Biodiversity refers to the variety of life forms in a particular area, including plants, animals, micro-organisms and the ecosystems they comprise.

We are committed to minimising impact to the biodiversity of the areas in which we operate. Our operations span a large geographical spread of marine and terrestrial environments. Biodiversity values in these areas are protected by government regulations and monitored by our stakeholders.

**Biodiversity management at Origin**

Prior to work starting, it is our standard practice to analyse the potential biodiversity impact of our projects. If risks to biodiversity are identified, we develop and implement mitigation measures or offsets to reduce the risk of biodiversity loss to an acceptable level guided by our environmental approvals.

We conduct biodiversity assessments during the design phase of each project. The assessment identifies whether biodiversity may be affected or placed at risk by a specific project, site or activity. We record:

- legally protected or recognised areas and species;
- species, ecosystems and natural areas with special conservation status, such as conservation-significant flora and fauna, and rare and threatened species listed regionally, nationally and/or in the International Union for Conservation of Nature (IUCN) Red List of Threatened Species;
- vegetation and habitat condition, fauna movement corridors, species diversity and species assemblages;
- biodiversity considered to be of significant value; and
- views of relevant external and internal stakeholders.

Once the biodiversity assessment is complete, we develop site construction plans that minimise our impact. Where possible, these plans include:

- locating facilities to avoid critical terrestrial and aquatic habitats;
- considering sensitive seasons for conservation-significant species or communities;
- avoiding potential threats to the viability of species or communities;
- and take into account Cultural Heritage, landowner needs, erosion risk and constructability.

With regard to offshore seismic activity, we undertake assessments to identify significant risks to or disturbance of cetaceans (aquatic mammals). We record these assessments and document all applicable mitigation measures to reduce our potential impact. These assessments are carried out in accordance with relevant legal and regulatory requirements, as well as industry best practice.

**Meeting regulatory requirements**

Before construction starts, Origin obtains all necessary environmental regulatory approvals and consent, and plans meeting permit conditions regarding biodiversity management. Our clearing activities are undertaken in a way that minimises habitat loss and/or degradation. We try to ensure there is no negative impact on biodiversity outside authorised and planned clearing areas, taking care to avoid introducing weeds and pests that may have an impact. If protected flora or fauna is located within an area zoned for clearing and disturbance is unavoidable, we implement an offset or relocation program.

**Offset initiatives**

Origin implements offset initiatives for projects where a significant impact to a site’s biodiversity is unavoidable. These initiatives are designed to align with stakeholder interests and counterbalance defined impacts. We aim to connect tracts of protected habitat with fauna movement corridors between similar bioregions or catchments. When it is not possible to implement a biodiversity offset program we consider alternatives such as:

- funding new biodiversity research;
- contributing to existing national, regional or local research programs; and
- developing or supporting existing threatened species or ecosystem recovery plans.

Our business supported a number of ecological research programs during the year. We also continue to support terrestrial and marine biodiversity research through GISERA.

Image above: Otway Gas Project (Thylacine), the location of the Astrolabe 3D seismic survey timed to occur outside of the marine animals calving and migration period.
Biodiversity incident management

We record incidents and observations according to Origin’s biodiversity incident management procedures. For example, at every site we record accidents involving animals struck by vehicles or other equipment, and observations of noxious weeds. Our biodiversity management procedures include emergency response scenarios and plans for instances where our actions could negatively impact biodiversity.

Rehabilitation and site closure

During the design and development phases of project development, we also create plans for the site’s rehabilitation, closure and decommissioning, taking the biodiversity assessment into account. Site closure and rehabilitation plans consider:

- management of contaminated land and soil;
- the suitability of selected seed species, including factors affecting seed management;
- seedling growth, transfer and planting;
- fauna habitat re-establishment;
- benthic habitat re-establishment for impacted water bodies, such as lakes and rivers; and
- maintenance and monitoring of activities.

Origin’s rapid response to the discovery of white asbestos (chrysotile) in a drilling mud product in March involved a temporary suspension of drilling operations, environmental sampling, expert analysis of potential health risks and setting up a health surveillance program.

Drilling product supplier Australian Mud Company Pty Ltd (AMC) notified Origin that some imported product used in drilling muds could contain asbestos. The product — called NUTPLUG — is used during drilling to help seal the walls of a gas well to prevent drilling fluids moving sideways when the surrounding rock is porous. Origin took immediate precautionary actions to safeguard employees, contractors, landholders and the environment, suspending activity at 12 Australia Pacific LNG drill rig sites that were operating at the time and quarantining 160 well sites that had potentially used affected NUTPLUG during drilling activities.

Origin notified the government (including the Office of Workplace Health & Safety) of the incident and actions taken for the safe removal of all potential asbestos in line with the Queensland Code of Practice for asbestos removal.

A robust program of environmental sampling, testing and analysis was undertaken where asbestos-affected product may have been used. This included both atmospheric testing and soil testing of over 15,000 samples. Independent accredited third parties have assured various elements of the restoration program.

Medical advice from a range of external experts confirmed that the risk is very low for the vast majority of activities undertaken by our workforce (contractors and employees). Nonetheless, an expert provider in occupational medicine — Medibank Health Solutions — was engaged to implement an accredited and independent health surveillance program from April. All rigs and well sites have been returned to full operations.
Our 2014 performance
Exploration & Production

During the reporting period, our projects posed no material danger to threatened species and ecological communities, with regard to biodiversity impact (as determined by the Environment Protection and Biodiversity Conservation Act 1999 (Cth)), or International Union for Conservation of Nature (IUCN) Red List of Threatened Species.

In addition, there were no activities or incidents that materially impacted biodiversity in any project areas.

During the year, we undertook the Astrolabe 3D seismic survey in the offshore Otway Basin in Victoria. This area is a potential habitat for five threatened marine mammal species including the IUCN-listed blue whale (Balaenoptera musculus) and southern right whale (Eubalaena australis).

To reduce the potential for interactions with these marine animals, we timed the survey to start after the southern right whale calving season and finish before the peak of the blue whale migration period. As part of the survey, four experienced marine mammal observers took part and were authorised to stop the survey if whales were sighted within defined distances from the acoustic source. (1)

Our business has also supported a number of ecological research programs during the year. These included a study by the International Association of Oil and Gas Producers on the effects of sound generated by the offshore petroleum industry on marine life, and a study by the Fisheries Research and Development Corporation on the impact of marine seismic surveys on southeast Australian scallop and lobster fisheries.

Australia Pacific LNG

As the Upstream operator of the Australia Pacific LNG project, our operations cover approximately 570,000 hectares of the lower east corner of the Brigalow Belt in Queensland. The region includes a wide band of Acacia wooded grassland between coastal tropical rainforest and the semi-arid interior of Queensland. It is regarded as one of the most ecologically transformed areas in Australia due to varying historical land use and is active with agriculture, mining and transport.

Through design and operation, Origin implements threatened species management plans for:
- 48 threatened fauna species;
- 18 threatened flora species; and
- 7 threatened ecological communities.

The most intensive and long-term impact of the project on terrestrial vegetation communities and associated fauna species will come from the clearing of remnant vegetation for wells and infrastructure.

The Australia Pacific LNG project operates in accordance with detailed and documented approvals relating to environmental and social regulation.

These approvals have been issued by regulatory bodies following an EIS process and extensive consultation with community and other stakeholders, and address identified environmental and social risks.

All disturbance activities associated with the Australia Pacific LNG project are subject to a rigorous assessment process which includes both desk-top and field-based activities. All disturbance is assessed for compliance against regulatory approvals and is also ground-truthed in the field to ensure that, where possible, impacts to identified environmental values are avoided or minimised to realise best-practice environmental outcomes. In terms of preserving biodiversity values, we aim to avoid, mitigate and, as a last resort, offset impacts.

Under the Environmental Protection and Biodiversity Conservation 1999 (Cth) approval, the Australia Pacific LNG project’s gas fields have set disturbance limits for two ecological communities listed as threatened: the endangered ecological community of brigalow (Acacia harpophylla dominant and co-dominant) and endangered ecological community of semi-evergreen vine thickets of the Brigalow Belt (north and south) and Nandewar bioregions.

From time to time on project sites, we have encountered flora and fauna classified under the Nature Conservation Act 1992 (Qld) as endangered, vulnerable or near threatened (EVNT). In accordance with the Act and other environmental authority requirements, we have commissioned intensive surveys to map the presence of EVNT flora. These surveys on occasion have resulted in greater understanding of EVNT flora within the project area and the identification of greater numbers of Rutidosis lanata, Eleocharis blakeana and Acacia tenuinervis. As a result, under the Nature Conservation (Wildlife) Regulation 2006 (Qld) the Queensland Government has reclassified Rutidosis lanata from endangered to vulnerable, and Eleocharis blakeana and Acacia tenuinervis from near-threatened to least concern. The Boggomoss Snail (Adclarkia dawsonensis) and Dulacca Woodland Snail (Adclarkia dulacca) are of local significance and we avoid their habitats where possible. Where vegetation clearing is required in a known snail habitat, we employ spotter/catchers to collect snails from areas zoned for clearance and relocate them to nearby vegetation. This labour-intensive exercise has resulted in the relocation of more than 100 snails from one property.

(1) More information on our surveys can be found on our online fact sheets: originenergy.com.au/files/Otwayexplorationfactsheet.pdf
Fire management and protection of biodiversity

Fire-management regimes are critical to conserving the fire-prone vegetation covering most of Australia. Fire-prone grassy woodlands dominate the CSG development region, and the CSG industry has identified fire management as a main priority.

Fire management is of great concern to Origin’s business because of the risk to people and infrastructure. We acknowledge that our activities involving the use of petroleum, such as in vehicles, increase the risk and frequency of accidental fires. In some instances, the size and scale of our project structures and developments may also restrict the free movement of fire across a landscape. Origin’s bushfire management practices are conducted in accordance with the Australia Pacific LNG business unit’s Bushfire Management Plan. We conduct initial site risk assessments to understand the risks and plan our response.

These Bushfire Management Plans include detailed strategies to protect our infrastructure by:

— lowering fuel loads through controls such as grazing (mainly used in area external to infrastructure), slashing/mowing (used where grazing can’t be used or is ineffective, or in areas containing infrastructure such as around buildings), weed spraying hazard reduction burns and stick raking; and
— separating infrastructure assets from fuel sources through fire breaks (bitumen/dirt roads) and clearing/thinning of vegetation (particularly connecting/overhanging tree canopies).

Australia Pacific LNG supports terrestrial and marine biodiversity research through GISERA. Current projects include:

— priority threat identification, management and appraisal (terrestrial biodiversity);
— fire ecology of grassy woodlands (terrestrial biodiversity); and
— towards an integrated study of the Gladstone marine system (marine environment).

GISERA’s research findings, due in 2015, will help Australia’s CSG industry better manage the risks associated with the fire-prone grassy woodlands in which we operate and potentially biodiversity impacts.

Biosecurity

Australia Pacific LNG’s Biosecurity Management Plans include weed hygiene procedures to reduce weed propagation. These procedures are also incorporated in contractor management plans. We revised the upstream Biosecurity Management Plan to incorporate ISO 14001 Continuous Improvement Principles, ensuring we remain focused on the continuous prevention, detection, management and monitoring of biosecurity risks.

During 2014, we revised Australia Pacific LNG’s Biosecurity Management Strategy to incorporate ISO 14001 Continuous Improvement Principles. The revised strategy, which has already been implemented at selected project sites, is supported by procedures providing field staff with extra guidance on biosecurity prevention detection measures for domestic transport and international imports. It also includes additional guidance on the management and monitoring of issues such as weed infestations, an improved Geographic Information System (GIS) platform, weed identification guides for staff and contractors and an improved record management process. Finally, we have started a new baseline assurance project to evaluate the weed wash-down and inspection practices of Origin staff, contractors and third-party providers. Australia Pacific LNG will incorporate any resulting process improvements into its Biosecurity Management Strategy.

Offset program

Australia Pacific LNG’s offset program is strategic and in line with government recommendations.

As the Upstream operator of Australia Pacific LNG, Origin is creating a strategic offset site to compensate for the project’s impact on threatened ecological communities (Brigalow and Semi-evergreen vine thicket), fauna habitat and cycas megacarpa (cycads).

To date, two direct offset sites (approximately 112 hectares) on properties owned by Australia Pacific LNG near Miles, Queensland, have been legally protected under the Vegetation Management Act (1999) as habitat for threatened plants, *Rutidosis lanata* (a vulnerable daisy) and *Eleocharis blakeana* (a near-threatened sedge). Australia Pacific LNG has purchased leasehold interests for the 7,890 hectare Dukes Plain property, located near Theodore in Central Queensland, to strengthen areas of endangered Brigalow and Semi-evergreen vine thicket, threatened ecological communities and threatened fauna. The property includes the 3,190 hectare Shankeen Nature Refuge and Australia Pacific LNG is working towards legal protection for an additional 2,000 hectares.

We have finalised negotiations with a landholder regarding 190 hectares of habitat suitable for establishing at least 1,800 cycads.
The unique ecology and heritage of Curtis Island will be preserved and protected under a landmark conservation initiative developed by Queensland’s natural gas sector.

The proposed conservation initiative will cover more than 25,000 hectares of newly protected areas, and has been made possible by funding from Australia Pacific LNG, QGC, and Santos and GLNG.

Working in combination, the companies purchased a former Curtis Island grazing property and associated leases in order to transfer the titles to the Queensland Government and remove cattle from the island, enabling the long-term restoration of environmental values.

The property transfer adds to existing and newly declared areas of national park and conservation areas within the Curtis Island Environmental Management Precinct. It provides a habitat for state and Australian government–listed threatened fauna species including migratory shorebirds, and includes marine and fish habitats and declared wetlands.

The total area of Curtis Island being set aside for environmental protection will be 59 per cent, compared to the 3 per cent used by the LNG projects on the island’s southern tip.

The property purchase meets Australia Pacific LNG’s offset obligations for our activities on Curtis Island and the Narrows Crossing pipeline project.

Gladstone Healthy Harbour Partnership

In November 2013, Australia Pacific LNG joined the Gladstone Healthy Harbour Partnership (GHHP), along with more than 25 partners representing community, research and industry groups, and local, state and federal governments. GHHP aims to improve community engagement and confidence in health and management of Gladstone Harbour by communicating in plain English without compromising scientific rigour.

GHHP has adopted a definition of “healthy harbour” as one which is socially, culturally, economically and environmentally healthy. In late 2014, GHHP plans to release an interim report on the health of Gladstone Harbour, which has been an industrial port for more than 50 years.

Fitzroy turtles

During the year, Australia Pacific LNG provided $20,000 to extend the Fitzroy River turtle nest protection project. The project is managed by Greening Australia and the Fitzroy Basin Association, and forms part of our indirect offsets program.

The funds contributed to turtle nest coverage during the 12-week breeding season in spring and summer 2013. The project helped reduce predation of turtle eggs by approximately 35 per cent, recorded more than 400 hatchlings and assisted in filling an important funding gap for the project.