake regional parks to improve drainage and visitor access.
- Conservation and stabilisation works were undertaken on Perry's Cottage and Stables in Perry's Paddock in Yellagonga Regional Park and a new dual use path was constructed from Whitfords Avenue to Perry's Paddock in Yellagonga Regional Park.
- Improvements to the Cockburn Road frontage of Woodman Point Regional Park included landscaping and the removal and replacement of fencing.
- Road and path upgrade works were completed to the main entry road into John Graham Reserve in Woodman Point Regional Park.
- An asbestos structure was removed and rehabilitation works were completed at a previously leased site at Rockingham Lakes Regional Park.
- A new terraced garden area with a gazebo was constructed at Araluen Botanic Park.
- Engineering and design works associated with the Araluen Botanic Park concept plan are being completed for the park entry and overflow parking areas in preparation for construction.

Community liaison and participation

The Regional Parks Branch continued to administer eight community advisory committees for regional parks, which met on 40 occasions during the year. The branch also contributed to the administration of the Minister for Environment's *Environmental Community Grants* program.

Social and visitor research

During 2011–12, several projects were undertaken through collaboration with various branches and divisions within DEC, tertiary institutions and other agencies. Projects included:

- ongoing involvement in an Australian Research Council linkage project promoting and managing national parks into the 21st century that will improve our understanding of the place that parks occupy in Australian society'
- ongoing collaboration with whale shark tour operators in Ningaloo Marine Park to obtain data about the whale shark experience and visitor satisfaction
- ongoing involvement in a survey to determine visit and visitor characteristics, activities, knowledge of marine parks, and satisfaction with services and facilities at Shoalwater Islands and Marmion marine parks
- completion of a study at the Tree Top Walk to determine visit and visitor characteristics, satisfaction and reasons for visiting
- completion of studies at Monkey Mia Reserve, Mitchell River and Kennedy Range national parks to determine visit and visitor characteristics, activities and satisfaction.

DEC continued to work closely with Western Australia's major tertiary institutions via the Nature Based Recreation and Tourism Research Reference Group, comprising academic staff from all five Western Australian universities as well as DEC staff and representatives from Tourism WA. This group provides funding to honours, masters and PhD students and projects. The project funded for 2011–12 was a study that will give insight into the characteristics and expectations of nature-based campers.

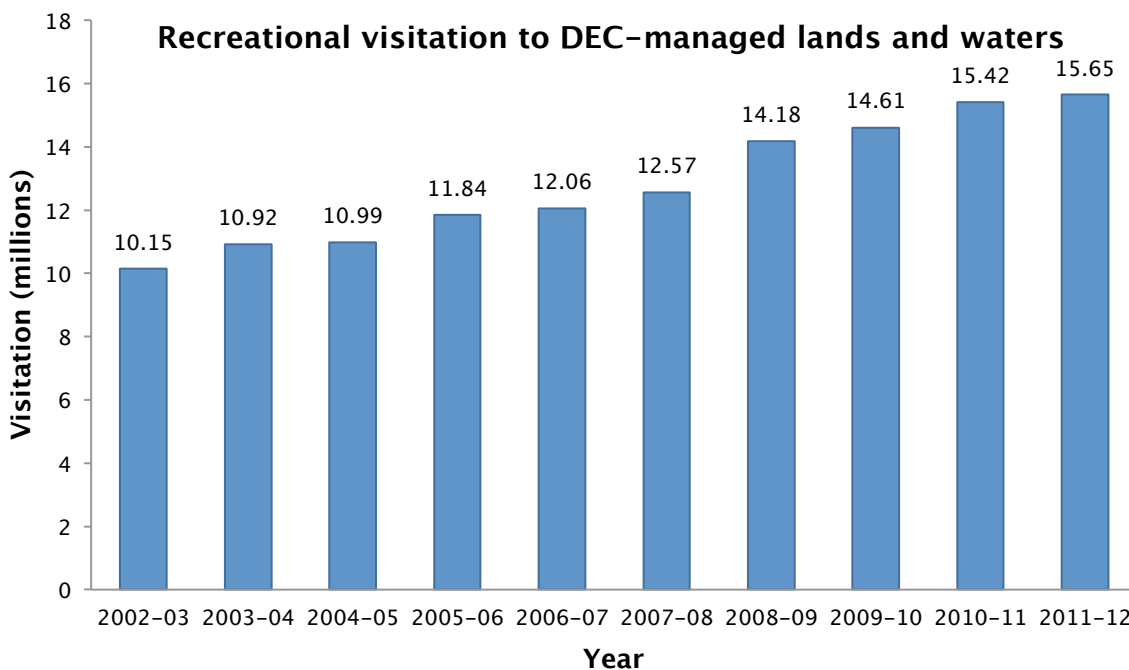
Visitor-use monitoring

Visitor use was monitored at 406 sites using a variety of methods including traffic classifiers and counters, pedestrian counters, observation surveys, and ticket sales in national parks, state forest and other reserves throughout the state. The total reportable visitation to lands and waters managed by DEC during the year was 15.65 million, an increase from the 15.42 million visits reported during 2010–11 (see Figure 1).

The visitation reported last year was corrected downward from 15.75 million as reported in DEC's 2010–11 Annual Report. The figure was amended to 15.42 million following the discovery of an error in the visitation database.

DEC also continued to upgrade the *Visitor Information and Statistics* and *Visitor Survey* databases contained within the *Recreation and Tourism Information System* database and the hardware required to monitor visitor use.

Figure 1: Total reported visits to DEC-managed lands and waters





Visitor survey program

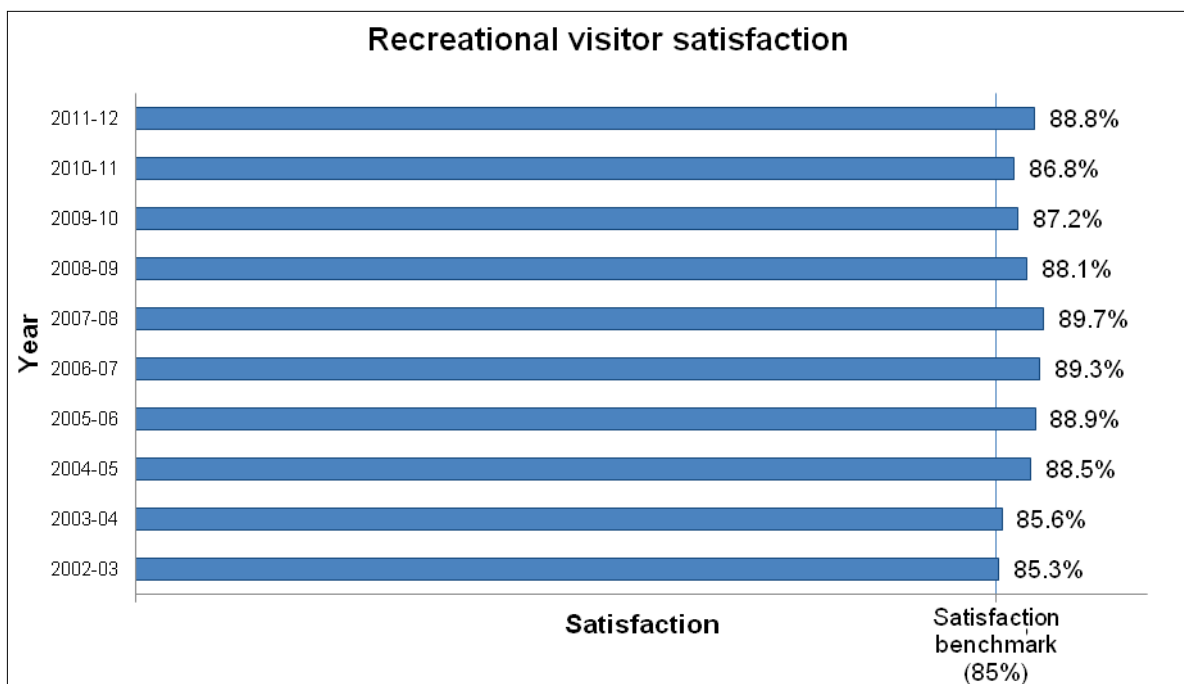
DEC's visitor survey program continued to provide visitor feedback that was used to assess visitor needs and expectations, as well as gauge visitor satisfaction with recreation and tourism facilities and services provided by DEC.

During 2011–12, the following information was gathered through the *Statewide Visitor Survey Program*:

- The most common activities were: sightseeing, bushwalking/hiking, relaxing and photography.
- The main purpose of visits was to enjoy nature and the outdoors and to rest and relax.
- Visitors were most satisfied with feeling safe in the park and having access to friendly, responsive staff.
- Overall, 99.1 per cent of respondents indicated they would recommend the park they were visiting to friends who shared their interests.

As part of the program, a benchmark visitor satisfaction index has been adopted to compare visitor satisfaction levels each year. This benchmark has been set at 85 per cent. The 2011–12 index, averaged from visitor responses to the survey at the selected parks, reserves and forest areas around the state, was 88.8 per cent. The results from 2011–12 and previous years of the visitor survey program are illustrated in Figure 2.

Figure 2: A comparison of annual visitor satisfaction levels within DEC-managed lands and waters



Astronomy

Astronomy activities are conducted at DEC's Perth Observatory in Bickley. The Observatory provides a range of opportunities for public viewing and public participation. The Observatory also contributes to scientific research in astronomy by cooperating with national and international institutions in the acquisition, analysis, interpretation and dissemination of information.

Public viewing and participation

Members of the public are able to view astronomical objects through telescopes by visiting the Observatory for Star Viewing Nights or attending Astronomy Field Nights held at various sites. Observatory staff also give lectures to community groups and as part of a university course.

Dr John Kennewell, the former Director of the Learmonth Solar Observatory, delivered the annual Summer Lecture and he spoke of the growing problem of space debris and its effect on space-based industries including orbiting manned space missions.

Perth Observatory participated in the *Astrofest*, an expo run by the local astronomical community and held at Curtin University. The Observatory had a display stand and staff facilitated star viewing using the Observatory's portable 30-inch telescope. Staff were assisted by members of the Perth Observatory Volunteer Group.

The format for the star viewing sessions remains unchanged with the Perth Observatory Volunteer Group running the night tours under the supervision of the Observatory's outreach coordinator. The relevant sections of the primary school curriculum have been integrated into the day tour and volunteers are being trained to assist with day tours.

On 6 June, Venus transited the disk of the Sun and images of the transit were collected with the Observatory's solar telescope and uploaded to the Observatory's web page and were viewed 53,000 times.

During 2011–12, 4,174 visitors attended star viewing nights and daytime guided tours. Customer satisfaction showed 97 per cent were satisfied with their visit or the service provided by the Observatory and 98 per cent were satisfied with the educational quality of the services in which they participated. A total of 4,393 people attended talks or astronomy field nights.

Observatory staff informed the public of astronomical events in 121 newspaper articles, 11 radio interviews and answered 602 email and 5,358 phone queries. The Observatory also provided information via its website, which received more than 346,471 page views.

Research activities

The *Probing Lensing Anomalies Network* collaboration continued to observe changes in brightness caused by the gravitational focusing of light from a star. This lensing effect occurs when two stars are aligned, when viewed from the Earth. This year, six refereed papers resulted from this collaboration. They included a paper published in the journal *Nature* that estimates how common it is to have planets orbiting other stars and concludes that this is the rule rather than the exception. The paper is based on six years of observations.

Other publications included a map of the night sky brightness for Perth that was produced in collaboration with Curtin University and the Perth company, Micromine. This is thought to be the first time that the brightness of the night sky has been mapped for an entire city. The paper is intended to set a benchmark for monitoring artificial light in Perth's night sky and will possibly provide a method for similar studies in other cities.

During the year, a member of staff was involved in the development of software and electronics for the Murchison Widefield Array (MWA) radio telescope. This radio telescope is one of two telescopes being built as a precursor for the Square Kilometre Array Radio Telescope. A worldwide consortium of universities (including UWA and Curtin University) is building the MWA radio telescope.



Support to the Conservation Commission and the Marine Parks and Reserves Authority

DEC supports the Conservation Commission of Western Australia in accordance with the CALM Act and the 2011 *Operational Relationship Agreement*. During 2011–12, DEC assisted the Conservation Commission with:

- staffing of the Conservation Commission Service Unit, which supported the Conservation Commission in:
 - facilitating liaison within DEC for the delivery of the Conservation Commission's statutory responsibilities in relation to management planning
 - facilitating review and guidance in relation to management plans
 - undertaking management plan performance assessments, including the performance assessment report *Protection of significant flora and understorey species within the Forest Management Plan 2004–2013*
 - old-growth forest recommendations for the following blocks: Alco, Andrew, Boorara, Burnside, Butler, Challar, Cleave, Court, Crowea, Diamond 2, Gray, Iffley, Lane, Lewin, Mattaband, Morgan, Muirillup, Murtin, O'Sullivan, Quininup, Solai, Sutton, Storry, Wattle, Weld and Yanmah
 - reporting on community nominated old-growth forest in the Meribup and Warrup forest blocks
 - preparation and coordination of the *Forest Management Plan 2004–2013 End of Term Audit of Performance* report and the *Forest Management Plan 2014–2023 Environmental Scoping Document* that was submitted to the EPA
 - preparation of the *Overview of Mining Activities within Conservation Commission Vested Lands* and the *Position Statement No.6: Management Plans for Lands Vested in the Conservation Commission Under the Conservation and Land Management Act 1984*
- providing advice and information relating to the statutory functions of the Conservation Commission regarding leases, licences and permits, land tenure, mining proposals and ecologically sustainable forest management
- preparation of management plans for lands vested in the Conservation Commission.

DEC supports the MPRA in accordance with the CALM Act and a memorandum of understanding. During 2011–12, DEC assisted the MPRA by providing policy advice, development of indicative and final management plans for proposed marine parks and reserves and executive support services. Highlights for the year included:

- creation of the Ngari Capes and Camden Sound marine parks
- 10-year audit of the implementation of the Marmion Marine Park Management Plan
- development of a more streamlined and focussed MPRA audit approach for annual, periodic and 10-year MPRA audits of marine parks and reserves.

Other initiatives

Memoranda of understanding

DEC continues to maintain a number of significant partnerships that are formalised through a memorandum of understanding (MOU). The review of MOUs started in June 2011 is near completion. The review has confirmed best-practice relationships are being maintained and the standard format recommended will be used across the department.

Long-standing MOUs include one with the Department of Corrective Services where prisoners make a valuable contribution to DEC projects and the community through maintenance and construction of walk trails and other facilities including the Bibbulmun Track, the Munda Biddi Trail and the Cape to Cape Track. Prisoners also assist with signage work, construction of picnic tables and benches, weed control, maintenance of firebreaks, and cleaning and repair of campground facilities in many parks and reserves around the state including Mirima, Millstream Chichester, Porongurup and Leeuwin-Naturaliste national parks and Coalseam Conservation Park.

The MOU between DEC and Leave No Trace Australia continued, with further projects to promote visitor behaviour that has minimal impact. Leave No Trace messages have been included in DEC publications and signs and Leave No Trace continued its involvement in the completion of the Adventure Activity Standards and other government and community initiatives. DEC supported the development of the *Leave No Trace Australia, Western Australian Strategic Plan 2012–14*.

The successful partnership between DEC, CVA and Rio Tinto continued during 2011–12. The Department of Education, as an additional partner in Rio Tinto's *Earth Assist* conservation program, allowed volunteering opportunities to be enjoyed by schoolchildren in Perth and regional Western Australia. The program promotes environment-based volunteering to secondary school students.

In particular, further links between CVA and the Black Cockatoo Preservation Society at Martin have enabled significant conservation and restoration work to be completed. CVA also assisted wildlife rehabilitation groups in the South West following bushfires. This work has helped CVA forge supportive relationships with a number of DEC programs and other partners across the state.

The MOU between DEC, Track Care Western Australia and the WA Four-wheel Drive Association continued, with further projects to promote minimal impact use of four-wheel-drive vehicles. The MOU seeks to clarify and maintain the highest standards of cooperation and understanding between all three organisations and includes a volunteer adoption program. The track and rangelands adoption program has resulted in a number of successful partnership projects across the state.

The successful partnership approach with the four-wheel-drive community is being mirrored with the trail bike riding community, with the development of several projects including the gazetted off-road vehicle area at Pinjar, along with planning a pilot trail network in the Perth Hills District. During 2011–12, DEC continued to liaise with the peak bodies, with the intention of formalising partnership arrangements through the development of an MOU.

World and national heritage

The Ningaloo Coast was inscribed on the World Heritage List on 24 June 2011. An event to celebrate the inscription was held in May 2012 and was attended by both the state Minister for Environment and federal Minister for Sustainability, Environment, Water, Population and Communities. A World Heritage coordinator has been recruited to establish the Ningaloo Coast World Heritage Advisory Committee and develop a communication and interpretation strategy for the World Heritage area. Similarly, the recruitment process has begun for a Purnululu World Heritage area project officer to coordinate the establishment and function of the Purnululu World Heritage Advisory Committee.

DEC has continued to provide advice in relation to national heritage, including involvement in the development of the *Australian Heritage Strategy*.

Formal management arrangements with Aboriginal people

Miriuwung-Gajerrong

DEC and the Yawoorroong Miriuwung-Gajerrong Yirrgeb Noong Dawang Aboriginal Corporation (Miriuwung-Gajerrong Corporation) are jointly responsible for developing management arrangements for six new conservation reserves (totalling 150,000 hectares) in the east Kimberley. Achievements for 2011–12 included:

- installation of boundary signage for Ngamoowalem Conservation Park
- bollards installed and car parks completed at Molly Springs
- ongoing work on interpretation and site design for each reserve.

A study exploring tourism opportunities and activities was undertaken in February 2012. This included on-ground assessment with Miriuwung-Gajerrong Rangers, and meeting Dawang representatives and representatives from the Mirima Language Centre and Waringarri Aboriginal Arts.



Yawuru Ranger Preston Manado collects water from a flowing drain.



Yawuru Ranger Domanic Matsumoto holding samples of lyngbya.

Drain sampling in full swing during wet season

The first major downpour of the 2011–12 wet season in Broome saw DEC's Yawuru Rangers out and about conducting the important task of drain sampling to capture 'first flush' data on the nutrient levels flowing into Roebuck Bay.

Yawuru Ranger Curtis Robinson said the nutrients carried in run-off from the town and its iron-rich pindan soil were thought to trigger blooms of lyngbya—a naturally occurring but potentially toxic blue-green algae.

"Lyngbya can smother seagrass beds, which in turn impacts on turtles and dugongs as it is their major food source," he said.

"In its toxic phase, lyngbya can cause skin and eye irritations and is best avoided.

"It was essential we sampled on the first rain so we can accurately measure the amount of nutrients flowing into the bay and determine any links to lyngbya blooms. It was a long wait, as this year the first big downpour came in early January."

Mr Robinson said the Yawuru Rangers had been joined by volunteers from the community to undertake the sampling at more than 15 drain sites.

"The support from the volunteers has been great, especially at a time of year when many people are away on holiday," he said.

West Kimberley District Manager Alan Byrne said the sampling was part of a study being done into the triggers of lyngbya outbreaks.

"The Yawuru Rangers are helping researchers from The University of Western Australia learn more about the hydrology of, and nutrient flows into, Roebuck Bay," Mr Byrne said.

During 2011–12, three Miriuwung-Gajerrong Rangers graduated with a Certificate III in Conservation and Land Management. One trainee is part way through completing his Certificate III and two are continuing with Certificate II.

Yawuru

An Aboriginal land-use agreement was signed on 25 February 2010 with Yawuru native title holders over 5,297 square kilometres of land in and around Broome. This will enable the creation of terrestrial and marine conservation reserves to be jointly managed by the Yawuru people, DEC and, within the Broome town site, the Shire of Broome. These areas include a coastal park covering the intertidal area, terrestrial reserves around Broome and its north, and a marine park from Gantheaume Point to Cape Villaret. Achievements for 2011–12 included:

- implementation of the Yawuru Agreements for the joint management of new Yawuru conservation estate
- operation of the Yawuru Park Council (Yawuru, DEC, Shire of Broome) to oversee the development and implementation of management plans for new Yawuru conservation estate
- various stages of development of four management plans and recreational planning for new Yawuru conservation estate
- training and employment of four trainee Yawuru Rangers in the Yawuru joint management team (comprising nine staff members, of whom seven are Yawuru)
- two trainees completing their Certificate II Conservation and Land Management with one Yawuru trainee being awarded the DEC MATES trainee of the year in 2012
- on-ground activities such as maintenance of site infrastructure and walk trails, access management, weed control and patrols
- site protection works on the northern shores of Roebuck Bay (partly funded through Rangelands NRM)
- delivery of school holiday program focusing on marine and terrestrial reserves within Yawuru conservation estate
- research and monitoring at Roebuck Bay, a Ramsar site, including monthly benthos sampling for invertebrates, bird monitoring and stormwater sampling for excess nutrient flow.

Bunuba Rangers

In July 2011, the *Bunuba Ranger Program* was created through funding from the *Kimberley Science and Conservation Strategy*. Rangers began their Certificates II and III in Conservation and Land Management and are undertaking conservation work in West Kimberley parks relating to weed and feral animal control, and prescribed burning.

In conjunction with Bunuba Films, the Bunuba Rangers and DEC hosted the play *Jandamarra* for five nights in July to sell-out audiences in Windjana Gorge National Park. This was a resounding success and has further strengthened the relationship between DEC and the Bunuba people.

Burrup

The state government entered into the Burrup and Maitland Industrial Estates Agreement Implementation Deed with three Aboriginal groups on 1 November 2002.

The Burrup Agreement allows for industrial development to progress across southern parts of the Burrup Peninsula, provides for the development of areas for conservation, and ensures the protection of Aboriginal heritage.

DEC continues to work towards having an approved management plan and a management agreement in place. In March 2012, amendments to the CALM Act and WC Act came into effect, which will enable joint management arrangements to be implemented on the Burrup Peninsula, in accordance with the agreement.



Regional activities

Goldfields Region

- Implementation of the visitor master plan for Credo and Goongarrie stations has continued. The road network around the Credo homestead precinct has been consolidated and resurfaced. Issues identified in the structural assessment were addressed, including stabilisation of sections of the shearing and machinery sheds. Improvements to and maintenance of the homestead, including completion of the verandah, have also been undertaken. The construction of the field study centre is underway.
- Improvements undertaken at Goongarrie station cover various maintenance projects and included the installation of a new sewage system for the homestead.
- The 'working together' project with the Wiluna native title claimants and the local community continued at Lorna Glen and included fencing and fire management.
- A Contract of Service has been implemented with the Martu people for the provision of various land management services.
- Joint management with the Spinifex Aboriginal community in the Great Victoria Desert has continued, with the installation of a new shed tank, repairs and maintenance of three existing tanks, weed control and fire management. Two meetings were held with the Tjuntjuntjara community during 2011–12 to further progress the joint management arrangement.
- Three local Aboriginal trainees continued to receive training under the MATES program as part of a three-year joint management project with Cliffs Asia Pacific Iron Ore Pty Ltd.
- The installation of a toilet block, picnic tables and a shade sail at the Boorabbin Memorial Site was negotiated with Main Roads WA.

About 100 people visited Credo Station during an open weekend held in November 2011.





The boardwalk in Mirima National Park under construction.

Kimberley Region

- New car parks and visitor facilities were completed at Echidna Chasm, Piccaninny Creek and Mini Palms Gorge in Purnululu National Park.
- Road realignment was completed at Echidna Chasm and Kurrajong campsite and 10 kilometres of Gorge Road was upgraded at a cost of \$1 million.
- Work to upgrade the power supply system in Purnululu National Park was completed.
- Road work to repair flood damage was completed in Purnululu National Park.
- Fire tanks were installed in strategic locations throughout Purnululu National Park.
- Four Aboriginal ranger assistants were employed in Purnululu National Park on a contract basis through federal *Caring for our Country* grants.
- Site development and interpretation planning were undertaken for Munurru campground and day-use area in Mitchell River National Park. Considerable Aboriginal liaison was undertaken as part of the process.
- About three kilometres of gravel road was resurfaced and water crossings were improved in Mitchell River National Park.
- One Aboriginal community member was employed on a casual basis during the dry season in Mitchell River National Park.
- Campground volunteers contributed 800 hours at Munurru campground in Mitchell River National Park.
- Stage one of a new boardwalk in Mirima National Park was completed.
- At Mt Hart Wilderness Lodge in King Leopold Ranges Conservation Park, the manager's quarters were completed, substantial maintenance work was undertaken on the access road and the electrical systems were upgraded.
- A new two-bedroom ranger's accommodation was completed at Silent Grove campground in King Leopold Ranges Conservation Park.
- With *Kimberley Science and Conservation Strategy* funding, stage one of a new car park in Tunnel Creek National Park was completed and a new wheelchair accessible toilet block was completed in Geikie Gorge National Park.



Kalbarri coastline. Photo – Samille Mitchell/DEC.



The lookout at Eagle Gorge offers spectacular views of Kalbarri National Park's distinctive stratified sea cliffs.



Along with the other upgraded coastal paths, the path to Natural Bridge is now accessible to people in manual wheelchairs who have assistance.



The boardwalk linking Island Rock and Natural Bridge has been completed.

Kalbarri's spectacular coast access upgraded

A major upgrade of Kalbarri National Park's coastal walks has been completed, providing better and easier access to Red Bluff's rugged cliffs and Island Rock's solitary sea stack.

In March 2012, Environment Minister Bill Marmion said works at some of the park's most spectacular features were completed under the first phase of a three-year roads and tourism infrastructure program for Kalbarri National Park funded by Royalties for Regions.

"About two kilometres of paths to Red Bluff, Natural Bridge, Island Rock, Shellhouse and Eagle Gorge have been sealed with asphalt. The paths provide improved access to these popular spots and now offer assisted access for people with disability," Mr Marmion said.

"A further highlight of the project, which is being implemented by DEC has been the completion of the boardwalk linking Island Rock and Natural Bridge. The boardwalk, which is built from recycled plastic, will help protect fragile vegetation while providing stunning views of the coastline."

Red Bluff has also received a makeover with the installation of a 250m limestone concrete path providing easier access to spectacular cliff-edge lookouts. Bicycle parking racks have also been installed at Natural Bridge, Grandstand, Eagle Gorge and Red Bluff.

Regional Development Minister Brendon Grylls said the infrastructure improvement program supported the local tourism industry.

"With its magnificent Murchison Gorge, rolling sand plains and beautiful coastal cliffs, Kalbarri National Park is one of the Midwest's most popular tourist attractions," Mr Grylls said.

"The improved access will increase visitor satisfaction and safety. These sites will now have year-round access which meets international standards and this will boost confidence in the local tourism product and support the Kalbarri local economy."

The second phase of Kalbarri National Park roads and infrastructure will provide improved road access to Nature's Window and Z Bend and the popular Murchison Gorge tourist sites.

Midwest Region

- Operations continue to be refined at the Pinnacles Desert Discovery in Nambung National Park and Monkey Mia Visitor Centre in the Shark Bay World Heritage area, with the focus on improving efficiency.
- At Hangover Bay day-use site in Nambung National Park, road and visitor infrastructure works were nearing completion. The work was undertaken in response to an increase in visitors associated with the completion of Indian Ocean Drive between Lancelin and Cervantes.
- Management effort on coastal reserves increased significantly due to increased numbers of visitors, illegal camping and the use of unlicensed off-road vehicles, particularly in the vicinity of the shack communities of Wedge and Grey. DEC staff attended meetings with the Wedge and Grey community associations to investigate management issues.
- DEC is undertaking a series of studies to identify the potential for Wedge and Grey to provide the public with low-impact, nature-based, affordable visitor facilities and accommodation, including caravan and camping facilities, and to retain shacks at a level that contributes to opportunities for public use.
- Landfill operations have ceased at Wedge and Grey and skip bins were installed for the removal of putrescible waste.
- The *Shark Bay Terrestrial Reserves and Proposed Reserve Additions Management Plan* was released in May 2012.
- DEC started a three-year *Caring for our Country* funded program to continue the implementation of the *Shark Bay World Heritage Area Communication Strategy*. This included visitor interpretation for Shell Beach Conservation Park and a communication plan for the proposed Edel Land National Park.
- Planning was completed for the re-development of visitor facilities at Shell Beach Conservation Park.
- A recreation master plan was prepared for the proposed Edel Land National Park.
- In François Péron National Park, the upgrading of visitor facilities at Gregories and South Gregories campgrounds and day-use sites was completed.
- A potential *Naturebank* site in François Péron National Park was assessed and is being prepared for release.
- Under the *Royalties for Regions*-funded infrastructure and roads initiative at Kalbarri National Park, paths at five coastal sites were sealed and the 900-metre Bigurda boardwalk was completed. Good progress was made on the planning of the second phase of the project, which includes sealing the access road to the Murchison Gorge and improving recreation sites at the gorge. On-ground works are scheduled to start in early 2013.
- A recreation master plan was prepared for Mount Augustus National Park and presented to the Wajarri Yamatji native title group. Further consultation with the Burringurrah community is required.
- A heritage assessment was prepared for Binthalya homestead precinct, an area purchased for addition to Kennedy Range National Park. Negotiations continued with Track Care WA regarding the adoption, repair and maintenance of homesteads on several former pastoral lease properties.
- DEC participated in the Midwest and Gascoyne regional planning committees convened by the WA Planning Commission to prepare 20-year regional planning and infrastructure frameworks and sub-regional plans.

Pilbara Region

- DEC Pilbara Region presented displays at various regional festivals including the FeNaCING, Whale Shark and Nameless Jarndunmunha festivals.
- As part of the *Rediscover Parks* initiative, free entry days were held at Karijini and Millstream Chichester national parks in conjunction with regional festivals.
- The *Millstream Chichester National Park and Mungaroona Range Nature Reserve Management Plan* was released in October 2011.



- Information about various parks and reserves in the Pilbara Region continued to be gathered and prepared for publication on *EveryTrail*.
- Brochures, maps, signs and interpretive products for a number of Pilbara parks were reviewed and updated.
- Day-use area improvements were completed at Deep Reach in Millstream Chichester National Park. These included a new car park, water access points, shade shelters, picnic tables, toilet, gas barbeques, information and interpretation.
- Negotiations progressed with the Murujuga Aboriginal Corporation regarding joint management aspirations related to the Burrup Peninsula and Dampier Archipelago island reserves.
- A range of compliance and enforcement activities involving other agencies were undertaken across DEC-managed lands and waters. Agencies included the Department of Fisheries, Western Australia Police and Customs and Border Protection.
- Road maintenance was undertaken in a number of reserves.
- Support continued for campground host and volunteer programs across the Pilbara Region.
- A Parks and Visitor Services business plan was produced for the Pilbara Region parks to identify priorities and guide capital works for the next five years.
- A geotechnical inspection and assessment of public gorges and lookouts was undertaken in Karijini National Park. This included a structural engineer inspection and assessment of lookouts. Progress was also made on the development of a sign prescription for the park and all walk trails were inspected, assessed and re-classified to Australian Standards.
- In Karijini National Park, the Fortescue Falls car park upgrade was completed. Other improvements included a new toilet block, signs and interpretation. Work continued on the redevelopment of Hamersley Gorge access, car parks, lookouts and day-use area.
- Specific park passes were produced for the Fortescue Metals Group Solomon Project based near Karijini National Park to improve compliance with entry fee payments and the FMG workforces' general awareness and appreciation of natural areas.
- Tenders were awarded for the construction of two new houses and to improve power and water infrastructure at Karijini National Park staff headquarters. The solar-diesel hybrid power systems at the visitor centre and staff headquarters were upgraded.
- Road risk signs were installed and associated information provided at Karlamilyi National Park and liaison continued with stakeholders regarding road maintenance work and general management.
- A structural assessment of all recreational shacks on East and West Lewis islands was completed in conjunction with the Dampier Archipelago Recreational Dwellers Association and the Shire of Roebourne. The rebuilding of several shacks was approved and progress is being made on the approval of shack modifications to bring them in line with structural engineer recommendations and relevant building codes.
- A tender was awarded for the expansion of the camping area and improvements to facilities at Kurrajong campground in Cape Range National Park.
- In May 2012, a pre-feasibility study was completed for a proposed *Naturebank* site in Millstream Chichester National Park.
- Management of and liaison with commercial tour operators continued. The licence conditions for tour operators in Ningaloo Marine Park were reviewed and modified and whale shark tour operators continued to be monitored using electronic logbook returns via satellite tracking.
- Administration, management and annual audits were undertaken of leases on DEC-managed land, including Sal Salis in Cape Range National Park and Karijini Eco Retreat in Karijini National Park.
- Programmed capital asset maintenance was carried out across all parks and progress was made on a range of capital works in Cape Range, Millstream Chichester and Karijini national parks.
- DEC's visitor risk management system was implemented. This included undertaking annual inspections and assessments of formal recreation areas, updating regional databases and taking action to mitigate risk.

- Initial field surveys and heritage assessments were undertaken along the route of the proposed Nyiminjarra Road in Karlamilyi National Park.
- Discussions and negotiations regarding native title and customary land activity progressed with a range of Aboriginal groups across the region.
- Progress was made on re-establishment of Millstream Chichester, Karijini and Karlamilyi national park councils.

South Coast Region

- Progress continued to be made on the \$40 million *Fitzgerald River National Park Improvement Project*, with the construction and partial sealing of 15 kilometres of Hamersley Drive, spur roads and car parks on the eastern side of the park. Road improvements on the western side of the park are nearing completion and the road to Quaalup Homestead Wilderness Retreat has also been improved. Upgrading of recreation sites continued at 4 Mile Camp, Four Mile Beach, Barrens Beach, East Entry Station and East Mount Barren. Planning is in progress for two shorter walk trails at either end of the park.
- A three-kilometre section of the Bibbulmun Track was realigned around the Grasmere expansion of the Albany Wind Farm close to Torndirrup National Park, and two new overnight shelters were built.
- A section of Shelley Beach Road at West Cape Howe National Park was resurfaced with gravel.
- Concepts plans, geotechnical surveys, heritage surveys and a wave action study were completed as part of the \$1.8 million *Royalties for Regions* project in Torndirrup National Park.
- Septic systems were upgraded in Cape Le Grand National Park.
- Walk trail, information shelter and civil works were completed as part of campground and day-use area improvements at Peak Charles National Park.
- Gravel road resurfacing was completed on sections of Dunns Rock Road in Cape Le Grand National Park and the Scenic Drive in Porongurup National Park where drainage works were also carried out.
- Formal annual inspections were undertaken at all recreation sites to assess visitor risks and quarterly and annual reviews were carried out to monitor progress on action taken to mitigate risk. Visitor risk management related maintenance was undertaken at remote sites at Nuytsland Nature Reserve, and Eucla and Peak Charles national parks. Additional and improved signage was installed to highlight the dangers of rock fishing at Torndirrup National Park.
- Aboriginal native title group negotiations were conducted as part of a heritage survey for the *Naturebank* project at New Island Bay in Cape Le Grand National Park.
- In West Cape Howe National Park, 150 metres of 'track pad' were installed on the Dunsky Track, with further rehabilitation completed to stabilise the track.
- A septic system was upgraded in Two Peoples Bay Nature Reserve.
- The construction of a 74-kilometre section of the Munda Bididi Trail from Albany to Denmark was completed.
- Work started on upgrading the walk trail and day-use area to supplement the visitor experience offered by the Granite Skywalk lookouts in Porongurup National Park.



South West Region

- All recreation sites were inspected to assess visitor risks and quarterly and annual reviews were undertaken to monitor progress on action taken to mitigate risk.



- Thirty-seven rock fishing anchors and 58 abseiling anchors were load-tested to ensure ongoing suitability for use.
- In Leeuwin-Naturaliste National Park, a consultant geologist was engaged to inspect cliff sites at Huzzas, Hamelin Bay and Bunker Bay.
- Tree pruning was carried out at several recreation sites to minimise the risk to visitors from falling branches. Sites included Honeymoon Pool, Contos, Boranup and Point Road campgrounds, Hoffman Mill, Leschenault Peninsula, Sue's Bridge, Wellington Discovery Forest, Lake Brockman Tourist Park, Crooked Brook Forest, and trails and abseil sites near Giants, Calgardup and W116 caves.
- *EcoEducation* programs continued to be delivered at Wellington Discovery Forest and Margaret River Eco Discovery Centre. *Sustainable Forestry* excursions were also conducted out of the Dwellingup Forest Heritage Centre.
- The Aboriginal cultural program run out of Wellington Discovery Forest was well supported in 2011–12 and the *Monitoring Marsupials* program, which contributes to *Western Shield* research, was particularly popular with most trapping nights being booked by schools.
- Presentations at the annual conference of Australian Science Teachers Association of WA lifted the profile of DEC's *EcoEducation* and *Western Shield* programs.
- Two tertiary level programs were run, one covering sampling and measurement for TAFE Certificate III students and the other, based on the Sustainable Forestry excursion, for Notre Dame University students taking an Australian Ecology unit.
- A total of 2,857 students took part in 129 *EcoEducation* excursions. A total of 2,069 students and teachers attended the Wellington Discovery Forest, 968 attended the Margaret River Eco Discovery Centre and 147 attended other centres.
- In Wellington National Park, interpretation signage was installed along the River's Edge Path at Honeymoon Pool with funding and support from the *Collie Noongar Interpretive Trails* project run by the Ngalang Boodja Aboriginal Corporation.
- At Logue Brook Dam, visitor management continued to focus on restricting camping to managed areas, providing day-use facilities and controlling off-road vehicles to encourage more family-friendly use of the area. Improvements to picnic facilities continued, with provision of information signs, a new toilet block and construction of a car park and barbecue area.
- Dune rehabilitation was carried out at various sites in the Leeuwin-Naturaliste National Park, with more than 5,000 seedlings planted by Noongar Employment and Enterprise Development Aboriginal Corporation, four-wheel drive clubs, the Department of Corrective Services, volunteers and DEC staff. About 500 metres of rehabilitation fencing was erected to protect an Aboriginal burial site.
- Working partnerships continued with the South West Mountain Bike Club and West Australian Mountain Bike Association, and with the Mitsubishi Four-wheel Drive Club at Leschenault Peninsula Conservation Park.
- The 16-kilometre Wellington National Park spur trail linking the Bibbulmun Track to the park trails network was completed. It includes three foot bridges, two camp sites (with toilets, shelter and camping areas), signs and trail markers.
- In collaboration with the Crooked Brook Community Group, improvement works undertaken in Crooked Brook Forest included the construction of rock retaining walls around information and picnic shelters and along the path edge. Parking areas, access and pedestrian paths were also upgraded.
- District staff worked with Tangaroa Blue Ocean Care Society, Mitsubishi Four-wheel Drive Club and Leschenault Catchment Council on a rubbish clean-up along the beach in Leschenault Peninsula Conservation Park. Sixty-seven bags of rubbish plus an assortment of larger items were collected.

Swan Region

- In partnership with the WA Mountain Bike Association and the broader mountain bike community, the Kalamunda Circuit mountain bike trail was completed. Work continued at the Langford Park Mountain Bike Circuit.
- At Lane Poole Reserve, the Baden Powell caravan and camping site redevelopment was nearing completion and included a sealed access road, 60 camp sites catering for tents, camper trailers, small caravans and group camping facilities. Redevelopment started on the Nanga Mill caravan and camping site.
- Planning for the Martins Tank camp site redevelopment in Yalgorup National Park was completed to the tender stage.
- The Pinjar off-road vehicle area has been further developed with trailhead signage, re-surfacing works, car parks and paths.
- The Gngalara off-road vehicle area received partnership funding for an interim trail area from the Department of Sport and Recreation.
- The *Lane Poole Reserve and Proposed Additions Final Management Plan* was released in October 2011.
- The *Swan Region Caravan and Camping Strategy (2012)* was completed.
- Advice and input for the draft *Swan Coastal Plain South Management Plan* were provided.
- Infrastructure maintenance was carried out on the Bibbulmun Track and Munda Bididi Trail.
- Work continued to be carried out in partnership with a diverse range of organisations including the WA Four-wheel Drive Association, Track Care, WA Mountain Bike Association, the Recreational Trail Bike Riders Association of WA and Motorcycling WA.
- Work continued on providing information for the Disability Services Commission *You're Welcome* initiative, with five sites assessed and access details uploaded on the www.accesswa.com.au website.
- In November 2011, Penguin Island marine rangers Murray Banks and Sean Emmet received Royal Life Saving bravery awards for their role in rescuing people at risk of drowning off Mersey Point sandbar on 28 December 2010.
- All recreation sites were inspected to assess visitor risks and included quarterly and annual reviews to monitor the progress of action being taken to mitigate risk.

Warren Region

- In Gloucester National Park, the Cascades Road and car park and a section of Gladders Road were widened, reformed and sealed under an inter-agency agreement between the Shire of Manjimup and DEC. This site is an integral part of the Karri Forest Explorer Drive developed as a key tourism attraction for the region in response to the downsizing of the timber and allied industries over the last decade.
- Also in Gloucester National Park, the Cascades site pedestrian paths were sealed, the interpretive shelter was replaced and a high-maintenance section of Burma Road was sealed with bitumen.
- The Donnelly Boat Landing launch access and pedestrian paths were sealed, completing the final stage of this site redevelopment.
- The interpretive node (section two) of the Mount Frankland Wilderness View structure was completed.
- Preliminary design options were prepared for the finger jetty at Coalmine Beach boat ramp in Walpole and Nornalup Inlets Marine Park.
- Surveying and engineering inspections of the Walpole town jetty and precinct were started. This is a collaborative project with the Shire of Manjimup. The project will address safety and user conflict issues and generally improve visitor infrastructure associated with the marine park.



- Work continued on upgrading access and visitor facilities at Black Point and Lake Jasper in D'Entrecasteaux National Park. Improvements include the construction of two new toilets, several interpretation shelters, new campgrounds and resurfacing of sections of roads and paths.
- Maintenance grading was completed on about 400 kilometres of recreation sites access roads.
- Along the Frankland District section of the Bibbulmun Track, trail infrastructure maintenance work included the installation and repairs to steps, small bridges, huts and toilets and new paving products were tested in erosion-prone areas.
- DEC staff prepared and presented more than 70 themed activities including school holiday programs, NAIDOC Week and Keep Australia Beautiful activities, and specific school and conference presentations on request.
- The Valley of the Giants staff conducted site interpretive tours, at least twice a day for 364 days of 2011–12.
- Construction started on the Munda Biddi Trail and camp sites in the southern section between Manjimup and Denmark.
- More than 30 interpretive projects were completed, including site interpretive and management signage, park notes, publication reviews, and displays for community events.
- The management plans for Shannon and D'Entrecasteaux national parks and Perup were released.

Wheatbelt Region

- Barna Mia nocturnal tours continued to give visitors to Dryandra Woodland a special wildlife encounter experience.
- The Toyota Land Cruiser Club of WA continued to assist with volunteer maintenance work at Dryandra Woodland and Emu Rocks on the Holland Track.
- Redevelopment continued in Kokerbin Nature Reserve and Kwolyin town site in partnership with the Shire of Bruce Rock. Work on the walk trail was nearing completion. The Shire of Bruce Rock has secured funding to relocate camping to Kwolyin, allowing for the existing camp site to be turned into a day-use area. This work is expected to start in 2012–13 after the shire has changed the purpose of the reserve from town site to public open space.
- In collaboration with the Wongan Hills community and the Shire of Wongan–Ballidu, the walk trail and parking infrastructure at Gathercole Nature Reserve were completed. In Wongan Hills Nature Reserve, maintenance was carried out on the Mount Matilda walk trail and trail interpretation was installed. Construction of the road and parking area was completed. An interpretation shelter is still to be completed.
- Consultation continued with the Hyden-Kondinin communities to develop a plan for recreational facilities and access at Lake Cronin Nature Reserve. Infrastructure has been prefabricated ready for installation after an Aboriginal heritage survey has been completed.
- The Central Wheatbelt District has been working with the North Eastern Wheatbelt Regional Organisation of Councils to assist in the development of the Wheatbelt Way tourist drive. As part of the project a walk trail was developed at Billyacatting Hill Nature Reserve and toilets were installed at Billyacatting Hill and Korrelocking nature reserves.



Environmental officer Saorla Finucane with Pollution Response Unit section manager Dr Jimmy Seow. Photo – Peter Nicholas/DEC

Environmental Regulation



Environmental Regulation

DEC has regulatory powers which it uses to manage and protect the environment and minimise risks to public health, particularly in areas where human activities have the potential to pollute or otherwise impact on the quality of air, land or water. Under the provisions of Part V of the EP Act, DEC assesses works approval application proposals for new industries, issues licences to industries to restrict emissions, responds to incidents of non-compliance or pollution, and takes enforcement action when required. DEC also regulates the transport of controlled waste to minimise the potential for pollution or environmental harm. Under the *Contaminated Sites Act 2003*, the department ensures that contaminated sites are appropriately managed. In addition, DEC monitors ambient air quality and develops air quality management plans for priority airsheds to provide long-term protection of public health and the environment. DEC also supports local government in managing environmental noise and monitoring pollution issues.

To ensure consistent, efficient and legally sound delivery of industry regulation work and project approvals, DEC operates within a policy framework and management system that also ensures that approvals are processed within target timeframes. DEC is completing a major review of its industry regulation services and has introduced a sweeping reform project, Re-Engineering For Industry Regulation and Environment (REFIRE). Information about this is included in the Overview section of this Yearbook (see page 14).

Air quality program

Perth Air Quality Management Plan

The *Perth Air Quality Management Plan* (AQMP) is a 30-year government initiative started in 2000. The plan aims to steadily improve Perth's air quality by reducing the emission of air pollutants. During 2011–12, DEC continued to focus on strategies to address vehicle emissions and haze from domestic wood heaters, as well on air quality investigations and environmental regulation. There was also a focus on implementing the supported recommendations of the Perth AQMP five-year review.

In November 2011, DEC held consultation workshops for each of the 10 Perth AQMP initiatives. Key stakeholders were invited to attend and provide comment on programs, the progress of action being undertaken and future needs. The feedback will inform the updated Perth AQMP. The first draft of the Perth AQMP rewrite, a key action of the Air Quality Coordinating Committee, was completed. Revisions and additions are being done following an internal review.

In March 2012, more than 125 participants attended Perth's first Air Quality Forum. The forum was presented by the Air Quality Coordinating Committee and will be an annual event.

Vehicle emissions

CleanRun is a DEC initiative to manage motor vehicle emissions. The aim of the program is to develop and implement a range of targeted initiatives to reduce the impact of motor vehicle emissions in line with the objectives of the Perth AQMP and the National Environment Protection (Diesel Vehicle Emissions) Measure. The primary focus is on the Perth airshed.

CleanRun continued to focus on vehicle emissions reduction and driver behaviour. The Remote Sensing Device was used to conduct on-road vehicle testing to obtain a comprehensive real-world dataset of vehicle fleet emissions and identify vehicle fleet characterisation over time. Vehicle emissions data from about 25,000 vehicles monitored in 2010–11 were analysed in 2011–12 and a draft final report prepared.



Environment Minister Bill Marmion and Professor Barry Marshall with Fourier transform infrared spectrometer monitoring equipment.

Air quality forum held in Perth for first time

In March 2012, more than 125 people attended Perth's first air quality forum. The forum was opened by Environment Minister Bill Marmion, who identified vehicle emissions and transport planning as key areas for air quality improvements.

DEC's Strategic Policy and Programs director and Air Quality Coordinating Committee chair Stuart Cowie said attendees learnt more about what is being done to manage air quality issues in Perth under the Perth Air Quality Management Plan.

Attendees also contributed their ideas about ways to maintain and improve the city's air quality.

"The forum, which will be an annual event, was a great opportunity for people to find out how Perth's air quality is monitored, how local and national data are collected, where to find the data and what it means, and how individuals, communities and businesses can help improve our air quality," Mr Cowie said.

"Specific issues, such as impacts of vehicle emissions, were explored as well as topics such as community education and action.

"The keynote speakers were Nobel Prize laureate Professor Barry Marshall and Associate Professor Andrea Hinwood, from Edith Cowan's School of Natural Sciences.

“Professor Marshall urged the state government to continue to act on air pollution to avoid issues experienced in other cities around the world and Dr Hinwood highlighted the potential for Perth’s dynamic growth and development to contribute to air quality issues in the future.”

Twelve presentations were given by representatives from government agencies, the business sector and non-government organisations who also contributed to panel discussions.

The sessions covered four topics:

- Community education, health and indoor air quality
- Industry emissions, air quality modelling and monitoring
- Haze reduction, smoke management and community action
- Vehicle emissions, land use and transport planning, and local government action.

Discussion on aspects within each topic included the National Pollutant Inventory; odour; understanding the risk to air quality during bushfires and planned burns; and moving away from car dependency and high polluting models of land use and transport planning.

Forum participants also had a rare opportunity to see and discuss specialised air quality monitoring equipment used by DEC, including the Fourier transform infrared spectrometer, which records levels of pollutants by measuring the amount of light an air sample absorbs at a particular wavelength, and the mobile monitoring caravan which is fitted with a range of analysers and can be used in situations where a quick field deployment is needed for short-term air quality monitoring.

The free forum was held at DEC’s WA Conservation Science Centre. All the presentations are available on DEC’s website: www.dec.wa.gov.au/content/view/6876/1576/





The *CleanRun* EcoDrive initiative continued to attract significant interest from the transport industry, industry bodies, local government and interstate agencies. EcoDrive, a do-it-yourself resource package for fleet operators, reduces fuel use and emissions by working with drivers to make small changes to their driving habits. The package provides resources to develop an EcoDrive training program in-house, including driver training materials developed by experts in the transport industry. The target market for the package is heavy vehicle fleets, such as transport companies; however, most EcoDrive principles can be applied by all drivers.

The free resource is available on the DEC website: www.dec.wa.gov.au/pollution-prevention/air-quality/air-quality-projects-and-programs/cleanrun

Haze from domestic wood heaters

The *Halt the Haze* program, an initiative of the Perth AQMP, has been developing a series of new tools to assist local government environmental health officers manage smoke nuisance issues from domestic wood heaters. DEC provided ongoing support to local government health officers in addressing domestic smoke nuisance complaints and provided advice on request to members of the community.

Wood moisture meters were bought to assist audits of firewood sellers. Under the EP Regulations, wood with an internal moisture content greater than 20 per cent is not permitted to be sold as high moisture content wood creates excessive smoke.

Haze alerts continued to be issued by the Bureau of Meteorology, on advice from DEC, between June and September.

Background air quality study—Midland

The *Midland Background Air Quality Study* continued with the deployment of a Fourier transform infra red spectrometer to monitor hydrogen fluoride and hydrogen chloride gases over shorter periods in the Midland area. The 12-month monitoring phase ended in June 2012. A data processing and validation phase is being undertaken and a report is expected to be released in 2013.

Background air quality study—Kwinana

The findings of *Kwinana Background Air Quality Study*, which was carried out in three phases between 2005 and 2010, were released in early 2012. During phase IV of the study, a Fourier transform infra red spectrometer will be used to investigate levels of ammonia and volatile organic compounds for 12 months at various locations in the Kwinana area.

Regional air quality investigations

DEC continued to investigate ambient air quality issues in regional areas, including Port Hedland, Goldfields, Collie and the Burrup Peninsula as part of its commitment to manage environmental impacts in key regional centres of WA. DEC is actively engaged in managing air quality issues resulting from high particulate concentrations in Port Hedland through environmental assessments, licence conditions and by supporting the implementation of the *Port Hedland Air Quality and Noise Management Plan* (March 2010).

DEC has continued to support and work collaboratively with the Cooperative Research Centre for Contamination Assessment and Remediation of the Environment to engineer and trial the novel application of Light Detection and Ranging (LIDAR) technology. This technology is scheduled for deployment in Port Hedland in 2012–13.

DEC also chairs the Port Hedland health studies subcommittee of the Port Hedland Dust Taskforce. This group has been established to undertake a health risk assessment of the particulate emissions in the Port Hedland area. A parallel study is being undertaken by the ChemCentre.

DEC has also focused on industry emissions in the Goldfields and Collie regions and continues to manage these emissions through works approvals and licences. Considerable effort has been invested in the ongoing investigation of the reason for the poor performance of many air quality models in the Collie region. Work has also started on the development of an industry-supported air quality management strategy for the Collie area, with similar work planned for the Goldfields and the Burrup Peninsula.

Fixed ambient air quality monitoring network

DEC operates an ambient air monitoring network throughout the Perth metropolitan region. Fixed ambient air monitoring stations are also located in selected regional centres. The operation of the monitoring network and the results measured against National Environment Protection (Ambient Air Quality) Measure standards are used to produce annual 'efficiency' and 'effectiveness' indicators.

Monitoring stations

During 2011–12, DEC maintained and operated 10 metropolitan (including two temporary sites established for the *Kwinana Child Health Study*) and five regional air quality monitoring stations in WA. The location and period of operation of these sites are listed below.

Table 25: Summary of monitoring stations

	Parameters measured	Period of operation
Albany	PM ₁₀ & Met	July 2011 to June 2012
Bunbury	PM ₁₀ , PM _{2.5} & Met	July 2011 to June 2012
Busseton	PM _{2.5} & Met	July 2011 to June 2012
Caversham	CO, NO, NO ₂ , O ₃ , PM ₁₀ , PM _{2.5} & Met	July 2011 to June 2012
Collie	PM ₁₀ & Met	July 2011 to June 2012
Duncraig	CO, NO, NO ₂ , PM ₁₀ , PM _{2.5} & Met	July 2011 to June 2012
Geraldton	PM ₁₀ & Met	July 2011 to June 2012
Quinns Rocks	NO, NO ₂ , O ₃ , PM _{2.5} & Met	July 2011 to June 2012
Rockingham	NO, NO ₂ , O ₃ , PM _{2.5} & SO ₂	July 2011 to June 2012
Rolling Green	NO, NO ₂ , O ₃ & Met	July 2011 to June 2012
South Lake	CO, NO, NO ₂ , PM ₁₀ , PM _{2.5} , SO ₂ & Met	July 2011 to June 2012
Swanbourne	NO, NO ₂ , O ₃ & Met	July 2011 to June 2012
Wattleup	SO ₂ & Met	July 2011 to June 2012

CO—carbon monoxide, NO—nitric oxide, NO₂—nitrogen dioxide, PM₁₀—particles measuring 10 micrometres or less, PM_{2.5}—particles measuring 2.5 micrometres or less, SO₂—sulfur dioxide, Met—meteorological parameters.

The stations monitor a range of pollutants including carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide and particles as PM₁₀. Particles as PM_{2.5} are also monitored at selected sites as part of a nation-wide program.



DEC's air quality laboratory

The air quality laboratory is a vital part of a general network upgrade as air quality monitoring progresses toward National Association of Testing Authorities (NATA) certification. Work continues on establishing the required standard operating procedures, recordkeeping systems and equipment certification processes.

Public access to air quality data

The air quality web page (www.dec.wa.gov.au/pollution-prevention/air-quality) was maintained, providing updates to ambient air quality data from all DEC-operated air quality monitoring stations twice a day. Hourly averaged graphs for CO, NO₂ and SO₂ and 24-hour averaged data for PM₁₀ and PM_{2.5} can be downloaded. Ambient air quality data for Collie, Kalgoorlie and Kwinana industries obtained in accordance with their respective licence conditions are also available on the website.

Annual reports summarising the previous year's data are provided to the National Environment Protection Council as part of WA's national obligation to this group. The report also details WA's compliance with the National Environment Protection Measure (NEPM) and provides historical context to the annual data.

Air quality data are provided to members of the public on request. Data are provided free of charge to *bona fide* researchers, students and interested stakeholders. Consultants are provided data on a fee for service basis.

Noise regulation

DEC provides technical noise advice to the Office of the EPA and to planning and local government authorities, as well as policy, technical, enforcement and training support for DEC, WA Police and local government officers.

During 2011–12, DEC provided 82 reports on 68 projects in response to requests for environmental impact assessment. A variation of the noise emission standard under Regulation 17 of the EP (Noise) Regulations 1997 was gazetted for Alcoa's Wagerup Alumina Refinery. Two Regulation 17 variations are nearing completion, for the Western Power Substations variation and the Western Power Transformer variation final EPA report. DEC has substantial involvement in issues such as Perth and Busselton airports noise and the Northbridge noise study. It has input into the work of the Port Hedland Dust and Noise Taskforce, which has prepared a consultant's brief for cumulative noise modelling.

A report on the public submissions received on the proposed amendments to the EP (Noise) Regulations 1997 was released and further drafting of these amendments is in progress.

Further information about noise regulation is available on the DEC website:
www.dec.wa.gov.au/pollution-prevention/noise

Industry Regulation

Approvals processing

DEC continued to receive a high number of works approval and licence applications and carried over a large number of open applications at the end of 2011–12. The number of new major resource project works approval applications received in 2011–12 (144) shows a continued high number compared with 2009–10 (84), following the trend set in 2010–11 (175). Despite this increase, DEC processed 92 per cent of major resource project works approvals within the 60-working day target timeframe, achieving an average of 47 working days for the



Environmental officers Christine Davis and Clarrie Green referring to the regulatory maps.

Regulatory maps go external

Early in 2012, DEC made a comprehensive industry regulation resource—a series of regulatory maps—easily available to the public.

The maps identify all environmental issues associated with a particular industry type and the agency and mechanism responsible for managing that issue.

Previously only available to DEC staff, they can now be accessed on DEC's website by people outside the department.

Environmental Officer Christine Davis said the maps helped DEC licensing officers in determining the likely environmental impacts of prescribed activities and the associated regulatory requirements under the EP Act as well as other legislation.

"Following completion of a number of regulatory maps it was clear that other stakeholders could also benefit from this resource and so 15 maps have been published on DEC's website," she said.

"These will serve as a useful guide for those preparing applications for regulatory approvals—including industry, consultants and the community—as well as for managing whole-of-government approval processes.

"Publishing regulatory maps externally will help improve timeliness in determining applications."



148 applications approved. DEC also processed 80 per cent of major resource project licence applications within the 60-working day target timeframe, achieving an average of 45 working days for the 22 applications.

During the year, six industry regulation bulletins, one policy, six guidance documents and eight regulatory maps were completed and published for internal use. DEC published 15 regulatory maps on its website to assist the community, consultants and industry in identifying environmental issues that may arise from these prescribed activities.

Regulation of prescribed premises

During 2011–12, 921 premises held licences under Part V of the EP Act. A total of 233 works approvals were issued in 2011–12, the same as the number issued in 2010–11. Seventy two new licences were issued in 2011–12 compared with 51 in 2010–11. The sustained high number of works approvals is primarily related to increased activity in the resources sector in the Pilbara and Goldfields. The number of new works approvals issued for the Pilbara region accounted for 45 per cent of the total works approvals issued by DEC in 2011–12.

Table 26: Prescribed premises

Region	New works approvals issued 2011–12	New licences issued 2011–12	Active licences 2011–12
Goldfields	40	8	97
Kimberley	8	3	36
Midwest	18	5	95
Pilbara	105	18	141
South Coast	9	5	54
South West	10	5	123
Swan	37	24	297
Wheatbelt	6	4	78
Total	233	72	921

National Pollutant Inventory

DEC implements the National Pollutant Inventory (NPI) program in WA on behalf of the federal government. In 2011–12, reports of substance emissions and transfers of substances in waste from 763 industrial facilities were submitted to the federal government for publication on the NPI website (www.npi.gov.au). Ninety one per cent of facilities in WA now use the online reporting system to submit their reports.

In 2011–12, DEC conducted nine audits on companies submitting NPI reports. Facilities audited included brickworks, power stations, gold mines, landfills and fibreglass swimming pool manufacturers. Audits enable onsite assessment of emission values reported to the NPI and assist in developing an understanding of possible issues associated with reporting.

Controlled waste

Continued high levels of activity in the resources sector have seen a significant increase in controlled waste licensing and tracking activity. In 2011–12, the Controlled Waste Tracking System was upgraded to improve functionality and industry interface.

Table 27: Number of controlled waste licences issued in 2010–11 and 2011–12

Type	2010–11	2011–12
Carrier	338	337
Vehicle	503	547
Driver	927	1,009

Implementation of the review of the EP (Controlled Waste) Regulations 2004 is progressing.

The total volume of controlled waste tracked during 2011–12 was 770,264 kilolitres (compared to 678,660 kilolitres in 2010–11). A total of 92,131 loads were transported (compared to 79,000 in 2010–11). These comprised:

- 66.2 per cent biological
- 5.4 per cent alkalis
- 0.31 per cent acids
- 18.65 per cent waste oils
- 8.45 per cent low-strength waste waters
- 1 per cent other.

The Controlled Waste Tracking System's computer software upgrade included the following improvements:

- a reduction in lost time caused by system performance problems and the need to process data manually
- improved customer service levels
- a reduction in errors resulting from manual processing
- removal of a potential risk of data being lost or corrupted
- an improved ability to meet legislative requirements.

Further information on controlled waste is available on the DEC website:

www.dec.wa.gov.au/pollution-prevention/controlled-waste

Industry regulation compliance strategy

Proactive compliance inspections are used to promote best practice environmental management and consistent implementation and enforcement of environmental regulations across industry. DEC's industry regulation compliance strategy is implemented through annual industry regulation compliance programs. In 2011–12, DEC revised its industry regulation compliance strategy and underlying framework to improve compliance management.

Under the 2011–12 compliance strategy, more than 1,100 compliance inspections were carried out across various industry types, and incorporated a risk-based regional prescribed premises program. The special risk premises inspection program identified risks presented by activities undertaken outside the current regulatory framework. This program is coordinated by DEC's Pollution Response Unit and involves the Fire and Emergency Services Authority (FESA) and Department of Mines and Petroleum (DMP). It is designed to reduce the risk of major environmental and hazardous materials accidents, fires and discharges to the environment.

The compliance strategy sets performance targets at the start of the year and measures progress against these targets quarterly.

Compliance actions were managed in accordance with DEC's Enforcement and Prosecution Policy.



Table 28: Industry regulation compliance strategy performance outcome

Program area	Inspection target	Inspections undertaken	Performance outcome (% compliant)
Industry sector (excluding controlled waste)	184	184	100
Industry sector—controlled waste	303	282	93
Special risk premises (joint FESA/DMP)	71	70	99
Prescribed premises inspections undertaken 2011–12			
High risk	23	16	70
Medium high risk	86	82	95
Medium risk	133	122	92
Low risk	197	123	62

Further information about industry regulation is available on the DEC website: www.dec.wa.gov.au/pollution-prevention/licensing-and-regulation

Environmental hazards management

Pollution emergency management

DEC's Pollution Response Unit (PRU) continued to provide statewide emergency response capabilities for pollution incidents and hazardous material incidents under the State Emergency Plan for hazardous materials. The PRU responded to more than 90 pollution incidents and provided support to DEC regional offices as well as other agencies such as FESA, WA Police and the Department of Health.

Significant achievements for 2011–12 included:

- attending two suspected pesticide incidents after people reported being acutely affected by noxious vapours from the application of pesticides
- responding to an ammonia release incident at a chemical manufacturer
- attending numerous incidents involving fuel, oil and chemical spills, gas leaks, boat fires, illegal dumping of chemicals, fuel tanker road crashes, clandestine drug laboratory contamination and major fires at scrap metal yards, a plastic factory and recycling facilities
- carrying out 72 risk-based inspections targeting suspected environmental hazards, including the storage of large numbers of used tyres or chemical drums. In each case, joint action was initiated with other relevant agencies to reduce the risk and prevent environmental harm
- reviewing and updating all of the PRU's incident response procedures to improve objectivity in decision-making during environmental emergencies.

DEC developed a draft Hazardous Materials Incident Guideline which is being considered by state emergency committees.

Further information on pollution incidents and pollution response is available on the DEC website: www.dec.wa.gov.au/content/view/3367/1917/



Regulation of contaminated sites

During 2011–12, 121 new reports of known or suspected contaminated sites were received under the *Contaminated Sites Act 2003*.

DEC classified 515 sites during the year, bringing the total number of sites classified under the Act to 2,221. Soil and groundwater investigations confirmed the presence of contamination at 518 sites (made up of more than 3,095 individual lots), which are listed on the publicly accessible database on DEC's website. DEC continued systematic follow-up of sites requiring remediation or identified as a high priority for further investigation.

In October 2011, DEC issued the first Investigation Notice under Part 4 of the Act to the owner of a landfill site in Mirrabooka, as appropriate action was not being taken to investigate and monitor groundwater contamination. The notice requires that the nature and extent of groundwater contamination in parts of Dianella and Mirrabooka be investigated. DEC is monitoring compliance with the notice.

In April 2012, the Minister for Environment approved a total of \$1.4 million from the Contaminated Sites Management Account for the investigation or remediation of state-managed sites in Bellevue, Collie, Dwellingup, Eden Hill, Grey, Kenwick, Maylands, Wedge Island and Wittenoom. By 30 June 2012, \$295,000 of these funds had been transferred to the relevant state agencies. The remaining funds will be transferred early in 2012–13.

In relation to acid sulfate soils, DEC released the updated guideline *Treatment and management of soils and water in acid sulfate soil landscapes* and the technical reports *Acid sulfate soil survey in Perth metropolitan region, Swan Coastal Plain, Western Australia* and *Experimental oxidation of Bassendean sands in soil columns*. DEC also released a contaminated sites *Interim guidance note — Assessment of petroleum hydrocarbons in soil and groundwater* in November 2011.

Specialist technical advice was provided to external parties such as community groups, land developers, industry and state and local government. DEC reviewed and provided advice on 1,001 technical reports relating to contaminated sites and 196 technical reports relating to acid sulfate soils and water.

Further information on acid sulfate soils and contaminated sites are available on the DEC website: www.dec.wa.gov.au/ass and www.dec.wa.gov.au/contaminatedsites

Industry regulation training

DEC provides training for its environmental compliance officers and offers a number of courses as well as innovative e-learning modules to provide cost-effective training to DEC staff and other agencies.

Local government support and training

DEC continued to provide training courses and technical support for local government environmental health officers. Courses in complaint handling, unauthorised discharges investigations and the use of enforcement tools were provided in both metropolitan and country areas. DEC also developed a training course for the Department of Housing to assist it in dealing with contamination issues arising from clandestine drug laboratories.

DEC received a High Commendation in the 2011 Safer Communities Awards for its joint project with FESA in developing a Hazardous Materials Emergency Planning Resource Kit for local government.



DEC senior environmental officer John Edwards with Michael Mischin, MLC, Member for the North Metropolitan Region.

HAZMAT project wins safety award

A joint DEC and FESA project was awarded a High Commendation in the 2011 *Safer Community Awards*.

The award was given for the development of a Hazardous Material Incident Management Plan resource kit for local governments and remote indigenous communities.

The kit contains a DVD with information that assists communities to develop hazardous material incident arrangements and improve their capacity to manage these events.

DEC senior environmental officer and project leader, John Edwards, said the Environmental Hazards Branch worked closely with local government and had become aware that it was difficult to find all the relevant information to develop local plans.

"Working with FESA, we identified that we could put all of the information together in a simple package with templates, making it much more straightforward. The result has been a great success," he said.

Mr Edwards said there were more than 50 significant hazardous materials incidents each year in WA, ranging from chemical fires, fuel tanker crashes, chemical spills and toxic gas releases.

"While DEC and FESA have joint arrangements for HAZMAT emergency response, there is still a need for local governments to plan for potential hazardous materials incidents in their districts for community protection and effective recovery.

"This resource kit has helped local governments do that. The package has been distributed to 140 local governments and 14 Indigenous service organisations throughout WA."

The joint project also provided hazardous material awareness training to remote Indigenous communities in Fitzroy Crossing, Kalgoorlie and on the Dampier Peninsula.

The use of these management plans has been recognised as an integral part of Westplan HAZMAT, WA's hazardous materials emergency plan.



USEPA representative Tim Czysz with Environment Minister Bill Marmion and DEC Environmental Hazards Branch Manager Ken Raine at a hazardous material emergency response training course held in Perth.

Regulatory training program

DEC's Authorised Officer Training Course is a specialist training program for officers conducting investigations and enforcing legislation and regulations.

The formal component of this course comprises two weeks of training at the Western Australia Police Academy. The training and assessment activities are mapped to the nationally recognised qualification, Certificate IV in Government (Investigation). Since its inception in 2005, the program has significantly built capacity within DEC's workforce and enabled staff to carry out their regulatory roles in a cost-effective, efficient and transparent way.

Modular Object Oriented Dynamic Learning Environment (Moodle)

Historically, DEC's e-learning modules have been distributed via CD/DVD. During 2011–12, DEC has been working to improve access to e-learning materials through a free web application, Moodle, which provides the necessary tools to create a virtual classroom via the internet. This initiative has improved accessibility and learning opportunities for staff across the state.

Industry Regulation Officer Development Program (IRODP)

The IRODP is a series of formal learning and development activities undertaken during the first 12 weeks of employment. These activities have been built around the core competencies required by industry regulation officers. The modular program can be configured by different business areas to meet their specific requirements.

Environmental hazards training

In August 2011, DEC hosted four United States Environmental Protection Agency (USEPA) officers in Perth to provide hazardous materials emergency response training for DEC officers, Department of Health officers and members of industry who deal with hazardous materials. The courses were well received and increased WA's overall capability to respond to environmental and hazardous materials incidents.

External funding for regulatory training—*Enterprise Based Productivity Places* program

In 2010, DEC secured \$200,000 through the federal government's *Enterprise Based Productivity Places* program to enable 40 DEC officers to undertake the Certificate IV in Government (Statutory Compliance) and Certificate IV in Government (Investigation). The program is a partnership including state government agencies, Government Skills Australia and the federal government. To date, 65 qualifications have been issued to DEC staff.



Indian Ocean Territories

DEC continued to provide environmental regulatory services for Christmas Island and Cocos (Keeling) Islands as part of a formal arrangement with the federal government. This includes issuing licences and works approvals, as well as clearing permits.

A clearing permit covering 64 separate sites and approximately 222.6 hectares was assessed and authorised for Christmas Island Phosphate's phosphate mine during 2011–12.

In January 2012, a ship ran aground at Christmas Island carrying more than 102 tonnes of oil and approximately 260 tonnes of phosphate ore. DEC provided technical advice including incident management, and waste management and also deployed staff to co-ordinate an oiled wildlife response.

Significant Issues

Southern Metropolitan Regional Council's Canning Vale waste composting facility

The Southern Metropolitan Regional Council (SMRC) operates the Regional Resource Recovery Centre in Bannister Road, Canning Vale. The facility composts putrescible waste, mainly from residential kerb-side collections, in rotating digesters and then in windrows on an enclosed aeration floor. The facility has been the source of ongoing odour complaints from the community. On 30 March 2012, DEC issued a 10-week licence for a managed phase-down of the facility until additional pollution control equipment had been installed.

The SMRC and its participating councils responded to this licence with a proposal to install additional pollution control equipment and to improve monitoring and management. DEC issued an amended licence on 7 May 2012. The licence included 21 new conditions that allow the centre to continue to operate, but at a reduced throughput and with temporary additional pollution control equipment, pending the installation of permanent new scrubbers prior to 15 December 2012.

Cockburn Cement Ltd lime and cement plant, Munster

Cockburn Cement Ltd's (CCL) operations at Munster have been the subject of ongoing community concerns and complaints. In December 2010, DEC amended the licence for this facility to require a baghouse filter to be installed on kiln six, which produces lime, by 29 February 2012. Baghouse filters constitute best practice for controlling dust emissions from lime plants. This filter was installed, and since it has been in operation dust emissions from kiln six have been significantly reduced, to very low levels.

On 30 March 2012, DEC issued a new licence to CCL with a number of new, stringent conditions designed to further improve the environmental performance of the operation. The licence requires CCL to install a baghouse filter on kiln five, to be in operation by 30 June 2013. The operation of the filter should see a similar reduction in dust emissions from this kiln to the reduction achieved on kiln six.

Other additional conditions in the licence issued in March 2012 are designed to monitor and reduce odour and other emissions from this facility.

Further information on the SMRC and Cockburn Cement licences (and all other industry licences) is available on DEC's website: www.dec.wa.gov.au/pollution-prevention/licensing-and-regulation



Students from Landsdale Primary School conducting a waste audit.

Environmental Sustainability



Environmental Sustainability

DEC has the responsibility to develop and implement policies and strategies that promote environmentally sustainable practices in industry, government and the community in Western Australia.

Strategic Policy

The Strategic Policy Branch leads and coordinates high-level strategic policy and legislative review across DEC, including regulatory gatekeeping, approvals reform and promoting good environmental sustainability policy outcomes.

This included leading DEC's input to the government's approval reform; providing high-level advice to state agencies, local government and the non-government sector on sustainability policy, programs and reporting; ensuring that DEC leads by example through incorporating sustainability principles into its diverse range of activities, operations and decision-making processes; and leading and coordinating major legislative and regulation reviews and amendments. In November 2011, amendments to the *Litter Act 1979* to increase penalties were tabled in Parliament.

The branch also coordinates DEC's involvement with the Regulatory Impact Assessment process administered by the Department of Treasury.

Strategic assessment of the impacts of development in the Perth and Peel regions

The state and federal governments have signed an agreement to undertake a strategic assessment of development in the Perth and Peel regions under the EPBC Act for the protection of matters of national environmental significance. The coordinated and integrated assessment will improve biodiversity conservation outcomes for a growing Perth.

The strategic assessment addresses the incremental loss of biodiversity values that can result from a case by case approach to environmental assessment, and is also intended to reduce regulatory burden and streamline approvals. DEC is leading the preparation of the plan for the protection of matters of national environmental significance.

Offsets

DEC contributed to the preparation of a Western Australian Government Environmental Offsets Policy, which was published in September 2011 and provides guidance to agencies on the application of offsets. DEC is leading the preparation of offset guidelines to support the policy that will outline the respective roles and responsibilities of agencies, proponents and statutory bodies; legislative requirements; assessment and decision-making processes; auditing; monitoring and review.

DEC is also developing a public register that will contain consolidated records of environmental offsets and meet government, community and industry expectations for transparency and accountability.

Support for participation in Council of Australian Governments Standing Council on Environment and Water

DEC provides policy advice to the Minister for Environment and government on national environmental reform issues considered by the Standing Council on Environment and Water and other Council of Australian Governments forums. DEC also participates in inter-jurisdictional working groups that advise on and/or implement these reforms.



Waste management

Legislation and regulations

DEC has responsibility for administering the *Waste Avoidance and Resource Recovery Act 2007* (WARR Act), *Waste Avoidance and Resource Recovery Levy Act 2007*, WARR Regulations 2008, and the WARR Levy Regulations 2008 to minimise waste production and manage its storage and recycling.

Under this legislation, all landfills throughout the state that receive waste from the Perth metropolitan area must pay a landfill levy on the waste disposed to landfill. The levy is determined by the type of landfill and quantity of waste.

Amendments to the WARR Levy Regulations 2008 came into effect on 2 July 2011. The amendments addressed concerns about levy exemption provisions raised by the Joint Standing Committee on Delegated Legislation.

Office of the Waste Authority

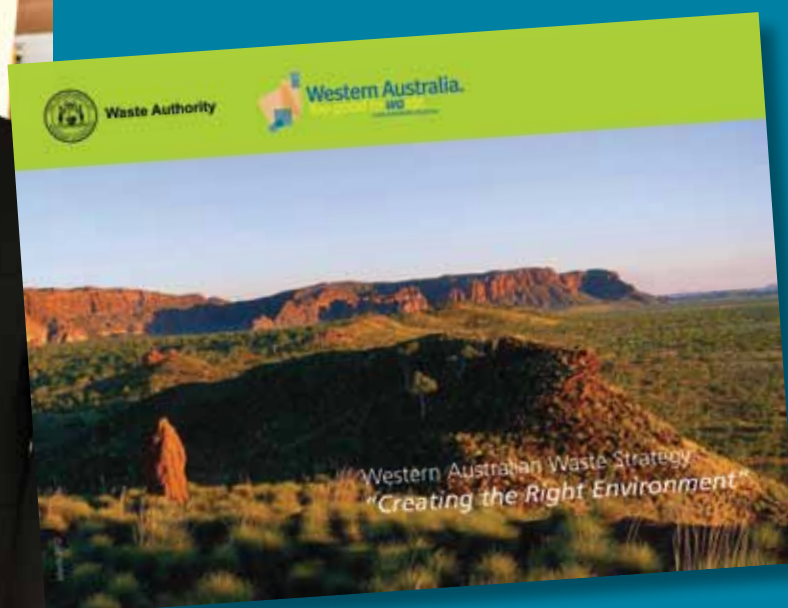
The Office of the Waste Authority provides secretariat services to the Waste Authority and manages key activities including policy, strategic partnerships and communications.

Delivery of programs on behalf of the Waste Authority

The department's Waste Management Branch provides program delivery support to the Waste Authority, in accordance with a service level agreement established in 2009. The Waste Management Branch manages the administration of various funding programs, such as the *Strategic Waste Initiatives Scheme*, *Community Grants Scheme*, *Regional Funding Program*, *Household Hazardous Waste Program* and *WA Transitional E-waste Program*. It also provides policy advice to government and other stakeholders on waste and recycling issues.

DEC provided support to the Waste Authority in the development of the state's first waste strategy. The *Western Australian Waste Strategy: Creating the Right Environment* was launched by the Minister for Environment on 6 March 2012.

Also in 2011-12, DEC started implementing the *Regional Funding Program* which will allocate up to \$6.78 million over four years to waste projects that will deliver results in line with the aims of the waste strategy and are undertaken by groups of local governments.



Environment Minister Bill Marmion and former Waste Authority Chair Peter Fitzpatrick AM.

Major strategy sets tough new waste targets

In March 2012, Environment Minister Bill Marmion released the *Western Australian Waste Strategy: Creating the Right Environment* to guide waste management and recycling for the next decade.

“The strategy has five key themes aimed at reducing waste to landfill. The primary focus is on reducing construction and demolition, and commercial and industrial wastes, which represent about three quarters of waste sent to landfill in WA,” Mr Marmion said.

“Recovery rates for municipal solid waste in the Perth metropolitan region were 36 per cent in 2009–10. This strategy aims to increase the recovery to 50 per cent by 2015 and 65 per cent by 2020. These targets are based on ambitious, but achievable, improvements in current recovery rates.

“The launch of the strategy builds on the state government’s announcement of a landmark agreement between Main Roads WA and the Waste Authority for a new specification for the use of recycled construction and demolition waste in road base.

“More than one million tonnes of recycled construction and demolition (C&D) waste could be diverted from landfill and used to build roads under this agreement.”

The five key strategic objectives outlined in the strategy are to:

- initiate and maintain long-term planning for waste and recycling processing, including access to suitably located land with buffers
- enhance regulatory services to ensure consistent performance at landfills, transfer stations and processing facilities, including establishing a dedicated inspection and compliance team to monitor landfills
- develop a best practice incentive program to drive improved waste practices
- use existing economic instruments, like the landfill levy, to support diversion of waste from landfill
- engage the general public, business and government to change behaviour and promote success.

West Australians produce 3.5 tonnes of waste per capita each year. Since 2008, the government has re-invested more than \$15.6 million from the landfill levy into the waste and recycling sector through a range of grants and programs.

“This reinvestment continues, providing a platform for new investment in better waste management and an opportunity for all of us to meet the challenge,” Mr Marmion said.

The *Western Australian Waste Strategy: Creating the Right Environment* is available on the Waste Authority website: www.zerowaste.wa.gov.au



The Murchison River, Kalbarri National Park. Photo – Samille Mitchell/DEC.

Coordinating Western Australia's Response to Climate Change

Coordinating Western Australia's Response to Climate Change

Taking action on climate change

DEC is charged with providing leadership across government in the development and implementation of policies and strategies to reduce greenhouse gas emissions and, of adaptation initiatives to reduce the impact of climate change for WA.

Further information about climate change is available on the DEC website:
www.dec.wa.gov.au/our-environment/climate-change

Low Emissions Energy Development fund

The *Low Emissions Energy Development* (LEED) fund aims to help develop sustainable low emission technologies to reduce Western Australia's greenhouse emissions. The assessment of 31 applications submitted under the fourth round was completed in 2011–12. In June 2012, \$12.7 million in LEED funding for six new low emissions energy projects in Perth, the Midwest and the Wheatbelt was announced. In-principle funding was awarded to Curtin University; Morton Seed and Grain; Biogas Renewables; Green Rock Energy Ltd; Solastor, in consortium with Carbon Reduction Ventures; and UWA.

Previously funded projects have made good progress and a total of \$508,613 in LEED funding was provided to Future Farm Industries CRC's mallee harvester, Carnegie Wave Energy's pilot plant at Garden Island and Aurora Algae's biofuel plant at Karratha for milestone achievements.

The development of a prototype oil mallee harvester by the Future Farm Industries CRC was successfully completed, making it the first LEED fund-supported project to be completed. The machine is able to harvest 38 tonnes of biomass in an hour, almost double the specification of 20 tonnes per hour. Work continues toward commercialisation of the technology.

The LEED fund's early investment in Carnegie Wave Energy's demonstration project has been followed by funding from the federal government after Carnegie successfully deployed a module near Garden Island.

Aurora Algae has produced its first biodiesel from algae and used it to fuel a utility vehicle.

Further information about the LEED fund is available on the DEC website:
www.dec.wa.gov.au/our-environment/climate-change/low-emissions-energy-development-leed-fund

Policy support and leadership

DEC provides advice to represent WA's interests (including analysis of costs, benefits and implementation issues) on the design of national climate change policies and programs. The department also provides advice on ways to complement national policies and regulations in the area of greenhouse gas mitigation.

DEC participates in inter-jurisdictional working groups to develop national climate change policy and provides policy advice to the Minister for Environment on Select Council on Climate Change matters. DEC is represented on the Complementary Measures and Adaptation working groups of the Select Council.



Indian Ocean Climate Initiative Stage 3

Research into the nature and impacts of climate change on WA as part of Stage 3 of the *Indian Ocean Climate Initiative* (IOCI) concluded in June 2012. The research was supported by a \$4 million investment by the state government in partnership with CSIRO and the Bureau of Meteorology to provide basic climate research in WA. Stage 3 has built on the existing work completed by IOCI to provide better understanding of the current and future climate and the impact of changes, particularly in the north-west of the state. This investment will enable the development of better projections of regional weather to allow people and businesses, as well as state government agencies, to plan and adapt to a changing climate.

Further information on the *Indian Ocean Climate Initiative* is available on the project website:
www.ioci.org.au/

Electric vehicles trial

DEC has incorporated an electric vehicle into its regular fleet as part of an Australian-first large-scale trial of converted electric vehicles. Managed by CO2 Smart and monitored by UWA, the trial is contributing valuable information regarding vehicle performance, recharging infrastructure, maintenance, environmental performance and usability.

System for Accounting and Reporting of Government Emissions

DEC continued to administer the *System for Accounting and Reporting of Government Emissions* (SARGE), assisting 27 government agencies to account for and report their greenhouse gas emissions and reductions for 2010–11. A triennial report of SARGE data for 2006–07, 2007–08 and 2008–09 was published.

Further information about SARGE and greenhouse reporting is available on the DEC website:
www.dec.wa.gov.au/our-environment/climate-change/greenhouse-reporting

Enabling state and local government adaptation and mitigation

DEC provided advice to state agencies, local governments and other stakeholders on measures to achieve mitigation of greenhouse gas emissions. The department also assisted state agencies to analyse and minimise greenhouse gas emission implications during the development or review of policies and programs.

DEC continued to support state and local government climate change risk and vulnerability assessments and adaptation planning initiatives.

DEC commissioned and co-supervised a Murdoch University student project: Literature Review of Climate Change Adaptation Support Tools.

Further information about climate change adaptation and mitigation is available on the DEC website:
Adaptation: www.dec.wa.gov.au/our-environment/climate-change/adaptation
Mitigation: www.dec.wa.gov.au/our-environment/climate-change/mitigation



A buoyant actuator, part of Carnegie Wave Energy's wave power demonstration plant at Garden Island. Photo – Carnegie Wave Energy

State invests in low emissions technology

In June 2012, Environment Minister Bill Marmion and Energy Minister Peter Collier announced in-principle funding of \$12.7 million from the *Low Emissions Energy Development* (LEED) fund for six new low emissions energy projects in Perth, the Midwest and the Wheatbelt.

The projects are being undertaken by Curtin University; Morton Seed and Grain; Biogass Renewables; Green Rock Energy Ltd; Solastor; in consortium with Carbon Reduction Ventures; and UWA.

"The funding is subject to these organisations matching every \$1 of government funds with at least \$3 from elsewhere, which will lead to a direct total investment of more than \$50 million in low emissions technology in WA," Mr Marmion said.

"LEED funding provides vital support to technological development aimed at reducing greenhouse gas emissions. The government is proud to support these important projects."

Curtin University is developing technology to simultaneously char and grind biomass so it can be efficiently burned with coal in existing coal generation infrastructure. Grinding the biomass as it is charred uses less energy and the resultant ground biomass is more compatible with coal burning power plants.

Morton Seed and Grain's proposal is a biomass project in the Wheatbelt using oat husks as fuel for cogeneration of electricity and heat.

Biogass Renewables is developing a commercial-scale anaerobic digester plant to convert solid waste to biogas for electricity generation and compost in thermally insulated tanks.

Green Rock Energy Ltd is developing a geothermal electricity generation plant in the Midwest near Dongara, and Solastor, in consortium with Carbon Reduction Ventures, plans to spend \$3.775 million to build a 1.5 megawatt grid-connected concentrated thermal power station incorporating heat storage technology near Morawa.

UWA has received \$356,000 to undertake research into recapturing methane from liquefied natural gas vents. Nitrogen is vented as part of LNG production; however, this contains a proportion of methane which is an extremely potent greenhouse gas. Capturing this methane economically could provide a significant source of abatement. UWA will also receive \$493,000 to evaluate the pumping of carbon dioxide (CO₂) underground to enhance natural gas recovery. Enhanced gas recovery would use injected (and therefore sequestered) CO₂ to increase natural gas production and deliver CO₂ sequestration.

In addition to the funding allocation to new projects, \$508,613 was provided to Future Farm Industries CRC's mallee harvester; Carnegie Wave Energy's pilot plant at Garden Island and Aurora Algae's biofuel plant at Karratha for milestone achievements.



Fire Management Services



Fire Management Services 2011–12

Bushfire season 2011–12

The 2011–12 bushfire season was dominated by a number of large bushfires that saw DEC heavily committed to fire response almost continuously for three months from late November 2011 to February 2012. The department attended several significant fires, including those at Margaret River and Milyeannup that were the result of escaped DEC prescribed burns. The Margaret River fire destroyed 45 houses, chalets and outbuildings, and greatly impacted on the local community. The Milyeannup fire was one of the largest fires in the south-west forest regions in 50 years. Other fires of note included those at Northcliffe, near Pemberton, and the Carnarvon complex of fires that burnt for almost six weeks. Started by lightning strikes, these fires required the longest sustained suppression effort ever undertaken by DEC.

The response to all of these fires involved significant inter-agency cooperation. DEC was assisted by FESA, local government, volunteer bushfire brigades and other agencies.

Also of note were large fires on the northern Nullarbor Plain, fuelled by the most prolific grass growth in the area since the mid-1970s.

DEC attended and monitored 625 bushfires throughout the state in 2011–12, which burnt about 4,991,504 hectares. Of this area, 398,936 hectares was in the Pilbara Region, 2,519,835 hectares in the Goldfields Region, 879,933 hectares in the Kimberley Region, 26,647 hectares in the South Coast Region, 1,061,703 hectares in the Midwest Region, 614 hectares in the Wheatbelt Region and about 103,836 hectares in the three south-west forest regions (Swan, South West and Warren).

About 31 per cent of all bushfires attended by DEC were caused by lightning, well above the 10-year average of about 23 per cent. About 36 per cent of DEC-attended fires were deliberately lit or arson-caused fires, below the 10 year average of about 44 per cent.

Other causes of bushfires included accidental fires (12 per cent), escapes from private burns (five per cent) and unknown (nine per cent). Two per cent were the result of escapes from DEC prescribed burns. Other causes accounted for the remaining five per cent.

DEC pre-formed incident management teams were deployed, either in full or in part, to five fires (or fire complexes) during the 2011–12 fire season. Several fires required multiple deployments over a period of weeks.

Details on the bushfires attended by DEC staff are provided in Table 30.

Table 29: Bushfires in all regions 2009–10 to 2011–12
 Number and area by land category
 Number and per cent by cause

Category						
	Number *			Area burnt (ha) **		
	All regions			2009–10	2010–11	2011–12
	2009–10	2010–11	2011–12	2009–10	2010–11	2011–12
State forest						
native hardwood	118	99	138	14,357	1,954	11,775
softwood plantation	94	114	73	136	192	511
National parks	99	111	109	450,384	226,625	496,789
Nature reserves	56	68	44	961,010	143,322	551,135
Other DEC-managed reserves	48	62	64	202,605	78,695	225,046
Other Crown lands	33	38	53	136,311	63,120	1,181,168
Private property	104	100	114	23,132	7,162	150,469
Unallocated Crown land	51	37	30	814,831	124,436	2,374,609
Total	603	629	625	2,602,767	645,505	4,991,502
Cause						
All regions	Number *			Per cent		
	2009–10	2010–11	2011–12	2009–10	2010–11	2011–12
Deliberately/illegally lit	216	321	228	36	51	36
Escapes – DEC burns	11	11	10	2	2	2
Escapes – non-DEC burning	35	36	34	6	6	5
Accidental – timber industry	2	7	10	0	1	2
Accidental – other industries	37	30	26	6	5	4
Accidental – recreationists	32	54	39	5	9	6
Lightning	166	72	193	27	11	31
Unknown	27	63	55	13	10	9
Other causes	77	35	30	5	5	5
Total	603	629	625	100	100	100

2011–12 information includes data from 1 July 2011 to 30 June 2012
 2010–11 information includes data from 8 June 2010 to 30 June 2011
 2009–10 information includes data from 12 June 2009 to 15 December 2010

* Number of bushfires that started in each tenure type and fire cause

** Area (ha) burnt by bushfires in the tenure type



Table 30: Area and number of bushfires attended and monitored by DEC for all regions 2011–12

Region	State forest native hardwood	State forest softwood plantation	National parks	Nature reserves	Other DEC reserves	Other Crown lands	Private property	Unallocated Crown land	Total
South-west forest regions									
Swan	Area (ha) *	328	1,764	111	29	5	2,566	23	5,295
	Number **	58	29	9	29	15	53	7	264
South West	Area (ha) *	10,462	28,954	4,063	2,162	3,197	3,073	3,440	55,394
	Number **	55	15	1	11	2	29	1	122
Warren	Area (ha) *	968	41,677	48	121	1	202	131	43,148
	Number **	23	32	6	1	0	11	2	76
Sub Total	Area (ha) *	11,758	72,395	4,222	2,312	3,203	5,841	3,594	103,837
	Number **	136	76	16	41	17	93	10	462
Other regions									
Kimberley	Area (ha) *	0	409,426	96,392	86,209	89,326	21,832	176,748	879,933
	Number **	0	9	5	8	1	1	2	26
Pilbara	Area (ha) *	0	13,679	3,408	115,089	139,835	21,500	105,425	398,936
	Number **	0	10	1	4	4	0	4	23
Midwest	Area (ha) *	0	1,277	6,503	498	926,804	8,006	118,615	1,061,703
	Number **	0	6	3	6	30	9	5	59
Goldfields	Area (ha) *	0	0	439,573	17,854	22,000	83,401	1,957,007	2,519,835
	Number **	0	0	11	2	0	1	5	19
Wheatbelt	Area (ha) *	0	0	84	0	0	530	0	614
	Number **	0	0	2	0	0	7	0	9
South Coast	Area (ha) *	18	12	954	3,085	1	9,359	13,219	26,648
	Number **	2	8	6	3	1	3	4	27
Subtotal	Area (ha) *	18	424,394	546,914	222,735	1,177,966	144,628	2,371,014	4,887,669
	Number **	2	33	28	23	36	21	20	163
Grand total (all regions)	Area (ha) *	11,776	496,789	551,136	225,047	1,181,169	150,469	2,374,608	4,991,506
	Number **	138	109	44	64	53	114	30	625

Only includes data from 1 July 2011 to 30 June 2012

* Area (ha) burnt by bushfires in the tenure type

** Number of bushfires originating in the tenure type



Prescribed burning

The department has legislative responsibility for fire preparedness on DEC-managed lands (generally parks, reserves and state forest) and unallocated Crown land and unmanaged reserves outside metropolitan and townsite areas. Fire preparedness activities include the preparation and implementation of an annual prescribed burning program by DEC on these lands.

Prescribed burning on DEC-managed lands throughout the state is undertaken for three primary purposes: to protect and conserve biodiversity values and community assets; to reduce the occurrence and impacts of large, intense bushfires; and to regenerate and protect forest ecosystems following harvesting operations or other disturbances. In many cases these outcomes are achieved together within a prescribed burn.

The indicative burn target for 2011–12 in the south-west forest regions was 200,000 hectares. To meet this objective, the department's master burn planning process identified areas in excess of 200,000 hectares as available for prescribed burning in the south-west forest regions for the 2011–12 burning seasons. The surplus burn area provides the flexibility to take advantage of favourable burning conditions as they occur in different parts of the south-west.

In 2011–12, DEC achieved 103,165 hectares in the south-west forest regions, including about 7,669 hectares that were burnt for pine plantation protection. About 71 per cent of all burns were undertaken in the spring–early summer period (September to December 2011), 13 per cent in autumn (April to June 2012), six per cent in winter (July and August 2011) and 10 per cent in summer (January to March 2012).

The department also completed its largest ever program of about 7.6 million hectares of prescribed burning in the Kimberley, Pilbara, Goldfields, Midwest, Wheatbelt and South Coast regions. Many of these burns were open-edged and wind-driven with aerial ignition. These burns provide the habitat diversity necessary to conserve biodiversity and establish protective buffers to limit the spread of bushfires. The burns were carried out on DEC-managed lands as well as on unallocated Crown lands and unmanaged reserves in these regions.

Figure 3 shows the achievement of prescribed burning in the south-west forest regions from 2001–02 to 2011–12. The relatively low level of burning for a number of years throughout this period, including 2011–12, reflects the impacts of drought and unfavourable burning conditions that prevailed in these years. The average area of burning achieved over the past 10 years has been about 160,176 hectares per annum.



Figure 3: Prescribed burning in the south-west forest regions, 2001-02 to 2011-12

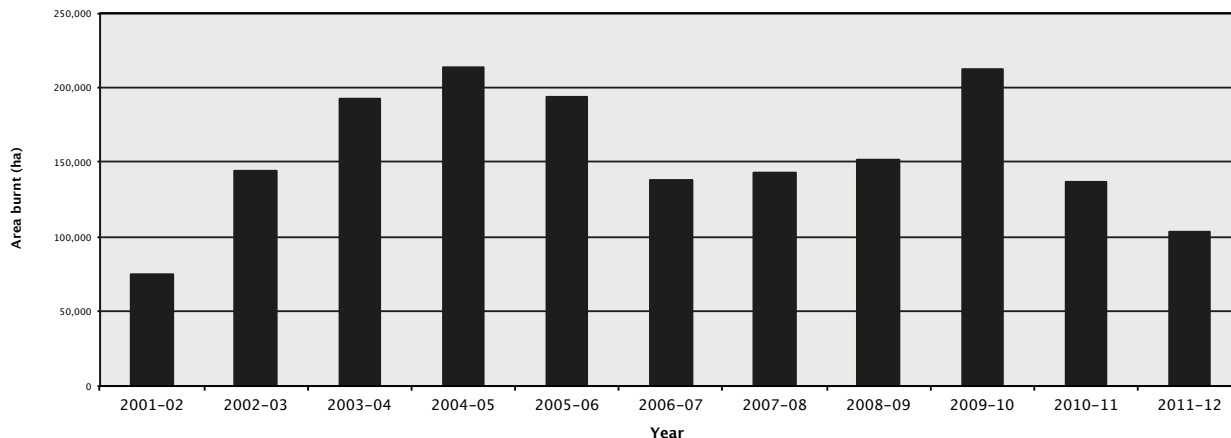
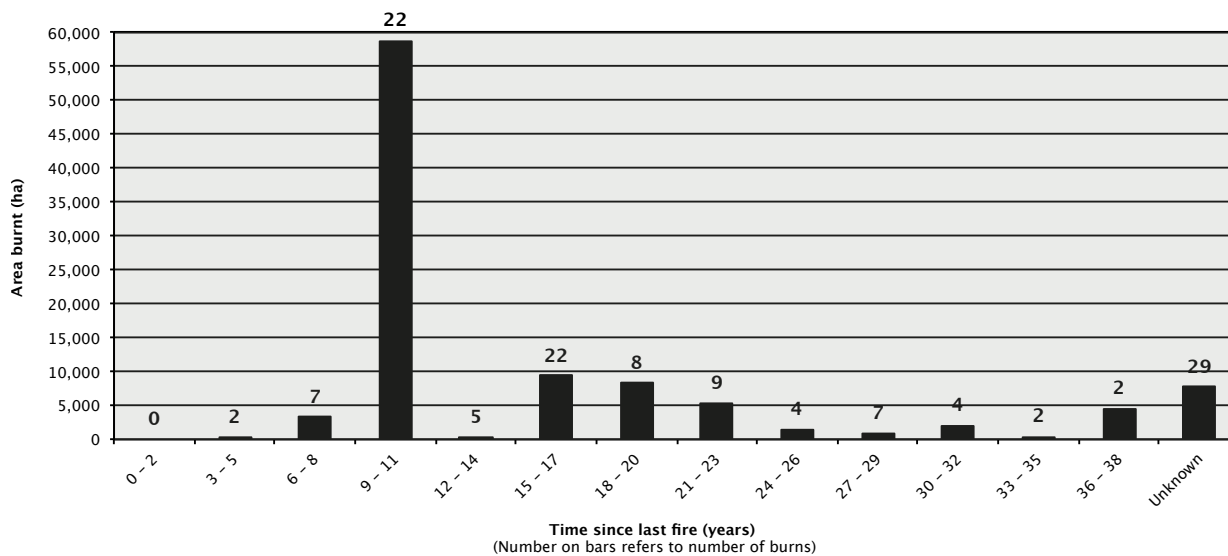


Figure 4 shows the number of years since fire last occurred in the vegetation/fuel in all of the prescribed burns conducted in the south-west forest regions in 2011-12. Approximately 90 per cent of the burns contained fuels that had not been burnt for at least 10 years.

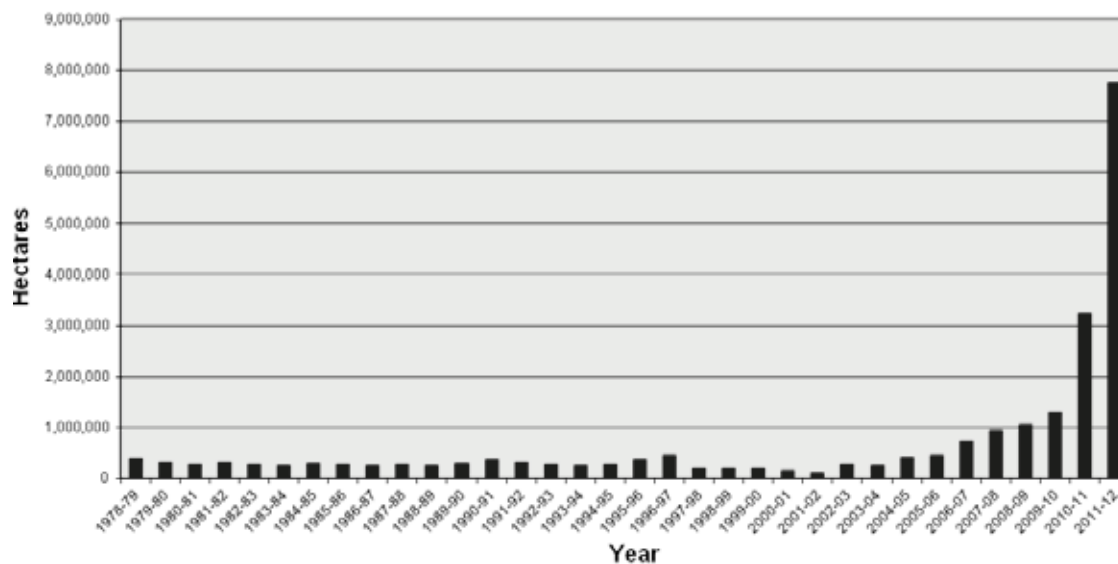
Figure 4 Years since last fire distribution for 2011-12 prescribed burns in the south-west forest regions



In 2011-12, the combined total area of prescribed burning undertaken throughout the state was 7.7 million hectares, the largest figure achieved by DEC to date.

The application of prescribed fire by DEC has increased markedly since July 2003 when the department became responsible for fire risk prevention and fire preparedness over large areas of unallocated Crown lands. Significant progress has been made in the Pilbara, Kimberley and Goldfields regions in applying prescribed fire across the landscape to achieve biodiversity conservation outcomes and to minimise the potential extent of damaging bushfires. Figure 5 shows the area prescribed burnt in all DEC regions since 1978.

Figure 5 Prescribed burning in all regions from 1978–79 to 2011–12



Details on the prescribed burn areas achieved are provided in tables 31 and 32, and in the Appendix (pages 174-5).

Table 31: Type of prescribed burns for all DEC regions 2009–10 to 2011–12

	2009–10	2010–11	2011–12
Indigenous vegetation—hand burning (ha)			
State forest	5,227	3,804	6,818
National parks	22,966	15,913	20,096
Nature reserves	2,092	7,516	957
Other Crown land and private property *	6,724	40,210	136,894
Total	37,009	67,443	164,765
Indigenous vegetation—aerial burning (ha)			
State forest	76,509	29,689	11,870
National parks	377,138	1,146,992	1,986,205
Nature reserves	66,218	1,103,496	704,597
Other Crown land and private property *	690,055	864,849	4,868,145
Total	1,209,920	3,145,026	7,570,817
Indigenous vegetation—silviculture burning (ha)			
- Jarrah-dominant forests	16,097	5,386	2,893
- Karri, kari/marri, marri forests	466	464	355
- Other forest	883	0	0
Total	17,446	5,850	3,248
Softwood plantation—burning (ha)			
- Strategic protection	3,806	4,036	4,754
- Clearing burns	367	640	0
- Logging debris removal, silviculture, regeneration	7,632	5,925	2,915
Total	11,805	10,601	7,669
Grand total	1,276,180	3,228,920	7,746,499

For data specific to south-west forest regions see Appendix

* Includes other Crown land, other DEC reserve and private property



Table 32: Area of prescribed burns for all DEC regions 2009–10 to 2011–12

South-west forest regions		2009–10	2010–11	2011–12
Swan	Area (ha)	73,902	13,007	26,358
	Number	65	48	54
South West	Area (ha)	56,174	48,651	23,211
	Number	52	56	45
Warren	Area (ha)	81,941	75,088	53,596
	Number	61	54	24
Subtotal	Area (ha)	212,017	136,746	103,165
	Number	178	158	123
Other regions		2009–10	2010–11	2011–12
Kimberley	Area (ha)	725,903	2,946,570	7,099,829
	Number	10	24	23
Pilbara	Area (ha)	245,749	106,346	95,148
	Number	14	11	14
Midwest	Area (ha)	6,555	3,102	199
	Number	24	12	3
Goldfields	Area (ha)	80,872	25,103	414,050
	Number	9	6	7
Wheatbelt	Area (ha)	1,212	2,334	2,510
	Number	13	16	17
South Coast	Area (ha)	3,872	8,719	31,598
	Number	29	31	27
Subtotal	Area (ha)	1,064,163	3,092,174	7,643,334
	Number	99	100	91
Grand total (all regions)	Area (ha)	1,276,180	3,228,920	7,746,499
	Number	277	258	214

Please note this table counts carryover burns (same burn ID done over multiple seasons) as different records, e.g. a burn started in spring and finished in autumn is counted as two burns.



DEC Director General Keiran McNamara and FESA Chief Executive Officer Wayne Gregson at the signing of the Heads of Agreement.

DEC and FESA sign heads of agreement

In November 2011, DEC and FESA signed a heads of agreement to provide joint bushfire management to the Western Australian community.

The agreement delivers on the first recommendation in the Keelty report into the February 2011 Perth hills bushfire, which recommended that FESA and DEC finalise a memorandum of understanding and commit to working in partnership.

DEC Director General Keiran McNamara said it was important that both agencies shared knowledge, resources and systems ahead of the summer bushfire season.

“FESA Chief Executive Officer Wayne Gregson and I both believe it is critical that we are united in our approach to bushfire management if we are to better protect lives, property and the environment,” he said.

“The heads of agreement paves the way for a strong partnership at all levels between FESA and DEC so both agencies can better prevent, prepare and respond to bushfires through more open communication, consultation and transparency.

“The new partnership will provide for a much more seamless approach to combating bushfires through the establishment of joint protocols and planning documents that will guide operating procedures, and a commitment to operate in accordance with the same policies and systems.

“DEC and FESA will undertake joint programs, projects and training, collaborate and consult on a regular basis and implement joint management of resources, including aircraft.”

It was signed on 4 November 2011 at the annual WA Seasonal Outlook meeting, attended by more than 150 personnel from WA's emergency services agencies including DEC, FESA, the Bureau of Meteorology, WA Police and local governments.

The briefing gave operational staff a chance to come together to discuss preparations for the coming bushfire and cyclone season.

The seasonal outlook is an important opportunity to ensure that all the different agencies involved in emergency services have a clear understanding of changes to operations management and state operational plans and can discuss any issues with their counterparts.

The heads of agreement can be viewed at www.dec.wa.gov.au or www.dfes.wa.gov.au.



Operations, planning and interagency cooperation

Aerial fire suppression operations

DEC contracted nine fixed-wing water bombers from late November 2011 to late April 2012. Two Air Tractor 602 aircraft were based at Manjimup, two Air Tractor 802 aircraft each were based at Albany, Bunbury and Perth, and an Air Tractor 802 was available on *ad hoc* hire from the Perth base. They provided rapid aerial suppression capability in the South Coast, Midwest, Wheatbelt and south-west forest regions, including the Perth outer-metropolitan area, giving significant assistance to ground crews in the initial attack on bushfires.

Fixed-wing water bombers were used successfully on numerous bushfires that threatened residential areas across the south-west. These aircraft flew 979 operational hours in attending 187 bushfires, and dropped 1,791 loads, delivering 5.4 million litres of product.

Fire detection

DEC provided an effective fire-detection system in the high fire risk zones of the south-west forest regions using single-engine fire detection aircraft and 11 fixed lookout towers. The department's fleet of 10 American Champion Scout 'spotter' aircraft flew 4,456 hours in 2011–12 for aerial surveillance in predetermined circuits in the south-west forest regions. Flight schedules varied according to the fire danger levels and fire activity. The aircraft also flew about 431 hours in support of aerial suppression operations during 2011–12. The detection aircraft were flown by three permanent senior pilots, and 11 pilots filling seasonal positions.

Logistics support for bushfire response

During the first half of 2012, Fire Management Services Branch and DEC Fleet and Works Support Section collaborated on the construction of a departmental logistics warehouse in Bunbury next to DEC's South West Regional Office.

The warehouse is expected to be ready to use during the 2012–13 fire season, when it will be the management and storage hub for:

- DEC fire and emergency cache equipment
- mobile communications facility and logistics semi-trailer
- mobile logistics offices
- fire consumables such as foam, retardant, fire hoses and fixings
- general fire equipment.

Fire training and development

Fire Management Services Branch development and education staff conducted 36 formal fire training courses involving 420 participants. In addition, district and regional staff delivered 12 formal fire-training programs to 105 participants. Course participants were predominantly from DEC, including campground host volunteers and Bush Ranger Cadets, but also included personnel from the FPC, FESA and local governments.

A list of the courses conducted can be found in DEC's 2011–12 Annual Report which is available on DEC's website: www.dec.wa.gov.au/annual-report-and-yearbook



The advanced incident leadership program was delivered by DEC staff to the Department of Sustainability and Environment in Victoria. It was also delivered in WA to DEC staff and to senior incident management personnel from fire and land management agencies across Australia and New Zealand.

Operations Section (Aviation) personnel provided training to 195 DEC aerial operations personnel. A list of the courses conducted can be found in DEC's 2011–12 Annual Report which is available on DEC's website: www.dec.wa.gov.au/annual-report-and-yearbook

In addition, water bomber reloading training was provided to 282 people at 35 operational bases, with the majority of these participants from south west volunteer bushfire brigades and local State Emergency Service units.

Incendiary operations supervisor, aerial incendiary bombardier, air observer and aerial drip-torch operator training was also provided to the Department of Environment and Natural Resources in South Australia. Aerial incendiary bombardier training was provided to staff from the Northern Territory Bushfires Council, Kimberley Land Council and the Australian Wildlife Conservancy.

DEC and FESA continued to develop and promote common fire-training programs and course materials under the auspices of the Interagency Bushfire Management Committee and with other agencies in Australia and New Zealand.

Fire planning

Work continued on redesigning and modernising DEC's tools and information management systems for prescribed fire planning, implementation and reporting. This effort focused largely on ensuring that the scope of works is comprehensive and suits the needs of district, regional and corporate users. The phased approach will ensure that system development, testing and adoption will be supported by statewide communication, consultation and training.

Fire preparedness on unallocated Crown land

Since 1 July 2003, DEC has had responsibility for the coordination and on-ground management of fire risk prevention and fire preparedness works on 89 million hectares of rural unallocated Crown land and unmanaged reserves.

Work undertaken by DEC during 2011–12 included the construction and maintenance of firebreaks, modification of vegetation in strategic buffers, and open-edge prescribed burning and large-scale aerial ignition. Prescribed burning was undertaken to mitigate risks associated with abnormally high fuel loads following good rainfall in some rangelands areas such as the Nullarbor.

In the Kimberley, Pilbara and Goldfields regions, DEC continued to make good progress in engaging and building partnerships with other stakeholders, including Aboriginal communities and neighbouring pastoralists. The use of planned fire for developing landscape-scale mosaics continued to yield benefits for mitigating large bushfires, protecting biodiversity and cultural values, and achieving designated nature conservation outcomes.

Interagency bushfire management

During 2011–12, significant DEC fire management resources were dedicated to improving interagency bushfire management arrangements through the Interagency Bushfire Management Committee (IBMC) and associated sub-committees.



The sub-committees servicing the IBMC are:

- Bushfire Research (chaired by DEC)
- Fuel Load Management (chaired by FESA)
- Training (chaired by FESA)
- Fire Operations (chaired by DEC)
- Aerial Fire Suppression (chaired by FESA).

Outside the IBMC, there was substantial inter-agency liaison regarding the implementation of the recommendations of the Special Inquiry into the Perth Hills Bushfire through a process coordinated by the Department of the Premier and Cabinet (DPC).

For information about DEC and the Special Inquiry into the Perth Hills Bushfire, the Special Inquiry into the November 2011 Margaret River Bushfire and the Post-incident analyses of the Margaret River and Milyeannup bushfires, see DEC's 2011–12 Annual Report which is available on DEC's website:

www.dec.wa.gov.au/annual-report-and-yearbook

Key efficiency indicators

Table 33: Prescribed burning in south-west forest regions

Region	10-year rolling average (ha)	Actual 2011–12	Difference (ha)	%
Swan	44,701	26,358	-18,343	-41
South West	50,415	23,211	-27,204	-54
Warren	65,060	53,596	-11,464	-18
Total	160,176	103,165	-57,011	-36

The fire suppression efficiency indicator is represented by the percentage of all forest bushfires, burning under 95 percentile weather conditions, which are effectively attacked and contained by DEC suppression forces. To be considered efficient, these fires must not exceed five hectares in size for Priority 1 and Priority 2 areas. These priority areas include high values (biodiversity conservation, recreation and landscape, primary production and community values) that may be vulnerable to bushfires or inappropriate fire regimes. DEC aims to exceed the percentage standard of successful attacks on 95 per cent of all forest fires. The 95 percentile weather conditions are days when the forest fire danger is below 'Very high' as calculated using the department's Forest Fire Behaviour Tables (1998).

Table 34: Fire suppression efficiency in south-west forest regions

Region	Priority 1 and 2 (%)			
	Standard	2009–10	2010–11	2011–12
Swan	95	100	95	97
South West	95	100	94	92
Warren	95	67	86	98
		DEC average (1 year)		96
		DEC average (5 years)		92

Includes only records where DEC was first attack agency



Machines at work tracking the fire edge.

DEC mops up after Carnarvon fire suppression

On 3 February 2012, DEC wrapped up its biggest firefighting operation in decades after more than a month of battling multiple fires that burned through more than 800,000ha of mostly pastoral land near Carnarvon.

Environment Minister Bill Marmion said in terms of the size and duration of the fires, it was the biggest single suppression campaign DEC had undertaken since the Dwellingup fires of 1961.

The fire was started by lightning on 27 December 2011 on the former Mooka pastoral lease near Kennedy Range National Park.

In the weeks that followed, more than 350 people from DEC, FESA, the shires of Carnarvon, Exmouth and Upper Gascoyne; WA Police, Main Roads WA, pastoralists, local volunteer bushfire brigades, State Emergency Services (SES), the departments of Water, Agriculture and Food, and Child Protection; St John Ambulance and local volunteer organisations were all involved in the fire response.

“The scale and complexity of this operation has been significant and presented huge challenges,” Mr Marmion said.

“There were 22 separate fires started by lightning over several weeks with plenty of fuel due to abundant grass. In two days (19–20 January) multiple lightning strikes started seven fires.

“On top of this, much of the area was difficult to access, with extensive areas of sand dunes up to 12 metres high and boggy conditions caused by isolated downpours from thunderstorms.

“In leading a multi-agency team, DEC had tremendous support from other agencies, organisations, volunteers, the community and pastoralists and we thank them for that.

“Although the fires burned through 11 pastoral stations, no homesteads were lost. Unfortunately, all of those pastoralists have been affected by the fires which impacted fences, watering systems, water points and stock feed, and damaged roads and tracks.”

The Minister commended the extraordinary efforts of the fire crews on the frontline.

“The perimeter of the fire complex stretched for 1,250 kilometres and crews had to travel huge distances just to get to the fires and where they were working on containment lines,” he said.

“The conditions were extremely draining and people were working long hours in temperatures about 42°C in the shade. Those from the south-west found they had to work in pairs taking turns to do half-hour stints to prevent exhaustion.

“DEC is also very grateful for the support of local companies and contractors that have provided services and facilities such as accommodation, transport and food, as well as volunteers such as the Lions Club, who fed all the firefighters.”

Incident facts and figures:

- 30 machines worked on the fires when they were at their peak, including eight bulldozers, 14 graders and eight loaders, plus equipment from pastoral stations
- 550 meals were required per day at the peak of the fires
- On 1 February 2012 the fire went into day 37 and shift number 58
- 316 people (175 DEC staff from more than 25 DEC centres from Kununurra to Esperance) were deployed in Carnarvon, some doing multiple stints. This figure excludes people based in Perth providing support for the Incident Management Team
- About 150 people were deployed daily across day and night shifts when fire activity was at its peak
- FESA provided crews from Bunbury, Albany, Geraldton, Manjimup, Aerial Operations Branch, Northam, Narrogin and Perth
- SES provided crews from Geraldton, Belmont, Kalbarri, Perth and Shark Bay
- FPC sent staff from Collie, Gnangara and South-West region
- Bushfire brigades came from Gascoyne River; Gascoyne Junction, Irwin, Geraldton, Mingenew, Waggrakine and Carnarvon.



Planning in the field: DEC's Manjimup fire operations officer John Fishwick (right) conducts an on-ground briefing.

On the fire front, smoke trapped by the inversion layer.

Appendix: Prescribed burning summary data

Area prescribed-burnt within south-west forest regions for 2011–12

Objective	Region	Area (hectares)				Year of last fire *
		Winter	Spring	Summer	Autumn	
Community/strategic protection	Swan	1,867	6,774	-	1,513	1980–2005
	South West	111	6,883	-	10	1962–2002
	Warren	-	25,125	9,987	8,148	1970–2003
Biodiversity conservation	Swan	584	9,401	-	725	1963–1997
	South West	188	514	-	911	1966–1994
	Warren	-	9,917	-	-	2001–2002
Hardwood silviculture	Swan	-	-	-	130	1987
	South West	-	2,763	-	421	1968–2001
	Warren	-	-	-	355	1983–1996
Plantation silviculture/protection	Swan	2,200	1,096	-	-	1990–1995
	South West	1,000	1,309	-	1,643	1970–1994
	Warren	-	-	-	-	-
Tourism and recreation/protection	Swan	165	1,903	-	-	1989–2005
	South West	-	7,458	-	-	1981–1994
	Warren	-	64	-	-	2000
Grand total by season (ha)		6,115	73,207	9,987	13,856	
Seasonal percentage		6	71	10	13	
Grand total (ha)		103,165				

Includes data from 1 July 2011 to 30 June 2012

* Range of vegetation/fuel ages at July 2012



Number of prescribed burns conducted in south-west forest regions in each season for various purposes in 2011-12

Objective	Region	Winter		Spring		Summer		Autumn		Total number of burns	Number of escapes
		Aerial	Hand	Aerial	Hand	Aerial	Hand	Aerial	Hand		
Community/ strategic protection	Swan	-	2	3	11	-	-	1	-	17	
	South West	-	2	4	6	-	-	-	1	13	5
	Warren	-	-	7	2	1	-	-	4	14	3
Biodiversity conservation	Swan	-	4	3	3	-	-	1	1	12	-
	South West	-	1	2	-	-	-	1	-	4	-
	Warren	-	-	2	-	-	-	-	-	2	-
Hardwood silviculture	Swan	-	-	-	-	-	-	-	1	1	-
	South West	-	-	2	1	-	-	-	3	6	-
	Warren	-	-	-	-	-	-	-	7	7	-
Plantation silviculture/ protection	Swan	-	5	-	3	-	-	-	-	8	-
	South West	1	4	2	2	-	-	-	9	18	-
	Warren	-	-	-	-	-	-	-	-	-	-
Tourism and recreation/ protection	Swan	-	4	-	12	-	-	-	-	16	-
	South West	-	-	3	1	-	-	-	-	4	-
	Warren	-	-	-	1	-	-	-	-	1	-
Total		1	22	28	42	1	-	3	26	123	8

Includes data from 1 July 2011 to 30 June 2012
Please note this table counts carryover burns (same burn ID done over multiple seasons) as different records e.g. a burn started in spring and finished in autumn is counted as two burns

Glossary of acronyms

AQMP	Air quality management plan
BIF	Banded iron formation
CALM	Conservation and Land Management (CALM Act= <i>Conservation and Land Management Act 1984</i>)
CEO	Chief Executive Officer
CCL	Cockburn Cement Ltd
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVA	Conservation Volunteers Australia
DAFWA	Department of Agriculture and Food Western Australia
DEC	Department of Environment and Conservation
DNA	Deoxyribonucleic acid
EBPPP	<i>Enterprise Based Productivity Places</i> program
EP	Environmental Protection (EP Act= <i>Environmental Protection Act 1986</i>)
EPA	Environmental Protection Authority
EPBC	Environment Protection and Biodiversity Conservation (EPBC Act= <i>Environment Protection and Biodiversity Conservation Act 1999</i>)
FACET	Forum Advocating Cultural and Ecotourism
FESA	Fire and Emergency Services Authority of Western Australia
FMP	Forest Management Plan
FPC	Forest Products Commission
FTIR	Fourier transform infra-red spectrometer
GIS	Geographic Information Services
HAZMAT	Hazardous materials
IBMC	Interagency bushfire management committee
IOCI	Indian Ocean Climate Initiative
IR	Incidence report

IT	Information technology
LEED	Low Emissions Energy Development
LFW	Land for Wildlife
ML	Management letter
MOU	Memorandum/memoranda of understanding
MWA	Murchison Widefield Array
NATA	National Association of Testing Authorities
NEPM	National Environment Protection Measure
NPI	National Pollutant Inventory
NRM	Natural Resource Management
NVF	Native Vegetation Framework
PEC	Priority ecological community
RCC	Roadside Conservation Committee
SARGE	System for Accounting and Reporting of Government Emissions
SES	State Emergency Services
SMRC	Southern Metropolitan Regional Council
TEC	Threatened ecological community
UWA	The University of Western Australia
VHS	Vegetation Health Service
WA	Western Australia/Western Australian
WALGA	Western Australian Local Government Association
WAMMP	Western Australian Marine Monitoring Program
WARR	Waste Avoidance and Resource Recovery (WARR Act= <i>Waste Avoidance and Resource Recovery Act 2007</i>)
WC	Wildlife Conservation (WC Act= <i>Wildlife Conservation Act 1950</i>)
WESTPLAN HAZMAT	State emergency plan for hazardous materials
WIN	Works improvement notice
WWF	World Wide Fund for Nature (WWF-Australia)

