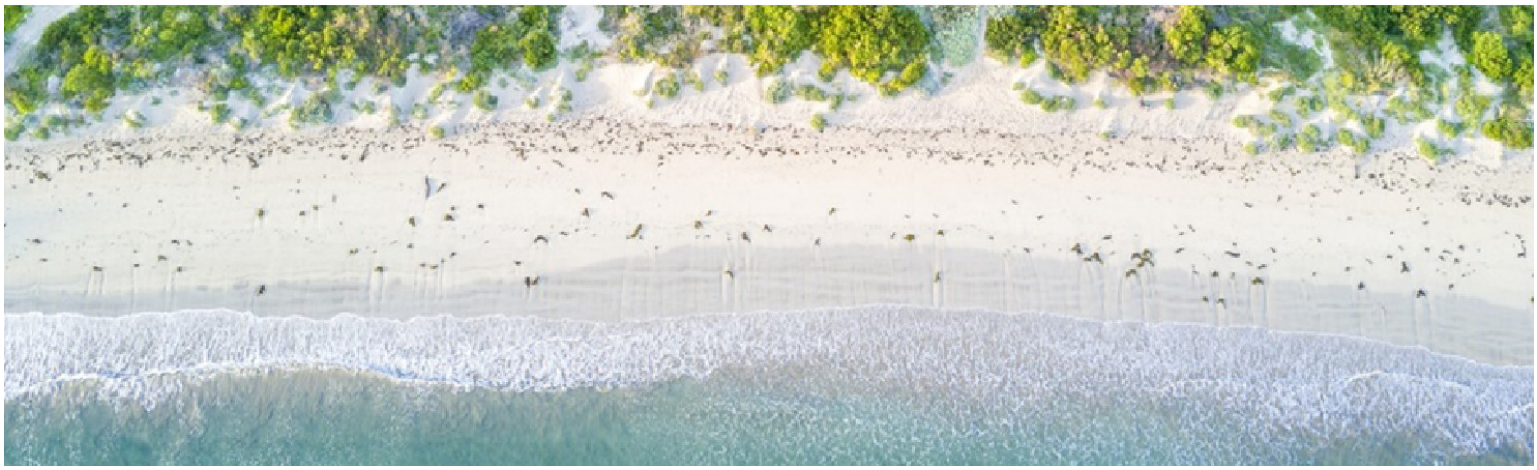
Reducing coastal threats to marine biodiversity

For NSW local councils preparing coastal management programs

Marine Estate Management Authority



A summary of the top 10 priority threats to marine biodiversity, example management actions and considerations for species at risk, to support local councils preparing coastal management programs.

WHY CONSIDER MARINE BIODIVERSITY?

Coastal Management Programs (CMPs) are guided by the *Coastal Management Act (2016)* (CMA). One of the objects of the Act is to support the objects of the *Marine Estate Management Act (2014)*. The marine estate includes ocean, estuaries, coastal wetlands, and coastline, all managed as a single continuous system.

Together these Acts advocate for the New South Wales coast to be managed with the principles of ecologically sustainable development - protecting and enhancing natural coastal processes and coastal environmental values. These include natural character, scenic value, biodiversity, and ecosystem integrity.

OBJECTIVES TO CONSIDER FOR A CMP

- To identify priority threats and minimise impacts on threatened and protected marine species at risk of harm.
- To protect and enhance marine biodiversity and marine ecosystem integrity.
- To promote healthy, productive, and resilient estuaries, coastal and marine ecosystems.

PRIORITY THREATS

The *NSW Marine Estate Statewide Threat and Risk Assessment* (TARA) identifies threats and underpins priorities identified in the NSW *Marine Estate Management Strategy (2018-2028)*. Initiative 5 in the Strategy focuses on reducing threats to threatened and protected marine species.

A priority threat is an intended activity or stressor with a high to moderate risk of causing significant harm.

CMPs should consider the following top 10 priority threats to marine biodiversity and ecosystem integrity identified in Table 3-1 of the TARA:

- Foreshore and urban development
- Water pollution and sediment contamination
- Clearing, dredging and excavation activities
- Estuary openings and modified freshwater flows
- Boating and boating infrastructure
- Shipping and related infrastructure
- Recreation and tourism
- Recreational fishing
- Climate change
- Introduced animals and plants.

This ready reckoner consolidates information in the TARA to assist local councils to address priority threats to marine biodiversity in their CMPs.

USING THIS DOCUMENT

Priority threats vary between regions and locally, and each coastal management project has a unique set of circumstances.

This ready reckoner does not address all possible situations, or all marine species potentially affected, or provide all possible solutions. It highlights marine wildlife groups at high to moderate risk of harm from priority threats identified in Tables 5.2-5.4 in the TARA, and provides examples of some management actions that councils may risk-assess and use or modify to fit their needs to mitigate an identified priority threat.

STEP 1

Check the summary page for each priority threat. Each page has:

- Summary of key stressors
- Examples of management actions
- A table showing where marine animal and plant groups are considered at:

high risk of harm is red

moderate risk of harm is orange

low or minimal risk is pale blue

as identified during the extensive risk assessment process and summarised in Table 3-1 of the TARA.

The geographic regions

The 3 regions shown in each table are based on the planning areas identified in the TARA. These are:

- North region - Tweed Heads to Newcastle
- Central region - Newcastle to Shellharbour
- South region - Shellharbour to the NSW /Vic border.

Areas within the regions

The coastal areas are divided into

- Coastal and marine area. This includes open coast beaches, foreshores, and marine habitats up to 3 nautical miles off the coast.
- Estuaries area is from the upper tidal extent of a river or coastal creek to the coastal outlet, and includes lakes, lagoons and ICOLLs.

Example management actions

Coast and Estuaries Officers from the Department of Planning and Environment are available to support councils to identify relevant management actions. Some example management actions listed under the priority threats fall within NSW Government control. In these instances, council should consult early with relevant government agencies during their CMP development, to collaborate and to identify if potential funding opportunities exist.

STEP 2

Refer to Section 2 of this document for more information about a marine wildlife group shown at moderate to high risk. (See Diagram 1).

EMAIL FOR FURTHER CMP ADVICE

- Your local DPE Coast and Estuaries officer at: coastal.management@environment.nsw.gov.au
- The NPWS Marine Wildlife Team at: marine.fauna@environment.nsw.gov.au

FOR BACKGROUND ON THE TARA

See the NSW Marine Estate Threat and Risk Assessment Background Environmental Information.

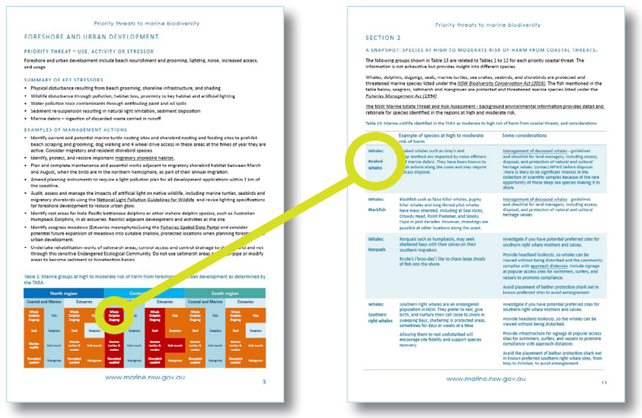


Diagram 1: Shows the connection between the table for priority threats to Section 2.

Determine which marine groups are at high (red) to moderate (orange) risk in your region, according to the TARA, then look up the group in Section 2.

FORESHORE AND URBAN DEVELOPMENT

PRIORITY THREAT – USE, ACTIVITY OR STRESSOR

Foreshore and urban development include beach nourishment and grooming, lighting, noise, increased access, and usage.

SUMMARY OF KEY STRESSORS

- Physical disturbance resulting from beach grooming, shoreline infrastructure, and shading
- Wildlife disturbance through pollution, habitat loss, proximity to key habitat and artificial lighting
- Water pollution toxic contaminants through antifouling paint and oil spills
- Sediment re-suspension resulting in natural light limitation, sediment deposition
- Marine debris – ingestion of discarded waste carried in runoff

EXAMPLES OF MANAGEMENT ACTIONS

- Identify current and potential marine turtle nesting sites and shorebird nesting and feeding sites to prohibit beach scraping and grooming, dog walking and 4 wheel drive access in these areas at the times of year they are active. Consider both migratory and resident shorebird species.
- Identify, protect, and restore important migratory shorebird habitat.
- Plan and complete maintenance and essential works adjacent to migratory shorebird habitat between March and August, when the birds are in the northern hemisphere, as part of their annual migration.
- Amend development control plans to include requirements for a light pollution plan for development applications within a specified location or distance, such as 1 kilometre from the coastline, where deemed necessary by the consent authority.
- Audit, assess and manage the impacts of artificial light on native wildlife, including marine turtles, seabirds and migratory shorebirds using the National Light Pollution Guidelines for Wildlife and revise lighting specifications for foreshore development to reduce urban glow.
- Identify rest areas for Indo-Pacific bottlenose dolphins or other inshore dolphin species, such as Australian Humpback Dolphins, in all estuaries. Restrict adjacent development and activities at the site.
- Identify existing seagrass meadows under 'estuaries macrophytes' in the Fisheries Spatial Data Portal and consider potential future expansion areas for meadows into suitable shallow, protected locations when planning foreshore and urban development.
- Develop an estuary wide foreshore structure strategy where foreshore development is a significant threat.
- Undertake rehabilitation works of saltmarsh areas, control access and control drainage to skirt around and not through sensitive Endangered Ecological Communities. Do not use saltmarsh areas as end-of-pipe or modify areas to become sediment or bioretention basins.

Table 1: Based on the TARA - marine groups at high to moderate risk of harm from foreshore and urban development.

North region				Central region				South region			
Coastal and Marine		Estuaries		Coastal and Marine		Estuaries		Coastal and Marine		Estuaries	
Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish
Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass
Marine reptile	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh
Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove

WATER POLLUTION AND SEDIMENT CONTAMINATION

PRIORITY THREAT – USE, ACTIVITY OR STRESSOR

Water pollution and sediment contamination may be sourced from urban stormwater, agricultural runoff, industrial discharges, sewage effluent and thermal discharges.

SUMMARY OF KEY STRESSORS

- Water pollution through nutrients and organic matter, toxic contaminants, sediment resuspension, pathogens
- Sedimentation
- Marine debris (including microplastics)

EXAMPLES OF MANAGEMENT ACTIONS

- Limit the discharge of stormwater run-off from roofs, pavements, exterior materials storage, and process areas from going off-site to avoid flooding or contamination of sensitive coastal habitats.
- Use retention or detention storage systems away from saltmarsh and mangrove ecosystems to manage peak stormwater flows within the on-site stormwater management system.
- Use infrastructure such as banks, kerbing, surface grade changes, containment bunds and contained drains to control stormwater runoff from entering sensitive habitats, such as mangroves, saltmarsh, and seagrass beds.
- Drain to treatment facilities for removal of solids and chemical residues and test for toxic contaminants and pathogens prior to disposal.
- Reduce harmful marine debris from land-sourced garbage and adopt new technologies in waste management as detailed in the National Threat abatement plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (2018).
- Periodic messaging across a range of products, such as on banners on organisations websites, stories on social media, and water-related products, such as water rates notices to reinforce positive behaviours, such as: minimise chemical use; keep stormwater drains clean; manage erosion; the drain is just for rain.

Table 2: Based on the TARA - marine groupsarine groups at high to moderate risk of harm from water pollution and sediment contamination.

North region				Central region				South region			
Coastal and Marine		Estuaries		Coastal and Marine		Estuaries		Coastal and Marine		Estuaries	
Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	**Fish**	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	**Fish**	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	**Fish**
Seal	Seagrass	Seal	**Seagrass**	Seal	Seagrass	Seal	**Seagrass**	Seal	Seagrass	Seal	**Seagrass**
Marine turtles & snakes	Salt marsh	Marine turtles & snakes	**Salt marsh**	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	**Salt marsh**	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	**Salt marsh**
Shorebird seabird	Mangrove	Shorebird seabird	**Mangrove**	Shorebird seabird	Mangrove	Shorebird seabird	**Mangrove**	Shorebird seabird	Mangrove	Shorebird seabird	**Mangrove**

CLEARING, DREDGING AND EXCAVATION ACTIVITIES

PRIORITY THREAT – USE, ACTIVITY OR STRESSOR

Clearing, dredging and excavation activities includes vegetation clearing, dredging, service infrastructure, mining, and extraction.

SUMMARY OF KEY STRESSORS

- Water pollution - contamination through nutrients, toxicants; sediment resuspension, acid sulfate soils
- Sedimentation
- Physical disturbance resulting from sediment re-suspension and shading resulting in light limitation, sediment deposition, trampling and grazing, habitat removal
- Changes to tidal flow velocity and patterns
- Wildlife disturbance

EXAMPLES OF MANAGEMENT ACTIONS

- Identify Indo-pacific bottlenose or Australian humpback dolphin resting sites and seagrass meadows in the estuary and exclude these areas from dredging and excavation activities.
- Assess the impact of proposed changes to tidal flow velocity and patterns on stability of shallow areas such as dolphin resting places, seagrass meadows and feeding areas for shorebirds.
- Identify historic and potential marine turtle and shorebird nesting areas and exclude them from being used as access to, or used in conjunction with, clearing and excavation activities.
- Consult with a local NPWS representative for information on migratory shorebird resting sites and only schedule maintenance or essential works in those areas between May to August, when the birds are in the northern hemisphere or in transit.
- Encourage restoration activities in cleared riparian and adjacent habitat.
- Maintain trained river entrances, armoured harbours, and groynes consistent with breakwater maintenance and upgrades: multi-use and eco-features, guidance for asset owners, designers and project managers.
- Investigate solutions to capture agricultural diffuse source runoff.
- Protect riparian vegetation, saltmarsh and river banks from livestock by promoting exclusion fencing.
- Promote Identification and mapping and treatment of exposed acid sulfate soils.
- Avoid or minimise acid sulfate soil disturbance and treat immediately to stop run-off from the site of disturbance.

Table 3: Based on the TARA - marine groups at high to moderate risk of harm from clearing, dredging and excavation activities.

North region				Central region				South region			
Coastal and Marine		Estuaries		Coastal and Marine		Estuaries		Coastal and Marine		Estuaries	
Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	**Fish**	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	**Fish**	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	**Fish**
Seal	Seagrass	Seal	**Seagrass**	Seal	Seagrass	Seal	**Seagrass**	Seal	Seagrass	Seal	**Seagrass**
Marine turtles & snakes	Salt marsh	Marine turtles & snakes	**Salt marsh**	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	**Salt marsh**	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	**Salt marsh**
Shorebird seabird	Mangrove	Shorebird seabird	**Mangrove**	Shorebird seabird	Mangrove	Shorebird seabird	**Mangrove**	Shorebird seabird	Mangrove	Shorebird seabird	**Mangrove**

ESTUARY OPENINGS AND MODIFIED FRESHWATER FLOWS

PRIORITY THREAT – USE, ACTIVITY OR STRESSOR

Estuary openings/modified freshwater flows includes hydrological modifications/estuary entrance/modified freshwater flows.

SUMMARY OF KEY STRESSORS

- Water pollution contamination through acid sulfate soils
- Sedimentation
- Physical disturbance resulting from sediment re-suspension, habitat loss
- Changes to tidal flow and tidal prism
- Wildlife disturbance

EXAMPLES OF MANAGEMENT ACTIONS

- Identify Indo-pacific bottlenose or Australian humpback dolphin resting sites and seagrass meadows in the estuary and restrict modification in the area.
- Consult with a local NPWS representative for information on migratory shorebird resting sites and only schedule maintenance or essential works in those areas between May to August, when the birds are in the northern hemisphere or in transit.
- Identify resident shorebirds and their conservation status to assess the risk of harm before proceeding and minimise shoreline profile modification.
- Promote Identification and mapping and treatment of exposed acid sulfate soils.
- Avoid or minimise acid sulfate soil disturbance and treat immediately to stop run-off from the site of disturbance entering saltmarsh, mangrove, seagrass, or shorebird feeding areas.
- Undertake extensive modeling prior to modification works to ensure seagrass meadows, dolphin resting areas and shorebird nesting and feeding areas will not be negatively impacted.
- Acknowledge best practice estuary and ICOLL management which has resulted in reduced threats to shorebirds at the site by celebrating the presence of migratory shorebirds across a range of products, such as on banners on the organisation's website, stories on social media and at community displays.
- Refer to the resource Form and function of NSW intermittently closed and open lakes and lagoons by NSW Environment, Energy and Science.
- Protect riparian vegetation, saltmarsh and river banks from livestock by promoting exclusion fencing.
- Identify existing seagrass meadows under 'estuaries macrophytes' in the Fisheries Spatial Data Portal and consider potential future expansion areas for meadows into suitable shallow, protected locations.

Table 4: Based on the TARA - marine groups at high to moderate risk of harm from estuary openings and modified freshwater flows.

North region				Central region				South region			
Coastal and Marine		Estuaries		Coastal and Marine		Estuaries		Coastal and Marine		Estuaries	
Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	**Fish**	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	**Fish**	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	**Fish**
Seal	Seagrass	Seal	**Seagrass**	Seal	Seagrass	Seal	**Seagrass**	Seal	Seagrass	Seal	**Seagrass**
Marine turtles & snakes	Salt marsh	Marine turtles & snakes	**Salt marsh**	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	**Salt marsh**	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	**Salt marsh**
Shorebird seabird	Mangrove	Shorebird seabird	**Mangrove**	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	**Mangrove**

BOATING AND BOATING INFRASTRUCTURE

PRIORITY THREAT – USE, ACTIVITY OR STRESSOR

Boating and boating infrastructure includes activity, use, maintenance, and associated infrastructure.

SUMMARY OF KEY STRESSORS

- Water pollution - toxic contaminants through antifouling paint and oil spills
- Physical disturbance resulting from propellers, anchoring, moorings, shoreline infrastructure, sediment re-suspension and shading from boats/jetties resulting in light limitation and bank erosion from access, egress and wake
- Wildlife disturbance through noise, vessel strike, conflict of use such as haul out sites for seals
- Marine pollution including discarded gear and waste

EXAMPLES OF MANAGEMENT ACTIONS

- Consider placement of boat launch ramp facilities, and regulated areas to reduce impacts to salt marsh, seagrass meadows, shorebird feeding areas or inshore dolphin resting areas.
- Build shoreline access car parks away from bird aggregation sites used for feeding or roosting.
- Use the National Light Pollution Guidelines for Wildlife to conduct an audit and assess the impacts of artificial light on potential astrotourism sites and marine turtle, seabirds and shorebirds.
- Investigate and install lighting consistent with National Light Pollution Guidelines for Wildlife and revise lighting specifications for lighting for boat ramps, public jetties and fish cleaning stations to reduce stray light and urban glow.
- Install seal haul out deterrents, such as SealStop, at recurrent conflict sites, where the seals are hauling out on built structures such as pontoons, vessels and marinas.
- Investigate installation of fish waste compost bins and bins for discarded fishing gear as well as waste collection services to promote compliance with the *Protection of the Environment Operations Act* 1997 which prohibits discarding of waste into waterways.
- Restrict activities where they are likely to result in harm, negative interactions, or conflict with marine wildlife, such as implementing zones for no fishing along break walls to reduce conflict with seals.
- Identify and encourage options to protect seagrass beds or sensitive rocky reefs from damage caused by anchoring.
- Design and site new boating infrastructure in locations that will not require long-term dredging programs to maintain functionality.
- Identify designated anchorage areas to prevent harm to marine vegetation and habitat.

Table 5: Based on the TARA - marine groups at high to moderate risk of harm from boating and boating infrastructure.

North region				Central region				South region			
Coastal and Marine		Estuaries		Coastal and Marine		Estuaries		Coastal and Marine		Estuaries	
Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish
Seal	Seagrass	Seal	**Seagrass**	Seal	Seagrass	Seal	**Seagrass**	Seal	Seagrass	Seal	**Seagrass**
Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh
Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove

SHIPPING AND RELATED INFRASTRUCTURE

PRIORITY THREAT – USE, ACTIVITY OR STRESSOR

Shipping and related infrastructure including ports and industries for large and small commercial vessels such as trade ships, cruise ships, ferries, commercial fishing, charter boats and whale watching vessels.

SUMMARY OF KEY STRESSORS

- Water pollution from toxic contaminants through antifouling paint, sewage, oil spills, and sediment resuspension
- Physical disturbance through vessels strike
- Physical disturbance through anchor damage
- Wildlife disturbance (shorebirds, marine turtles, whales)
- Marine pollution
- Introduction and transfer of pests and diseases

EXAMPLES OF MANAGEMENT ACTIONS

- Consider the location of resident dolphin populations and shorebirds when scoping shipping infrastructure.
- Identify and encourage options to protect seagrass beds or sensitive rocky reefs from damage caused by anchoring.
- Promote set paths for cruise ships to minimise impact on sensitive species and habitats.
- Ensure run off from dry dock maintenance activities is captured and discharged into a treatment system.
- Ensure infrastructure has systems in place to adequately manage ballast water, sewage, rubbish and other wastes from vessels.
- Promote awareness about the *Protection of the Environment Operations Act* 1997 which prohibits the disposal of waste, including dump, abandon, deposit, discard, discharge or emit, into the environment.
- Promote awareness about the *Marine Pollution Act 2012* which prohibits pollution of waterways from vessels.
- Provide support for rescue organisations who assist in rescue and rehabilitation of injured and sick wildlife.
- Consideration of shore-to-ship power where feasible to reduce air emissions, noise and vibration whilst ship is at berth.
- Provide pump out facilities for waste.
- Encourage and support a citizen science project with local dive clubs to monitor for exotic species brought in with ballast or on vessel hulls.

Table 6: Based on the TARA - marine groups at high to moderate risk of harm from shipping and related infrastructure.

North region				Central region				South region			
Coastal and Marine		Estuaries		Coastal and Marine		Estuaries		Coastal and Marine		Estuaries	
Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish
Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass
Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh
Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove

RECREATION AND TOURISM

PRIORITY THREAT – USE, ACTIVITY OR STRESSOR

Recreation and tourism include passive use, snorkelling, diving, 4WD, charter activities and shark control.

SUMMARY OF KEY STRESSORS

- Physical disturbance resulting from compaction of sand and sediment
- Water pollution toxic contaminants through antifouling paint and oil spills
- Wildlife disturbance through noise and light disturbance, vessel strike
- Marine debris
- Bank erosion

EXAMPLES OF MANAGEMENT ACTIONS

- Formalise walkways or provide a viewing platform to overlook sites of interest, such shorebird or seabird nesting areas or preferred bays for southern right whales, to discourage disturbance of wildlife and sensitive areas, and encourage approach distance compliance.
- Install signage for remote supervision to advise on areas where dogs and four wheel drives are not permitted during marine turtle and shorebird nesting season.
- Provide infrastructure to mount temporary seasonal signage and barriers around nesting marine turtles and shorebirds, to restrict site access and require dogs on leads.
- Identify and create exclusion zones to minimise 4WD access, beach driving, dog walking and beach grooming and protect saltmarsh, seagrass, mangroves, and dolphin resting areas.
- Conduct a light audit based on the National Light Pollution Guidelines for Wildlife, and revise current infrastructure in sensitive habitat, nesting and roosting areas and sites used for passive recreation and ecotourism.
- Develop policy or codes supporting responsible outdoor lighting principles and infrastructure revision to reduce urban glow and promote astrotourism.
- Fence off or install elevated boardwalks on the landward side of saltmarsh and mangroves to restrict access from four wheel drive vehicles, trail bikes and pedestrians. Erect interpretive signage along the boardwalk or fence with regulatory messaging explaining reasons for prohibiting access to saltmarsh.
- Promote fish friendly marinas, wharves and pontoons and boardwalks, also known as fish friendly marine infrastructure, and see the NSW Policy and guidelines for fish conservation and management.
- Design new infrastructure to avoid locating in sensitive habitats and to avoid requirement to trim vegetation to maintain access and views
- Include features in new and existing estuary breakwaters to improve biodiversity, fishing and other social values.

Table 7: Based on the TARA - marine groups at high to moderate risk of harm from recreation and tourism.

North region				Central region				South region			
Coastal and Marine		Estuaries		Coastal and Marine		Estuaries		Coastal and Marine		Estuaries	
Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish
Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass
Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh
Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove

RECREATIONAL FISHING

PRIORITY THREAT – USE, ACTIVITY OR STRESSOR

Recreational fishing includes shore-based line and trap fishing, boat-based line and trap fishing, hand gathering.

SUMMARY OF KEY STRESSORS

- Reduction in abundances of species and trophic levels
- Bycatch and incidental catch of species of conservation concern
- Physical disturbance through use of trawl gear
- Wildlife disturbance (shorebirds, marine turtles, whales)
- Physical disturbance of shorebirds on the beach and rocky areas
- Marine pollution including discarded gear and waste

EXAMPLES OF MANAGEMENT ACTIONS

- Remove intertidal fish cleaning stations to stop scavenging behaviour and conflict with marine wildlife and to comply with the *Protection of the Environment Operations Act* 1997 which prohibits discarding of waste into waterways.
- Investigate installation of fish waste compost bins and bins for discarded fishing gear as well as waste collection services for the site and incorporate explanatory signage.
- Identify locations and provide regular maintenance and a cyclic waste management schedule for the collection of marine waste, debris, and discarded fishing gear.
- Consider placement of boat launch ramp facilities so they do not impact ecosystem integrity or require regular and ongoing dredging campaigns to maintain safe access.
- Erect signs with messaging about sensitive habitats and positive behaviours and reinforce key messages periodically across a range of products, such as a banner on the council website and stories on social media.
- Audit lighting at public jetties and fish cleaning stations to reduce urban glow using the National Light Pollution Guidelines for Wildlife and develop a light fixture replacement program schedule if required.
- Identify and encourage options to protect seagrass beds or sensitive rocky reefs from damage caused by anchoring.
- Display contact details of local licensed wildlife rescue groups at popular fishing locations to maximise reporting and rescue of marine wildlife entangled in fishing gear.
- Provide support for rescue organisations who assist in rescue and rehabilitation of injured and sick wildlife.
- Promote adherence to take limits for intertidal seafood collection onsite using onsite signage or online using a web-based or social media campaign.

Table 8: Based on the TARA - marine groups at high to moderate risk of harm from recreational fishing.

North region				Central region				South region			
Coastal and Marine		Estuaries		Coastal and Marine		Estuaries		Coastal and Marine		Estuaries	
Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish
Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass
Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh
Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove

CLIMATE CHANGE

PRIORITY THREAT – USE, ACTIVITY OR STRESSOR

Climate change includes all climate change components based on a 20-year projection of impacts only.

SUMMARY OF KEY STRESSORS

- Physical disturbance through storm surge and extreme weather events
- Wildlife disturbance
- Water pollution through increased stormwater and sediment load
- Altered ocean currents and nutrient inputs, ocean acidification, climate and sea temperature rise, sea level rise and altered storm and cyclone activity

EXAMPLES OF MANAGEMENT ACTIONS

- Use Fisheries NSW Spatial Data Portal to assess the extent of current estuarine vegetation distribution and futureproof by protecting nearby low lying areas.
- Investigate current and possible locations for future marine turtle nesting sites and consider these when planning for development.
- Map current locations of shorebird nesting and roosting sites and predict potential locations based on sea level rise forecasts and protect them for future shorebird habitat if coastal inundation occurs.
- Preserve dune systems as a natural buffer to coastal inundation and storm surges, providing nesting sites and future habitat for shorebirds and marine turtle nesting.
- Engage with community for future-proofing decisions that identify and protect potential future habitat for threatened and endangered species under climate change scenarios using a range of methods, such as, workshops, banners on the organisation's website, stories on social media and at community displays.
- Provide support for licensed organisations who assist in rescue and rehabilitation of injured and sick marine wildlife.
- Investigate current and possible locations for migration of riparian vegetation, saltmarsh, and mangroves.
- Amend development control plans to include requirements for a light pollution plan for development applications within a specified location or distance, such as 1 kilometre from the coastline, where deemed necessary by the consent authority. This is to minimise light pollution impacts in future developments to give space and capacity for migratory species as they adapt to new sites due to the effects of climate change and as some species recover and recolonise the coast.

Table 9: Based on the TARA - marine groups at high to moderate risk of harm from climate change.

North region				Central region				South region			
Coastal and Marine		Estuaries		Coastal and Marine		Estuaries		Coastal and Marine		Estuaries	
Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish
Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass
Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh	Marine turtles & snakes	Salt marsh
Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove	Shorebird seabird	Mangrove

DELIBERATE INTRODUCTION OF PLANTS AND ANIMALS

PRIORITY THREAT – USE, ACTIVITY OR STRESSOR

Deliberate introduction of plants and animals. For example: foxes, bitou bush, dogs, feral cats, and garden escapees.

SUMMARY OF KEY STRESSORS

- Physical disturbance - foxes and avian predators and dogs eat shorebird eggs and young: foxes and feral pigs dig up marine turtle eggs; bitou bush and other plant roots penetrate marine turtle eggs and kill the developing foetus.
- Wildlife disturbance - dogs and foxes chase shorebirds, exhausting them at a time when they need to be resting.

EXAMPLES OF MANAGEMENT ACTIONS

- Use Fisheries NSW Spatial Data Portal to assess the extent of current estuarine vegetation distribution and futureproof by protecting nearby low lying areas.
- Fence saltmarsh to provide safe refuge areas for shorebirds.
- Program cyclic weed eradication in shorebird habitat and potential marine turtle nesting areas out of nesting season.
- Remove weeds from saltmarsh and dune areas.
- Implement a pest control program out of nesting season in shorebird and marine turtle nesting areas.
- Plan for and promote sustainable coexistence measures between recreational activities and wildlife, which may include exclusion in some areas.
- Engage the community through increased awareness and understanding about shorebird and marine turtle vulnerability and promote positive behaviours in shared spaces, such as keeping dogs at home during nesting season or putting them on a leash.
- Maintain stormwater outfall areas so weeds and rubbish washed into the system can be removed before they dominate and smother sensitive areas such as saltmarsh.
- Provide support for rescue organisations who assist in rescue and rehabilitation of injured and sick wildlife.

Table 12: Based on the TARA - marine groups at high to moderate risk of harm from introduced animals and plants.

North region				Central region				South region			
Coastal and Marine		Estuaries		Coastal and Marine		Estuaries		Coastal and Marine		Estuaries	
Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish	Whale Dolphin Dugong	Fish
Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass	Seal	Seagrass
Marine turtles & snakes	Salt marsh	**Marine turtles & snakes**	Salt marsh	**Marine turtles & snakes**	Salt marsh	**Marine turtles & snakes**	Salt marsh	**Marine turtles & snakes**	Salt marsh	**Marine turtles & snakes**	Salt marsh
Shorebird seabird	Mangrove	**Shorebird seabird**	Mangrove	**Shorebird seabird**	Mangrove	**Shorebird seabird**	Mangrove	**Shorebird seabird**	Mangrove	**Shorebird seabird**	Mangrove

SECTION 2

A SNAPSHOT: SPECIES AT HIGH TO MODERATE RISK OF HARM FROM COASTAL THREATS.

The following groups shown in Table 13 are related to Tables 1 to 12 for each priority coastal threat. The information is not exhaustive but provides insight into different species.

Whales, dolphins, dugongs, seals, marine turtles, sea snakes, seabirds, and shorebirds are protected and threatened marine species listed under the *NSW Biodiversity Conservation Act (2016)*. The fish mentioned in the table below, seagrass, saltmarsh and mangroves are protected and threatened marine species listed under the *Fisheries Management Act (1994)*

The NSW Marine Estate Threat and Risk Assessment - Background Environmental Information provides detail and rationale for species identified in the regions at high and moderate risk.

Table 13: Marine wildlife identified in the TARA as moderate to high risk of harm from coastal threats, and considerations

Group	Example of species at high to moderate risk of harm	Some considerations
Whales: **Beaked whales**	Beaked whales such as Gray's and strap-toothed are impacted by noise offshore and marine debris. They have been known to wash ashore along the coast and may require carcass disposal.	Management of deceased whales - guidelines and checklist for land managers, including access, disposal, and protection of natural and cultural heritage values. Contact NPWS before disposal. There is likely to be significant interest in the collection of scientific samples because of the rare opportunity of these deep sea species making it to shore.
Whales: **Blackfish**	Blackfish such as false killer whales, pygmy killer whales and long-finned pilot whales have mass stranded, including at Seal rocks, Crowdy Head, Point Plummer, and Smoky Cape in past decades. However, a stranding is possible at other locations along the coast.	Management of deceased whales - guidelines and checklist for land managers, including access, disposal, and protection of natural and cultural heritage values.
Whales: **Rorquals**	Rorquals such as humpbacks, may seek sheltered bays with their calves on their southern migration. Bryde's ('broo-das') like to chase large shoals of fish into the shore.	Provide headland lookouts, so whales can be viewed without being disturbed and the community complies with approach distances. Include signs at popular access sites for tourists, swimmers, surfers, and vessels to promote compliance.
Whales: **Southern right whales**	Southern right whales are an endangered population in NSW. They prefer to rest, give birth, and nurture their calf close to shore in sweeping bays and protected beaches, sheltering in areas for days or weeks at a time if left undisturbed. Allowing them to rest undisturbed will encourage site fidelity and support recovery of this endangered population.	Investigate if local bays and beaches are potential preferred sites for southern right whale mothers and calves, and if so, remove bather protection shark net from May to October, to avoid their entanglement. Erect signs to warn and explain why nets have been seasonally removed and include approach distances - 300 metres if a calf is present - for swimmers and surfers. Provide headland lookouts, so the whales can be viewed without being disturbed, and to promote eco-tourism. Provide infrastructure for signs at popular access sites for tourists, swimmers, surfers, and vessels to promote compliance with approach distances.

Group	Example of species at high to moderate risk of harm	Some considerations
Dolphins: **Australian humpback dolphin**	Australian humpback dolphin (Sousa). A tropical to subtropical species which has taken up residency in northern NSW, in the Richmond River.	Australian humpback dolphins face three major threats: discarded fishing gear, vessel strike and development in their coastal habitats.
Dolphins: **Indo-Pacific bottlenose dolphins**	Indo-Pacific bottlenose dolphins are in all large estuary systems in NSW, and are the most widespread dolphin species worldwide. Individuals are born and stay in the same area for life. If a local population is wiped out, it may not be replaced quickly by others moving in. Negative impacts on a population may have catastrophic consequences.	Know where Indo-Pacific bottlenose dolphin rest areas are. They use sheltered, shallow, sandy bottomed parts of the estuary. Foreshore development, powered vessels, and community events should be kept away from dolphin rest areas. But passive activities such as paddle boards and kayaking may be tolerated.
Dugongs	Dugong carried by warm currents into NSW waters should be reported to the local National Parks and Wildlife Service office so its welfare can be monitored. Individuals have been found as far as the south coast of NSW and have required emergency transport back into warmer waters under the guidance of a marine wildlife veterinarian.	Dugongs prefer the water temperature to be between 26 to 27 degrees Celsius and cannot survive in water below 18 degrees Celsius. If the NSW water temperature continues to increase with climate change, it will create conditions that favour dugong residency. Seagrass meadows are critical for dugong survival.
Seals Australian fur seals and New Zealand fur seals	The recovering fur seal populations of NSW were decimated by sealers two centuries ago. Australian and New Zealand (long-nosed) fur seals continue to slowly increase in numbers along the NSW coast as resident populations extend further north, and as ad hoc haul outs. They may haul out on beaches or seek sheltered areas in estuaries and bays. Leopard seals, Subantarctic fur seals, Australian sealions, crabeater seals and elephant seals are also known to haul out from time to time.	Manage interactions and conflict with people at haul out and breeding sites by promoting compliance with approach distances. Create exclusion zones to minimise disturbance and have a carefully conditioned approach to eco-tourism. Avoid allowing development that may encroach sites suitable for the recovering population to colonise in the future. Consider the installation of seal haul out deterrents, such as SealStop, at recurrent conflict sites, where seals are regularly hauling out on built structures such as pontoons, vessels and marinas.
Marine reptiles: **Marine turtles**	Green and loggerhead turtles nesting range is predicted to extend further south in NSW, or at an earlier time, with climate change. Green turtles need seagrass meadows, loggerhead turtles eat sea sponges. Sand temperature at 60 centimetres in depth should be above 22 degrees Celsius for marine turtle nest viability. Marine turtle hatchlings use the glow on the horizon from moon and stars to guide them to the ocean. Other species in NSW waters, but do not come ashore to nest, are leatherbacks, olive ridley, hawksbill and flatback turtles.	Protecting potential future nesting sites and seagrass meadows should be considered in coastal development planning. See the Fisheries Spatial Data Portal for estuarine vegetation distribution. Marine turtle nesting and hatchling survival are severely negatively impacted by artificial lighting and urban sky glow. The sea turtle sensitive area code – a model for local government is an example giving lighting specifications for foreshore development to ensure adverse impacts are avoided for marine turtles. Shark mesh nets are particularly problematic for leatherback turtles. The western Pacific leatherback population is considered to be one of the most endangered populations in the world.

Group	Example of species at high to moderate risk of harm	Some considerations
Marine reptiles: **Sea snakes**	Sea snakes, including Reef Shallows, Elegant and Yellow-bellied sea snakes are important in maintaining a balance in marine ecosystems. They occupy a range of habitats from muddy turbid estuarine waters to clear waters of coral reefs. There are eleven species of sea snake and one of sea krait in NSW waters.	The range for sea snakes may move further south in NSW waters if oceans continue to warm with climate change. Sea snake numbers are thought to be declining. Any washed ashore should be reported to NPWS. Sea snake are an indicator of ecosystem health.
Seabirds	Seabirds such as shearwaters rely on moon and star light to navigate. They are disoriented by artificial lighting and urban glow and may be fatally impacted by ingesting marine pollution when feeding. Little penguins are nocturnal on land. They are susceptible to vessel strike when they leave their burrows and go out at dawn to forage at sea and when they return at dusk.	Nesting and roosting sites for sea birds, including shearwaters and little penguins should be mapped and considered Minimise light pollution. Seabirds are negatively impacted by artificial lighting and urban glow.
Shorebirds	Shorebirds (waders) make up about 10% of Australia's bird species, each living in a narrow range of habitats, including reef-like rock platforms, beaches, inter-tidal mudflats, mangrove communities, estuary banks, shallow freshwater swamps, and temporary wetlands in cleared pastures. Different species of shorebird have specific niches. Some are critically endangered. 15 species are resident shorebirds and live on Australian shores all year round. Internationally and nationally important sites for migratory shorebirds occur along the NSW coast. 37 species are migratory. Breeding in the northern hemisphere, millions of shorebirds fly more than 10,000 km along the 'East Asian-Australasian Flyway' to arrive in NSW during September to October. They return north to breed some time between April and May.	Know where important migratory habitat is when planning, using the Fisheries Spatial Data Portal Shorebirds are negatively impacted by artificial lighting and noise disturbance from developments including car parks and picnic areas adjacent to roosting and nesting areas, as well as beach grooming, dogs, four wheel driving on beaches and feral animals. Dogs disturb nesting birds more than people on nesting beaches. All unleashed dogs pose a threat to beach-nesting birds. Do not allow dog walking in areas where shorebirds are nesting or roosting. Consider recreation-specific buffers among key stakeholder groups adjacent to nesting sites. Incorporate infrastructure and signs to allow for ease of seasonal closure in priority areas. Consult with a local NPWS representative for information on migratory shorebird resting sites. Schedule maintenance or essential works between May to August, unless advised otherwise, when migratory birds are in the northern hemisphere or in transit.
Fish **Syngnathidae family**	Seahorses and pipefish belong to the Syngnathidae family and prefer sheltered areas, such as seagrass. White's seahorse is endangered and relies on habitats such as Posidonia seagrass meadows. Seadragon, pipehorse and pipefish populations are under threat. They live amongst kelp in the Great Southern Reef.	*Posidonia australis* is an Endangered Population in some estuaries. Know the location of seagrasses by selecting 'estuaries macrophytes' in the Fisheries Spatial Data Portal available online. Consider and plan to reduce the impacts of development and stormwater run off on the Great Southern Reef.

Group	Example of species at high to moderate risk of harm	Some considerations
Seagrass	Seagrasses such as Zostera, Ruppia and Halophila stabilise the sea floor and reduce foreshore erosion, improve water quality by capturing sediment, provide habitat and important grazing and nursery areas for marine wildlife.	Know seagrass distribution and consider potential sites for recolonisation when planning. See the Department of Primary Industries information and maps for different localities showing estuaries habitats including seagrass. See Fisheries Spatial Data Portal for estuarine vegetation distribution.
Seagrass: ***Posidonia australis***	*Posidonia australis* is a specifically identified seagrass because of its endangered status with known threats, and its ecological importance to supporting other endangered species, such as White's seahorse.	Know Posidonia locations. *Posidonia australis* does not recover well from damage, taking up to 50 years to recolonise a scalded area of one metre square. Damaged meadows may be taken over from invasive species, which threatens biodiversity and ecological integrity. See Fisheries Spatial Data Portal for Posidonia distribution.
Saltmarsh	Saltmarsh is an Endangered Ecological Community vital for improving water quality by filtering out excess nutrients and sediment from run off. Saltmarsh is important habitat and the roosting site for shorebirds, such as endangered Eastern Curlews.	Know saltmarsh locations and consider site constraints when planning. Refer to Information and maps for different localities showing estuarine habitats including saltmarsh. See Fisheries Spatial Data Portal for saltmarsh distribution. Find out about saltmarsh habitats .
Mangrove	Mangroves are vital for improving water quality, acting as fish nurseries, capturing sediment and in protecting foreshores from erosion, caused by storm surges, wash from vessels, wind, and waves. There are over 100 animal species that may be found in mangrove swamps in NSW, with some listed as endangered or critically endangered.	Know mangrove locations and extrapolate for future colonisation when planning. Refer to Information and maps for different localities showing estuarine habitats including mangroves. See Fisheries Spatial Data Portal for mangrove distribution.