

2013 - V1

MANNING RIVER OYSTER FARMERS

ENVIRONMENTAL MANAGEMENT SYSTEM: A VOLUNTARY, INDUSTRY-DRIVEN ENVIRONMENTAL INITIATIVE





CONTACT:

This EMS is an ongoing process of environmental improvement, and the Manning River Oyster Farmers welcome any comments or suggestions that you might have. To encourage feedback, a blank form has been included at the back of this document on which you can make comments. Please forward correspondence to:

Mr. Ian Crisp
mroyster@tsn.cc
M: 0427 394 388



CARING
FOR
OUR
COUNTRY



This project is supported by **OceanWatch Australia Ltd.** through funding from the Australian Government's Caring for our Country

HOW TO USE THIS EMS

How to use the EMS to ...

Explain oyster farming practices

An introduction to the oyster industry is provided from page 11, and discusses the farming methods that are used to grow oysters in the Manning River. It also provides a summary of the species of oyster that are cultivated, and an explanation of the comprehensive water quality monitoring program that oyster farmers undertake to ensure a safe and premium quality product.

How to use the EMS to:

Highlight the high risk activities to the local oyster industry

High risk activities to oyster farming in the Manning River have been identified through an Environmental Review. This is based on a risk analysis approach, allowing potential risks to be identified and ranked as low, moderate or high depending on the likelihood of a risk happening and the severity of the consequence.

Risks have been split into two groups:

- External risks: May arise from other people's activities, or from natural events such as extreme weather conditions
- Internal risks: May arise as a result of oyster farming operations

A summary of these risks are provided on page 25.

How to use the EMS to:

Improve environmental performance of the industry & environmental conditions in the Manning River

The Environmental Improvement Plan outlines how the oyster industry and other stakeholders will work towards reducing the risks identified (see section above).

The Environmental Improvement Plan provides background information on the risks identified, and some actions that can be taken to reduce oyster growers' exposure to those risks.

How to use the EMS to:

Demonstrate that oysters farmers are continually improving their environmental performance

Prior to their AGM every year it is encouraged that oyster farmers, or a suitable organisation (e.g. OceanWatch), review the environmental performance of the industry against the Improvement Plan outlined in this EMS. An Annual Review Form has been including in this document on page 41.

Undertaking this review annually will allow farmers to assess how successfully they are working towards the Improvement Plan. A summary of the years achievements should be added to the back of this document, and can be used as the basis of a media release promoting the actions of the local industry.

TABLE OF CONTENTS

1. INTRODUCTION	7
1.1. Relationship to Other Plans & Regulations	8
1.2. Scope	8
1.3. Development	9
1.4. Emergency Response	9
1.5. Review and Communication	10
2. INDUSTRY DESCRIPTION	11
2.1. Sydney Rock Oysters	11
2.2. Pacific Oysters	12
2.3. Farming Methods	13
2.4. Land Based Activities	18
2.5. Water Quality Monitoring	19
3. ENVIRONMENTAL REVIEW	21
3.1. Manning River	21
3.2. Risk Assessment Process	23
3.3. Summary of Environmental Risks	25
4. ENVIRONMENTAL IMPROVEMENT PLAN	27
5. ENVIRONMENTAL POLICY	39
6. ANNUAL REVIEW FORM	41
7. SUPPORT FOR FARMERS – RURAL SUPPORT PROGRAM	46
8. EMS COMMENTS & SUGGESTIONS	47

1. INTRODUCTION

An Environmental Management System (EMS) is a step-by-step process to identify and manage environmental impacts, risks and opportunities. The model is based on a philosophy of **continual improvement** – that is, recognising current performance against certain requirements, and then working towards realistic and achievable improvements in the future.

The benefit for oyster farmers to develop an estuary-wide EMS is that it:

- **Provides an organised, documented and coordinated approach to both improving and demonstrating environmental sustainability**

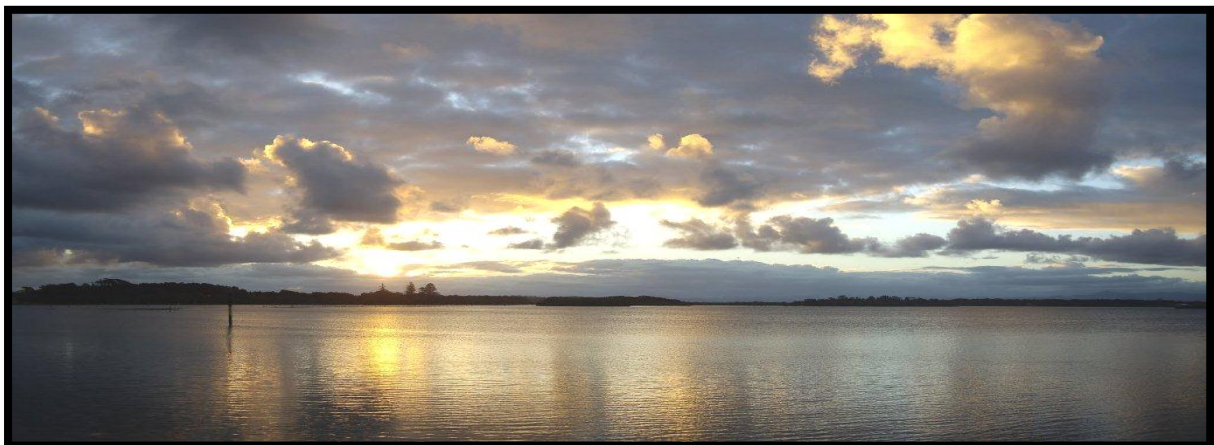
Other benefits that can be gained from having an EMS include:

- Avenue to engage with stakeholders & to improve catchment conditions;
- Ability to portray a positive public image of the industry;
- Reduced operating costs;
- Higher product prices from having a clean, green image;
- Improve compliance levels across operators;

An EMS helps ensure the long term sustainability of oyster farming by reducing or preventing identified negative impacts on the environment.

The Manning River Oyster Farmers recognise that they have a responsibility to cultivate oysters on behalf of the community as sustainably as current technology and techniques allow, and to improve as new methods develop.

The Manning River Oyster Farmers have a vested interest in maintaining and improving the local environment, with their livelihoods dependant on the health and productivity of the estuary. The oyster growers are demonstrating their commitment by voluntarily participating in this industry-driven EMS process,



1.1. RELATIONSHIP TO OTHER PLANS & REGULATIONS

An EMS is designed to complement existing laws, guidelines and strategies that control and guide environmental management and best-practice marine resource use. These include:

Fisheries Management Act	1994
NSW Threatened Species Conservation Act	1995
Environmental Protection & Biodiversity Conservation Act	1999
Environmental Protection & Biodiversity Conservation Regulations	2000
Fisheries Management (General) Regulation	2002
New South Wales Oyster industry – Sustainable Aquaculture Strategy	2006
Manning River Estuary Management Plan (& Study)	2009
Manning River Maintenance Dredging Strategy	2010
Farquhar Inlet Entrance Opening Management Plan	2010
Manning Valley Community Plan	2010
NSW Shellfish Industry Manual	2011
State Environmental Planning Policy (SEPP) 62 – Sustainable Aquaculture	2011
Hunter Central Rivers CMA – Catchment Action Plan	2013

Manning River Oyster Farmers are committed to implement the voluntary best practice standards provided in the NSW Oyster Industry Sustainable Aquaculture Strategy.



1.2. SCOPE

The scope of this EMS is limited to:

- The environmental aspects of aquaculture operations undertaken by Manning River Oyster Farmers
- The environmental aspects of activities within the catchment that may impact upon oyster farming in the Manning River

1.3. DEVELOPMENT

As an industry driven initiative, this EMS was developed by oyster farmers on the Manning River through a series of workshops, with a facilitator, Andy Myers from OceanWatch Australia. The project is supported by NSW Farmers Association and funded through the Australian Government's Caring for our Country.



Whilst the EMS was compiled with regards to International Standard, ISO 14001:2004 (Environmental Management Systems), it is not fully compliant with the standard in its current form. The ISO standard describes the general requirements for documenting and implementing environmental management.

1.4. EMERGENCY RESPONSE

The Manning River Oyster Farmers will respond to emergency situations and accidents, and work with the appropriate authorities to prevent or mitigate any associated negative impacts.

Growers are encouraged to work with the appropriate Authorities to develop 'Emergency Response Plans'. These plans will enable suitable preparation and planning, and a quick reaction in the event of an emergency. These actions will help to mitigate the negative impacts on the environment and the industry, increasing resilience.

Emergency response plans may include: fires, explosions, fuel & oil spills, release of hazardous chemicals, natural disasters, oyster mortality & disease, effluent spill / release.

1.5. REVIEW AND COMMUNICATION

An EMS is based on the philosophy of **continual improvement**. In accordance with this concept, the Manning River Oyster Farmers will endeavour to undertake an annual review to measure their performance against the Environmental Improvement Plan (see 'Annual Review Form' page 41).

This annual review will also provide the opportunity for growers to discuss incidents where the provisions of this EMS were not met. Failures may be:

- Intentional or unintentional
- An indication of inappropriate policy or actions
- Due to highly unusual circumstances
- Some combination of the above

Possible responses may include:

- No action
- A review of the EMS
- Training

In addition to the internal review, the Manning River Oyster Farmers will periodically reassess the environmental risks to oyster farming (i.e. the Environmental Review), and update the Environmental Improvement Plan to reflect the changing condition of the estuary and the catchment.

The Manning River Oyster Farmers will provide the local community and other stakeholders with regular progress reports as they work towards implementing their Environmental Improvement Plan.



2. INDUSTRY DESCRIPTION

2.1. SYDNEY ROCK OYSTERS (*Saccostrea glomerata*)

The Sydney rock oyster is endemic to Australia and is found in bays, inlets and sheltered estuaries between Harvey Bay (QLD) and Wingan Inlet (VIC). It is capable of tolerating a wide range of salinities and occupies the intertidal zone to 3 metres below low water. Within this range they are common on hard rocky substrates.

Sydney rock oysters generally spawn in summer. Peak spawning occurs at water temperatures of 21–23°C, meaning that the time of spawning varies between locations. Oysters are 'broadcast spawners', meaning that both male and female gametes are released into open water for fertilisation. Within hours of fertilisation the eggs develop into free-swimming planktonic larvae that remain in estuarine and coastal waters for up to 3 weeks. During this time the larvae develop clear shells and a retractable foot, before settling on a suitable substrate using the foot to find an appropriate site. The foot is resorbed once larvae are attached, the shell darkens and the small animal takes on the appearance of an adult oyster. Settled, footless oyster larvae are known as 'spat'. They remain settled in that location for the rest of their life.

All oysters are filter feeders, straining organic material (mainly plankton) from the surrounding water. Mortality is highest in the free swimming & early settlement phases, and at this stage oysters are subject to prey from a variety of fish species. Once the shell has hardened they are less vulnerable to fish predation, but stingrays, mud crabs, whelks and starfish all feed on adult oysters.

Growth rates vary with local conditions, but generally wild Sydney rock oysters reach 40–60 grams in 3-4 years. They are capable of spawning after 1 year, and have the peculiar trait of changing sex from males to females as they grow older. A later sex reversal is possible, but around 75% of prime eating oysters are female. To assist the industry, commercial hatcheries now selectively breed select oysters with a fast growth rate so that fast-growing spat can be derived. These hatchery-reared oysters can grow to market size in half the time of wild-caught spat (i.e. 2 years instead of 4). See box on page 13 for more details.

The Sydney rock oyster industry in New South Wales has been threatened by the introduction of *wild populations* of Pacific oysters. Pacific oysters were originally introduced into Tasmania from Japan in the 1940's for aquaculture purposes, and found their way into NSW waters in the 1980's. They have now spread and invaded intertidal habitats of many coastal waterways, with a 2010 survey finding populations of Pacific oysters in all NSW estuaries south of the Macleay River.

2.2. PACIFIC OYSTERS (*Crassostrea gigas*)

Pacific oysters are a hardy species with high reproductive rates and extremely fast growth. They can withstand a wide range of water quality parameters and in some estuaries wild populations can dislodge newly settled Sydney rock oysters and can potentially out compete and smother the native species. Due to very high densities of Pacific oysters in Port Stephens, in 1990 the NSW DPI permitted their commercial cultivation. Elsewhere in NSW, Pacific oysters are declared a Class 2 Noxious Species.

Recognising the need to diversify NSW oyster industry opportunities, the NSW DPI has since permitted a number of estuaries to cultivate reproductively sterile, triploid Pacific oysters. These oysters are spawned in a commercial hatchery before being distributed to oyster farmers as sterile spat. The Manning River farmers have been trialling the cultivation of this species since 2012.

As mentioned above, Pacific oysters have very high growth rates, and in some regions can grow to a marketable size within 12 months. Compared with the 3-4 years it takes for a Sydney rock oyster to reach market size, there are obviously cash flow incentives for oyster farmers to cultivate Pacific oysters.

Like Sydney rock oysters, Pacific oysters change sex during their life, usually spawning first as males, and later as females. Wild Pacific oysters can live up to 10 years and reach an average size of 15-20 cm, however cultivated triploid Pacific oysters harvested after 1-1.5 years are typically only 8-12 cm in length.



2.3. FARMING METHODS

Manning River oyster farmers utilise a variety of techniques to commercially cultivate oysters. Each method has advantages & disadvantages, and the choice of a particular method depends on personal preference as well as the location and features of the lease. Although some farmers are trialing the cultivation of genetically sterile, triploid Pacific oysters, operations of the Manning River oyster farmers are still predominantly focused on producing high-quality Sydney rock oysters.

Spat for cultivation of Sydney rock oysters can either be:

1. self-sourced by harvesting naturally occurring spat;
2. brought from oyster farms in other estuaries where the settlement of spat is consistently high;
3. purchased from commercial hatcheries. These spat are often bred from family lines that grow quickly & have natural resistance to disease. These spat are available through the work of NSW DPI in Port Stephens.

Breeding oysters for disease resistance and fast growth:

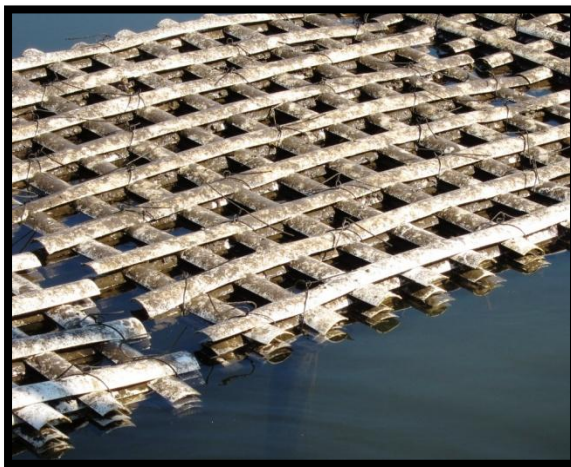
Research at the NSW DPI lab in Port Stephens initially concentrated on creating functionally sterile Sydney rock oysters. By genetically manipulating stocks to forego spawning, this allowed the oysters to divert the energy usually used in reproduction, into growth. Although successful, research lent toward a generational breeding program whereby select individuals with a fast growth rate form the brood stock from which fast-growing spat can be derived. After 4 years trialing these oysters on the Georges River, QX disease hit the estuary and decimated local oyster populations. Whilst this was a set-back, it was discovered that some of the trial oysters survived the outbreak and subsequently these oysters formed the brood stock from which a fast growing, more disease resistant oyster could be bred.

The generational breeding program is now in its 13th year. Whilst the intellectual property of the program belongs to NSW DPI and FRDC, production of spat is managed by the Select Oyster Company (SOCo). SOCo is a non-profit company that's been set up to commercialise the Sydney rock oyster breeding program, and to help NSW oyster farmers improve productivity and viability.

At present, one commercial hatchery is producing SOCo lines of stock. Southern Cross Shellfish is located in Port Stephens and commenced runs of Sydney rock oysters in 2008. Demand for SOCo stock currently exceeds supply, and getting hold of spat remains a major issue for oyster farmers throughout the state. From the hatchery, freshly metamorphosed spat are distributed to a small group of oyster farmers in various NSW estuaries, who act as nursery operators to grow the oysters to a more distributable size.

There are a number of different techniques used for the self-harvesting of spat, but the basic principles for all methods are similar. Spat collectors must be constructed of material that encourages settlement of oyster larvae, whilst providing the maximum amount of surface area. They must also provide juvenile oysters with protection from predators such as fish, and allow the oysters to be easily removed without damage. Two methods used in the Manning River are described below:

The first method utilises strips of arced PVC plastic or 'slats', that are arranged horizontally on a frame. The frame and attached slats are then stacked on top of one another to maximise the surface area available for settlement and then laid flat on racks exposed to the most natural spatfall. Some slats have fine ribs to encourage settlement, and to harvest the spat, slats are removed and twisted. Once removed, spat are transferred to other grow out methods discussed later.



The second method utilises frames consisting of numerous wooden sticks approximately 100mm apart that are braced by two shorter sticks. The frames are stacked one up, one down to lessen the gap between the sticks, and reduce exposure to predators. The frames are stacked on top of one another to increase the catching area and laid out on the racks. Traditionally, oyster farmers used tar and cement to prolong the life of sticks; however this practice is gradually being phased out as more farmers move towards the use of plastic slats and the buying of spat from other estuaries



Once spat have settled in sufficient quantities, and have grown to a size where predation is not a risk, the sticks can be thinned out (see bottom right photo on page 13) and moved to areas that are compatible with the next stage of growth. Such areas have higher nutrient loads (more food for the oysters), and typically lower spatfall, meaning that growing oysters will not be excessively fouled by over-catch.

While oysters are attached to sticks they are repeatedly cleaned and dried. The drying process is used to cull over-catch (i.e. natural oyster spatfall and other fouling organisms that settle on maturing oysters). Although oysters could remain on sticks until they reach a marketable size at around 3-4 years, many farmers choose to remove them and complete the final stages of growth using some other method.

Single Seed: Spat that is collected using the slat method, removed from catching sticks or purchased from other farms or hatcheries, are required to be dealt with individually. These oysters are known as ‘single seed’, and can be grown using a variety of different methods. Spat that is purchased from other producers or hatcheries can be bought at varying stages of development; the smaller the spat the cheaper they are, however mortality rates and handling requirements are increased.

Many oyster farmers use trays at some point during the oyster cultivation process. Plastic trays require very little maintenance and are being introduced to replace treated timber and wire trays. Tray divisions prevent oysters from clustering from wind or wave action, which would otherwise result in uneven growth. Snap on lids provide added protection from the elements and bird predation.



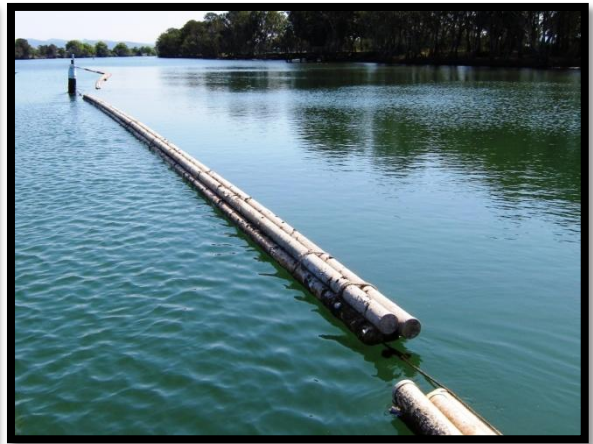
Where trays are used to “finish” oysters immediately prior to harvest, they are usually placed on a rack & rail system manufactured from vertical wooden posts and horizontal baton. The height of the trays is carefully controlled so that the oysters are intertidal; remaining underwater for the majority of the tidal cycle, but are fully exposed at low water. Exposing oysters is a technique used to manage fouling, and is also an important stage in toughening the oyster, strengthening the abductor muscle to prolong post-harvest shelf life.

Tarred and treated timber that has historically been in rack and rail construction is also being phased out of many operations. Common replacement materials include composite posts (wood / recycled plastic amalgam) and plastic sheathed untreated wooden products.



Due to the amount of infrastructure and labour required to establish rack and rail, this kind of infrastructure is only commonly found in shallow areas of the Manning River, such as Pelican Bay. In deeper parts, different farming methods must be used.

There are a number of alternative methods that utilise trays suspended below floatation. These methods allow farmers to use deep water leases that are not suited to more conventional techniques. As significant freshwater flows are quite common in the Manning River, this also has the advantage of keeping oysters below the freshwater that sits on top of the water column. This example shows stacks of trays, known as 'modules', suspended below a floating pipe-line.



As the modules are constantly submerged, these oysters are particularly susceptible to over-catch from settling juvenile oysters and other fouling organisms. Furthermore, because subtidal oysters are close to the muddy riverbed, there is also increased risk of mudworm infestation. To manage these issues, oysters are frequently pulled up and dried, as a means to cull fouling organisms and parasites.

Floating pillows on long-lines are becoming increasingly popular with farmers. Oysters are placed in reusable plastic mesh bags, which are attached with shark clips to long-lines, allowing them to move with the wind and tide. This movement is important to promote even growth and avoid clustering. As they grow, oysters are frequently dried and graded, and progressively moved to pillows with a larger mesh. This increases water flow, promoting nutrient availability & oyster growth.



Pillows are normally arranged on opposite sides of a length of polyurethane rope or heavy duty monofilament line. To dry the oysters, the pillows on one side can be flipped over and rested on top of the neighbouring pillow with the height of the combined floatation enabling the top pillow to rest clear of the water.

The long-line set-up can also be used to suspend bags or hard-frame baskets. As shown below, the majority of long-lines used with suspended containers are supported intermittently with upright posts which allow farmers to set the height of the rope so that oysters spend a proportion of the tidal cycle out of the water. This technique also allows farmers to manage the height of the stock in response to freshwater flows coming down the river.



One final method worth describing here is the oyster dredge. Whilst the dredging of oyster beds is common place overseas (particularly the US & UK), very few farmers in Australia farm using this technique. The Manning River is the only estuary in NSW that farms oysters in this way. The practice involves towing a dredge along the bottom of the estuary in order to collect wide populations of oysters. The dredge is then winched up back to the boat and the catch emptied. The dredge itself consists of a steel frame fabricated into the shape of a scoop. The frame is then covered in chain mesh, and functions as a net. After dredging, small oysters are thrown back on the beds to allow the further settlement of spat.

2.4. LAND BASED ACTIVITIES

The nature of commercial oyster cultivation not only requires significant water based infrastructure but also necessitates a functional land base from which operations can be conducted. The majority of permit holders on the Manning River operate from freehold land, however a small number do operate on Crown Land, for which they require a lease arrangement with the Department of Lands. This lease arrangement allows farmers permissive occupancy of a section of waterfront land for farming operations and the storage of cultivation infrastructure and associated equipment. The Department of Lands holds a bond paid by farmers when taking over a lease, and the growers hold 10 year tenures on land-based facilities.

Unlike many other estuaries in NSW, there is no central depot from which the Manning River oyster farmers conduct their operations. That said, the majority of oyster farmers in the Manning River are based just off Manning Point Road, on Mitchells Island. This area is serviced by the reticulated sewage system, and the majority of sheds are connected to this main line.

Oyster farmers do not storage large volumes of fuel or oil in their sheds, and hence no bunding is employed to protect against spills. Only small quantities of fuel / oil are held in sheds for everyday use, and these fluids are stored in appropriate canisters.

For many years, tarred & treated timber was the mainstay of the industry, used to increase the durability of cultivation infrastructure in the harsh estuarine environment, protecting it from marine borers. Oyster farmers throughout NSW are now phasing out the use of tarred & treated timber by converting to polyurethane trays, plastic sleeved timber posts, or adopting alternative farming methods using reusable plastic baskets, pillows or tumblers. Converting to these eco-friendly products reduce ongoing maintenance requirements and associated costs, and also eliminates potential contaminants entering the estuary. Whilst there are a few tar pits remaining in the area, local oyster growers are committed to their eventual removal.

Oyster farmers use a variety of different machinery to help them manage their land-based operational activities. These include forklifts, tractors, cranes and grading machines.



2.5. WATER QUALITY MONITORING

Due to a wide variety of activities and processes that can impact estuary health, the oyster farmers on the Manning River maintain a 'Quality Assurance Program'. Through this program, water and meat quality is assessed every two weeks, with additional biotoxin assessments conducted once a month. This rigorous sampling regime ensures that immediate action can be taken should pollution levels threaten the health of the river and the viability of oyster stocks.

The water and meat quality samples validate each farmers licence issued by the NSW Food Authority and all growers are required to pay a substantial levy to fund this local Quality Assurance Program (QAP). The program greatly benefits the wider community by providing a very clear indication of catchment health. The long-term, standardised dataset also provides an invaluable record of changing environmental parameters. In this way, the oyster farmers of the Manning River contribute significantly to the scientific understanding of the waterway and its management.

There are currently 4 areas within the Manning River Estuary that are classified by the NSW Food Authority for the harvesting of oysters (see map on next page). These areas have been classified in accordance with the requirements of the 'Australian Shellfish Quality Assurance Program' (ASQAP). All these harvest area have been classified as '**Conditionally Restricted**'.

The '**Conditionally Restricted**' status recognises that there may be some local issues with water quality, but at levels low enough to be removed from shellfish via depuration. Depuration is a statutory process that requires oysters to be placed in a sterilised recirculation tank for 36 hours. During this process the oysters self cleanse in recirculated water, which is sterilised using ultraviolet light.

As described above, **all harvest areas must met strict water quality criteria**. If these criteria are not met, then the area closes and oyster farmers are unable to depurate or sell oysters until there is an improvement in environmental conditions.

Harvest Area	Conditional Classification (depuration required)	Closed Classification
Mitchells Isl.	Rainfall < 25 mm in 24hrs AND Salinity at all sites > 18ppt	Rainfall > 25mm in 24hrs OR Salinity at any site < 18ppt
Mangrove Isl.	Rainfall < 25 mm in 24hrs AND Salinity at all sites > 18ppt	Rainfall >25mm in 24hrs OR Salinity at any site < 18ppt
Pelican Pt.	Rainfall < 25 mm in 24hrs AND Salinity at all sites > 19ppt	Rainfall >25mm in 24hrs OR Salinity at any site < 19ppt
Scotts Creek	Rainfall < 25 mm in 24hrs AND Salinity at all sites > 18ppt	Rainfall >25mm in 24hrs OR Salinity at any site < 18ppt



3. ENVIRONMENTAL REVIEW

3.1. MANNING RIVER

The Manning River estuary is located on the mid-north coast of NSW ~250 km north-east of Sydney. The estuary drains the 6th largest coastal catchment in NSW, covering an area of 8,420 km². The major tributaries include the Barnard, Nowendoc, Barrington, Gloucester, Dawson & Lansdowne Rivers.

The approximate length of the main channel is 150 km, with the lower reaches of the waterway winding through an expansive coastal floodplain. The Lower Manning River is a delta system with several channels creating large islands like the Mitchells and Oxley Islands.

The estuary is unique as it has two natural ocean entrances, one at Harrington and the other 12 km to the south, known as Farquhar Inlet, at Old Bar. Whilst the main entrance at Harrington is permanently open to the ocean, the entrance at Old Bar is untrained and has a history of periodic closure. Dredging has recently been undertaken at this south entrance to increase tidal flushing and improve water quality in the southern channels.

The Manning River estuary provides a wide range of habitats, which in turn supports a huge variety of fauna and flora. The region is home to 86 threatened fauna and 38 flora species, with 7 endangered ecological communities found on the coastal floodplain. Numerous migratory bird species have also been recorded in the area, including one of the largest breeding populations of little tern in Australia located at Farquhar Inlet.

The Manning River estuary is also designated as a Recreational Fishing Haven. Under the terms of this agreement, only recreational fishing is permitted downstream from Ghinni Ghinni and Berady Creek (including Scotts Creek). This exclusion of commercial fishing does not extend to oyster farming.

Around 50% of the catchment remains in a natural forested condition, with the primary urban areas of Taree, Gloucester & Wingham covering only 2% of the catchment. The coastal floodplain is very fertile and over time has been progressively cleared and drained for logging and agriculture. Cleared land now accounts for 35% of the catchment area, and is used predominantly for dairy and beef cattle farming.

Water supply & sewerage services within the Greater Taree LGA are provided by MidCoast Water. Two Sewage Treatment Plants (STPs) are licensed to discharge treated effluent directly into the Manning River and its tributaries; the Dawson River STP, and Wingham STP. All other STPs within the LGA rely on land-based reuse or sand dune infiltration into groundwater. Over 7,000 on-site sewage management systems are registered in the Greater Taree LGA (note: the Manning River catchment is much larger than the area covered by the Greater Taree LGA).



Manning River

3.2. RISK ASSESSMENT PROCESS

Risk is the chance of something happening that will have an impact on the environment and / or the industry

An EMS is based on a risk analysis approach. Potential risks are identified and ranked as low, moderate or high depending on the **likelihood** of a risk happening and the **consequence** if the risk does occur. Each specific risk is ranked, based upon the tables below:

LIKELIHOOD OF A RISK HAPPENING

1. Rare	May occur in exceptional circumstances (e.g. once in 10 years)
2. Unlikely	Uncommon, but has been known to occur
3. Possible	Some evidence to suggest this may possibly occur
4. Occasional	May occur
5. Likely	Expected to occur in most circumstances (e.g. 2-3 times a year)

CONSEQUENCE IF THE RISK DOES OCCUR

1. Negligible	Minimal impact. Unlikely to be measureable from natural variability
2. Minor	Possible detectable but minimal impact on structure / function
3. Moderate	Maximum acceptable level of impact on the environment. Time frame for recovery more months than years
4. Major	Will result in wider and long term impacts
5. Severe	Very serious impacts with relatively long time frame for recovery to an acceptable level. Includes irreversible damage

RISK MATRIX

		Consequence				
		Negligible	Minor	Moderate	Major	Severe
Likelihood	Rare	Low	Low	Moderate	Significant	Significant
	Unlikely	Low	Low	Moderate	Significant	High
	Possible	Low	Moderate	Significant	High	High
	Occasional	Moderate	Significant	Significant	High	High
	Likely	Significant	Significant	High	High	High

RISK CATEGORY & MANAGEMENT RESPONSE

Low	No further procedures or action required to address issue
Moderate	Appropriate action required to address issue May include continuation of current arrangements
Significant	Management attention required Action to address issue needs to be taken
High	Strong and immediate action required New or further risk control measures needed

Potential risks that are considered may be split into:

- 1) External risks: Risks that arise from other people's activities, or from natural events such as extreme weather conditions
- 2) Internal risks: Risks that arise as a direct result of oyster farming operations



3.3. SUMMARY OF ENVIRONMENTAL RISKS

External Risks Risks that arise from other people’s activities, or from natural events such as extreme weather conditions

		Consequence				
		Negligible	Minor	Moderate	Major	Severe
Likelihood	Rare					
	Unlikely					
	Possible		L		G	
	Occasional			I-J-K	F	
	Likely			H	E	A-B-C-D

- A. Animal effluent from cattle with unrestricted waterway access
- B. Sand / sediment accumulation at Farquhar Inlet
- C. Exposure of acid-sulphate soils by soil disturbance & drainage
- D. Release of deoxygenated black-water from floodgates & creeks
- E. Build up of sediment around oyster leases
- F. Contamination of waterways as a result of effluent irrigation
- G. Pump-station failure / overflow
- H. Sediment run-off from unsealed roads & unauthorised earthworks without appropriate controls
- I. Contamination from failing septic tanks close to the estuary
- J. Bank / gully erosion increased by land clearing, stock trampling & erosive floodwaters
- K. Fuel / oil spills originating from recreational & commercial vessels
- L. Harmful algal blooms as a result of high nutrient levels in run-off from fertiliser on agricultural lands & golf-courses

Internal Risks

Risks that arise as a result of oyster farming practices, as well as issues of disease

		Consequence				
		Negligible	Minor	Moderate	Major	Severe
Likelihood	Rare	N-O-P Q-R-S	I, J			
	Unlikely					
	Possible	K-L-M	H		B	A
	Occasional		G	C-D-E		
	Likely		F			

- A. Loss of stock through disease outbreaks (eg Qx in SRO)
- B. Oyster stocks infected with mudworm
- C. Visual pollution of leases that have not been maintained (incl. derelict leases)
- D. Potable water used to clean equipment & oysters
- E. Resource use & carbon emissions associated with use of mains electricity at shed sites
- F. Inefficient engines resulting in high emissions
- G. Contaminants from treated & tarred infrastructure leaching into the estuary
- H. Waterway contamination from faulty toilets not connected to reticulated system
- I. Tar leaching from pit / application area into surrounding area
- J. Chemicals that leak through poor storage or an adverse event
- K. Release of airborne contaminants by burning cultivation infrastructure
- L. Fuel / oil spills from oyster punts operating in the estuary
- M. Fuel / oil spills on land depots
- N. Disturbance of sediments through deep water oyster harvesting
- O. Damage to fauna & flora through deep water oyster harvesting
- P. Shed site erosion due to activity of farming machinery
- Q. Wild Pacific oysters competing with native, cultivated stock
- R. Wash from oyster punts travelling to & from leases
- S. Noise from oyster farming activities

4. ENVIRONMENTAL IMPROVEMENT PLAN

Addressing External Risks:

Effluent:

Background:

Effluent contamination of waterways is the number one concern to the oyster industry. Pollution of this nature contaminates shellfish & closes harvest areas as a means to protect food safety. This can lead to loss of income for farmers, and there are cases where ongoing issues of contamination have effectively driven oyster farmers from the river (e.g. Bellinger / Kalang in northern NSW). Not only does effluent impact on the oyster industry, but it can have impacts on estuarine ecosystems and severe implications on public health.

In its lower reaches, the Manning River winds through an expansive, fertile coastal floodplain. Over time, this has been progressively cleared and drained for logging and agriculture, and is now predominantly used for dairy and beef cattle farming. Local oyster farmers estimate that 50km of riverbank in these lower reaches are currently unfenced, allowing cattle with unrestricted access to the river and its tributaries. This leads to significant faecal contamination of the waterway.

Local oyster growers are also aware of terrestrial farms with very poor effluent management practices. These properties wash cattle effluent directly into creeks, and mismanage effluent irrigation regimes that result in significant run-off. .

Oyster farmers have a unique understanding of the estuary, and through their rigorous water quality testing program, have the ability to identify point sources of pollution. Anecdotal evidence suggests the oyster industry is often the first to detect waterway contamination. Whilst it is important that this information is provided to Authorities and organisations that can take action, given their local knowledge & existing relationships with landholders, oyster growers can sometimes play a key role in negotiating on-ground improvements.

The health of oysters is largely influenced by water quality, with their capacity to tolerate disturbances and disease linked to the health of the estuary. Oysters growing in a healthy ecosystem are more resilient to disturbance than those growing in an unhealthy system. To improve the health of oysters during stressful periods, farmers will endeavour to engage with catchment improvement projects beforehand with the aim of improving the overall health of the estuary.

Risks to be reduced by the actions below:

- Animal effluent from cattle with unrestricted waterway access
- Contamination of waterways as a result of effluent irrigation
- Pump-station failure / overflow
- Contamination from failing septic tanks close to the estuary

Initial Risk:

High
High
High
Significant

Actions (see 'Review Form' on page 41 for how performance is recorded every year)		Who
1.	Identify key sites subject to effluent input & forward to key stakeholders	Oyster farmers
2.	Engage with landholders and, where possible, facilitate on ground works	Oyster farmers
3.	Promote successful 'effluent' projects and partnerships	Oyster farmers
4.	Report unexpected test results to council	Oyster farmers
5.	Encourage regular maintenance & upgrade of pump-stations & holding tanks	Oyster farmers

Erosion & Sedimentation:

Background:

Erosion and downstream sedimentation is a natural process in many areas, however erosion of riverbanks may be exacerbated through riparian vegetation removal, stock access to creeks and boat wash destabilising banks. Logging operations & earthworks without inadequate controls, also mobilises sediment.

Suspended sediments affect water clarity & light penetration through the water column, which is an essential requirement for phytoplankton & seagrass growth. Significant erosion not only impacts on estuary health, but can also affect the feeding apparatus of oysters and lead to mudworm infestations. This can severely impact the oyster health and can result in mortalities.

Oyster farmers have a unique knowledge of the estuary, they are in a prime position to advise and work with Authorities and other organisations to identify erosion hot-spots and sources of sediment. Appropriate catchment management practices such as erosion control structures, planting programs and fencing / stock exclusions are all measures that could be used in bank stabilisation projects.

Sediments eroded from the catchment and upland waterways are typically deposited in the lower reaches of the estuary where water velocities fall. Sedimentation is also enhanced at tidal inlets, where river flows are opposed by tidal movements and wave action. Farquhar Inlet at Old Bar is especially prone to the natural build up of alluvial sediment and marine sand, and this area is subject to regular maintenance dredging.

The oyster farmers maintain representation on the Estuary & Coastline Management Committee, and were key stakeholders in the development and implementation of the Manning River Maintenance Dredging Strategy. The farmers will maintain a seat on the committee so that the interests and thoughts of the oyster industry are represented at this level.

Risks to be reduced by the actions below:

- Sand / sediment accumulation at Farquhar Inlet
- Build up of sediment around oyster leases
- Sediment run-off from unsealed roads & unauthorised earthworks without appropriate controls
- Bank / gully erosion increased by land-clearing, stock trampling & erosive floodwaters

Initial Risk:

High

High

High

Significant

Actions (see 'Review Form' on page 41 for how performance is recorded every year)

Who

Actions (see 'Review Form' on page 41 for how performance is recorded every year)	Who
6. Maintain representation on the Estuary & Coastline Management Committee	Oyster farmers
7. Contribute to the comprehensive review of the dredging strategy undertaken by council every 5 years (next is 2015)	Oyster farmers
8. Report all earthworks of concern to council	Oyster farmers
9. Identify key erosion sites for remediation	Oyster farmers
10. Engage with landholders, authorities & other organisations to facilitate on-ground improvements	Oyster farmers
11. Promote successful 'erosion / sedimentation' projects and partnerships	Oyster farmers

Acid Sulphate Soils & Floodgates:

Background:

Acid sulphate soils (ASS) are naturally occurring soils and sediments that contain iron sulphides. Under most conditions, where the soil remains waterlogged, ASS are harmless. When iron sulphides are exposed to air – by drainage, drought or excavation of the soil - they react with oxygen in the air or water, and can produce large quantities of sulphuric acid. This acid is stored in the soil, & is usually released after rain, or after flood waters have drained away. Acidification of waterways severely degrades estuarine ecosystems; it can cause fish kills & disease, & impacts on oysters by increasing mortality, reducing growth, dissolving shells, reducing feeding activity & damaging soft tissue.

Floodgates and earthworks play an important role in the mobilisation / containment of acid sulphate soil and a cooperative approach is needed for effective management. Many authorities have programs in place to manage floodgates and drainage systems to reduce the downstream risk from releasing water with a low pH. Local oyster farmers are aware of floodgate management plans developed for properties on the floodplain, and would be interested in finding out if landowners were complying with the guidelines.

Risks to be reduced by the actions below:

- Exposure of acid sulphate soils by soil disturbance & drainage
- Release of deoxygenated black-water from floodgates & creeks

Initial Risk:

High

High

Actions (see 'Review Form' on page 41 for how performance is recorded every year)

Who

12.	Report all earthworks of concern to council and the CMA	Oyster farmers
13.	Report unexpected water test results to council	Oyster farmers
14.	Request council to develop and maintain a register of floodgate management plans	Oyster farmers
15.	Educate community about land-water interactions and the needs of the oyster industry	Oyster farmers

Chemicals, Fuel & Oil:

Background:

Whilst responsibility in the event of spills in the estuary falls to council and RMS (NSW Maritime), a spill containment kit may enable the Manning River oyster farmers to quickly inhibit the spread of the pollutant and provide absorbents to clean the affected area. The negative impacts from accidental spills could therefore be minimised through immediate action.

The Manning River oyster farmers maintain a regular water & meat quality monitoring regime to ensure that prompt action can be taken should pollution levels threaten the health of the inlet & oyster stocks. Anecdotal evidence suggests that oyster industry is often the first to detect local pollution events such as toxic algae, sewage, chemical & fuel spills. Such events not only threaten the oyster industry, but have severe implications on public & ecological health.

Growers are encouraged to work with appropriate authorities to develop 'Emergency Response Plans'. Such plans will enable suitable preparation and planning, and a quick reaction in the event of an emergency. These actions will help to mitigate the negative impacts on the environment and the industry. Emergency response plans may include: fires; explosions; fuel & oil spills; release of hazardous chemicals; natural disasters; oyster disease & mortality; effluent spill / release.

Risks to be reduced by the actions below:

- Fuel / oil spills originating from recreational & commercial vessels

Initial Risk:

Significant

Actions (see 'Review Form' on page 41 for how performance is recorded every year)

Who	Actions
Oyster farmers	16. Purchase spill containment kit
Oyster farmers	17. Alert RMS (T: 131256) if spills noticed and assist with containment
Oyster farmers	18. Develop Emergency Response Plans to manage emergency situations

Nutrients:

Background:

During rain events, newly applied fertiliser may run-off from agricultural lands into the receiving waters. This peak in nutrient input, combined with favourable atmospheric conditions, stimulates the growth of algae. Depending on the species present, this can result in the formation of 'Harmful Algal Blooms' (HABs), a toxic soup that has severe implications for the oyster industry and for public health. As algal blooms die and the organic matter decays, dissolved oxygen levels in the waterway fall and may result in local fish kills.

Risks to be reduced by the actions below:

- Harmful algal blooms as a result of high nutrient levels in run-off from fertilisers on agricultural lands & golf-courses

Initial Risk:

Moderate

Actions (see 'Review Form' on page 41 for how performance is recorded every year)

Who	Actions
Oyster farmers	19. Educate community about land-water interactions and the needs of the oyster industry

Addressing Internal Risks

Ecological Effects:

Background:

Oyster disease: The health of oysters is largely influenced by water quality, with their capacity to tolerate disturbance and disease linked to the health of the estuary. In the Manning River, oyster farmers are particularly concerned with two diseases which have the potential to impact on the two different species under cultivation.

Qx disease (caused by the parasite *Marteilia sydneyi*) impacts on Sydney rock oysters, and has been identified in the Manning River estuary. What turns the parasite from benign to virulent is not currently known, but estuary health and the resilience of the oyster are likely to play a role. Farmers therefore have a vested interest to get involved in catchment based projects, and improve estuary health. This will give oysters the best possible chance to fight off infection.

POMS (Pacific Oyster Mortality Syndrome) impacts on Pacific oysters, and whilst this virus has currently only been identified in Botany Bay, Sydney Harbour and the Hawkesbury River, it is highly virulent and has the potential to spread quickly with devastating effect. Little is known about this virus, however the University of Sydney and NSW DPI are conducting research and trialing different cultivation techniques to reduce potential impacts. <http://oysterhealthsydney.wordpress.com/>

Mudworm: Where high levels of silt persist in the water column this can affect the sensitive feeding apparatus of oysters. This can lead to infestations of mudworm, a parasite that can severely impact the health of oysters, and in many cases result in mortality.

Deep water oyster harvesting: The Manning River is the only estuary in which deep water oyster harvesting is practiced in NSW. Leases are approved by NSW DPI (Fisheries) for this method of cultivation, and are typically in deep water with a hard substrate.

Pacific oysters: Whilst Manning River oyster farmers are approved to trial the cultivation of triploid (sterile) pacific oysters, wild populations of diploid (fertile) pacific oysters are listed as a noxious species in the Fisheries Management Act. This introduced pest settles as over-catch on cultivated stock and can seriously affect the commercial viability of the industry.

Risks to be reduced by the actions below:

- Loss of stock through disease outbreaks (e.g. Qx in SRO)
- Oyster stocks infected with mudworm
- Damage to fauna & flora through deep water oyster harvesting
- Wild pacific oysters competing with native, cultivated stock

Initial Risk:

High

High

Low

Low

Actions (see 'Review Form' on page 41 for how performance is recorded every year)

Who

20.	Continue working to improve estuary and catchment health to increase oyster resilience	Oyster farmers
21.	Report mortalities above 5% to NSW DPI	Oyster farmers
22.	Further understanding of POMS and those cultivation techniques that mitigate virus impact	Oyster farmers
23.	Engage with researchers working on mudworm and its management	Oyster farmers
24.	Monitor for, and report any significant damage to fauna & flora as a result of deep water oyster harvesting	Oyster farmers
25.	Continue to cull wild pacific oysters when encountered	Oyster farmers

Noise & Visual Pollution:

Background:

In 2006, NSW Department Primary Industries developed the NSW Oyster Industry Sustainable Aquaculture Strategy (OISAS) that includes criteria for acceptable lease materials & maintenance as well as their visual amenity. NSW DPI are currently reviewing the NSW OISAS. All farmers should be provided with copies of the new strategy upon release. See www.dpi.nsw.gov.au for more information. Manning River Oyster Farmers take great pride in the appearance of their leases and a lot of work has recently been undertaken to upgrade infrastructure.

The aesthetics of lease areas & shed sites is one of the main community concerns about oyster farming throughout coastal NSW. This uneasiness stems from a lack of understanding & appreciation of industry needs. Communication is a key component of the EMS, and farmers will work to engage with the local community to demystify the industry. The first step is the distribution of the EMS.

Noise issues are particularly relevant to shed sites which use a variety of equipment & practices that emit noise. Farmers take common sense steps towards minimising noise and leases are only normally worked between 7am – 6pm, depending on tides and weather conditions.

Risks to be reduced by the actions below:

- Visual pollution of leases that have not been maintained (incl. derelict leases)
- Noise from oyster farming activities

Initial Risk:

Significant
Low

Actions (see 'Review Form' on page 41 for how performance is recorded every year)

	Who
26. Maintain leases for visual amenity as outlined in the Oyster Industry Sustainable Aquaculture Strategy (OISAS)	Oyster farmers
27. Launch and distribute EMS to educate community and local authorities	Oyster farmers
28. Utilise opportunities to engage & educate community about farming practices	Oyster farmers
29. Follow NSW DPI best practice guidelines for noise as outlined in the NSW Oyster Industry Sustainable Aquaculture Strategy (OISAS)	Oyster farmers

Resource Use:

Background:

Recognising that potable water is a valuable resource, farmers are committed to minimising water consumption & wastage. They will also investigate options to re-use grey water where appropriate, & any opportunities to offset the cost of rainwater tank installation. This will enable farmers to harvest run-off from shed roofs, and use this rainwater to clean equipment and machinery.

Oyster farmers are conscious of the rising costs of electricity and carbon emissions associated with conventional, coal powered energy production. Renewable sources of electricity, such as solar power, would provide farmers with a responsible, alternative means to power tools & machinery at shed sites.

Risks to be reduced by the actions below:

- Potable water used to clean equipment & oysters
- Resource use & carbon emissions associated with use of mains electricity

Initial Risk:

Significant
Significant

Actions (see 'Review Form' on page 41 for how performance is recorded every year)

	Who
30. Install rainwater tanks to minimise use of potable water	Oyster farmers
31. Reuse grey water where appropriate	Oyster farmers
32. Install solar panels to minimise resource use and carbon emissions	Oyster farmers

Air Quality:

Background:

Engines: There are currently no Australian regulations or standards that limit air or water emissions from marine outboard engines. However, as all marine engines sold in Australia are imported mainly from the US or Japan, many do comply with emission standards applicable to the country of origin. On the other hand overseas manufactures produce high emissions marine outboard engines to sell in unregulated markets such as Australia.

There are moves for Australian emissions standards to be enacted, which are likely to be modelled on the 2010 USA standards for rating the environmental performance of outboards. Motors meeting these standards have significantly lower air and water emissions than conventional outboard motors and are also more fuel efficient.

Burning Old Infrastructure: For many years, tarred & treated timber has been used to increase the durability of cultivation infrastructure, protecting it from marine borers. This practice is now being phased out with the development of re-useable hard plastic products. Whilst lease conversion to re-useable hard-plastic products is undoubtedly beneficial to the environment, it is a time consuming and costly exercise to buy new equipment and also to dispose of old waste materials. Whilst burning of rubbish and old oyster infrastructure is not part of normal farming practice, farmers may be tempted to burn items such as treated timber and office refuse at certain times.

Moving forward, the Manning River Oyster Farmers will adopt a reuse or dispose approach to old infrastructure. In some circumstances, the wood removed from a lease might still be structural sound. Rather than the costly and wasteful act of disposing of this material at landfill, farmers may choose to sheath the wood in plastic to prevent any further leaching of contaminants, and then re-use on a lease. Material that cannot be re-used without causing environmental damage, will be dried and disposed at a suitable EPA approved waste management facilities.

Risks to be reduced by the actions below:

- Inefficient engines resulting in high emissions
- Release of airborne contaminants from burning cultivation infrastructure

Initial Risk:

Significant
Significant

Actions (see 'Review Form' on page 41 for how performance is recorded every year)

Who

33.	Consider upgrading to EPA approved motors when replacing	Oyster farmers
34.	Australian outboard emission standards circulated to farmers upon release	OceanWatch
35.	Where no environmental harm may result, adopt principles of reuse and recycle	Oyster farmers
36.	Other material to be disposed of at licenced EPA approved waste management facilities	Oyster farmers

Tar & Treated Timber Infrastructure:

Background:

For many years, tarred & treated timber has been used to increase the durability of cultivation infrastructure, protecting it from marine borers. There is no evidence indicating that this contaminates the oysters or neighbouring species (White, 2001), however over time the potential exists for chemicals in these wood preservatives to leach into the surrounding waters.

Oyster farmers throughout NSW are now phasing out the use of tarred & treated timber by converting to polyurethane trays, plastic sleeved timber posts, or adopting alternative farming methods using hard plastic baskets and floating pillows (see section 2.3. *Farming Methods* for more details). Converting to these new products will reduce ongoing maintenance requirements and associated costs, and also eliminate potential contaminants entering the estuary. There are a few tar pits remaining in the area, however the local oyster farmers are committed to their eventual removal.

Many farmers are working towards the exclusive use of re-useable plastic products, but this is a costly, time consuming and labour intensive task. While conversion to non-degradable products will ultimately save the farmers time and money, the sheer logistics of such an operation means the change will not occur overnight.

In some circumstances, the wood removed from a lease might still be structural sound. Rather than the costly and wasteful act of disposing of this material at landfill, farmers may choose to sheath the wood in plastic to prevent any further leaching of contaminants, and then re-use on a lease.

Risks to be reduced by the actions below:

- Contaminants from treated & tarred timber infrastructure leaching into the estuary
- Tar leaching from pit / application area into surrounding area

Initial Risk:

Significant

Low

Actions (see 'Review Form' on page 41 for how performance is recorded every year)

Who

37.	Continue phase out of treated & tarred timber infrastructure	Oyster farmers
38.	Where no environmental harm may result, adopt principles of reuse and recycle	Oyster farmers
39.	Other material to be disposed of at licenced EPA approved waste management facilities	Oyster farmers
40.	Decommission & remove tar pits	Oyster farmers

Effluent:

Background:

As well as spending considerable amount of time on the water tending their leases, the nature of commercial oyster cultivation also requires farmers to spend extended periods at their land based facilities, whether it be culling over-catch and fouling organisms, grading or maintaining equipment.

The majority of oyster farmers in the Manning River are based just off Manning Point Road, on Mitchells Island. Whilst this area is serviced by the reticulated sewage system, oyster sheds located elsewhere are not as fortunate, with effluent managed through on-site sewerage management systems (OSMS), or through the use of port-a-loos.

Expansion of the reticulated sewerage network is beyond the reach of oyster farmers. Until connection is possible, farmers with port-a-loos will seek to upgrade to OSMS, and those with existing systems will continue to inspect & maintain these amenities.

Risks to be reduced by the actions below:

- Waterway contamination from faulty toilets not connected to reticulated system

Initial Risk:

Moderate

Actions (see 'Review Form' on page 41 for how performance is recorded every year)

Who

41.	Upgrade port-a-loos to OSMS	Oyster farmers
42.	Continue to inspect and maintain current OSMS facilities	Oyster farmers
43.	Where option exists, pursue connection to the reticulated sewerage system	Oyster farmers

Chemicals, Fuel and Oil:

Background:

The main environmental concern in the use of chemicals, fuel and oil is the potential for stormwater and land contamination from spills. There is no bulk storage on site, and hence no bunding is currently employed to protect against spills. Only small quantities are held in sheds for everyday use, and these fluids are stored in appropriate canisters. Secondary containment is recommended to act as a back-up to contain spills in the unlikely event that the first container fails.

As oyster farming involves the use of a variety of machinery, including outboard engines, grading machines, tractors, fork-lifts, it is important for farmers to maintain this equipment in good condition to protect against leaks. Such maintenance is built into everyday farming activities, and is fundamental to maintain productivity.

Very few chemicals are used in oyster farming, with the most common probably being chlorine. Chlorine is used to disinfect depuration tanks, and should be stored as directed on the associated 'Safety Data Sheet'. Chlorine is corrosive & potentially hazardous to health, and all oyster farmers & employees should have access to the 'Safety Data Sheet' which should be stored with the chemical at all times.

Access to a spill kit will enable oyster farmers to respond quickly to an emergency situation, irrespective of the source of the spill. With oyster health linked to water quality, it is certainly in the farmer best interests to respond quickly and inhibit the spread of hazardous substances.

Risks to be reduced by the actions below:

- Chemicals that leak through poor storage or an adverse event
- Fuel / oil spills from oyster punts operating in the estuary
- Fuel / oil spills on land depots

Initial Risk:

Low
Low
Low

Actions (see 'Review Form' on page 41 for how performance is recorded every year)

Who

44.	Store chemicals as indicated by manufacturers with the appropriate safety data sheet	Oyster farmers
45.	Ensure all staff know how to use the chemicals and have access to the appropriate protective equipment	Oyster farmers
46.	Purchase spill containment kit	Oyster farmers
47.	Only small volumes of fuel and oil stored on site if no secondary containment	Oyster farmers
48.	Consider secondary containment of chemicals, fuel and oil (e.g. bunding)	Oyster farmers

Erosion & Sedimentation:

Background:

Due to the nature of oyster farming, growers require a land based depot than can be easily accessed from the water. For this reason, many oyster sheds are located directly adjacent to the waterway. Considering their location, any sediment displacement that occurs at oyster sheds typically flows straight into the receiving waters. Any erosion control measures considered therefore need to manage sediment on site, before mobilised soil enters the waterway.

Erosion not only impacts on estuary health through smothering seagrass & inhibiting light penetration, but can also affect the feeding apparatus of oysters and lead to infestations of mudworm. This can impact on the health of oysters, and can result in mortalities. Sediment instability at shed sites can also have severe consequences on business productivity, creating OHS issues and hinder machinery operation.

To mitigate these risks, farmers are exploring options to reduce shed-site erosion by making physical improvements to depot sites, and adjusting practices to reduce mobilisation of sediment. In other estuaries, farmers have constructed sediment sumps to retain sediment on site.

Deep water oyster harvesting occurs over hard substrate in relatively deep water (5m – 20m). The hard substrate is not easily disturbed, evidenced by the lack of substrate and clean oysters that are harvested using this technique.

Risks to be reduced by the actions below:

- Shed site erosion due to activity of farming machinery
- Disturbance of sediments through deep water oyster harvesting
- Wash from oyster punts travelling to and from leases

Initial Risk:

Low

Low

Low

Actions (see 'Review Form' on page 41 for how performance is recorded every year)

Who

49.	Improve erosion control at shed sites to minimise impact of machinery	Oyster farmers
50.	Wash gear in appropriate locations to minimise erosion	Oyster farmers
51.	Develop means to capture sediment mobilised in washing down activities	Oyster farmers
52.	Ensure that all Manning River oyster farmers are aware of the knot limits within the estuary	OceanWatch

ENVIRONMENTAL POLICY MANNING RIVER OYSTER FARMERS

Environmental Policy:

It is the policy of the Manning River Oyster Farmers to conduct all aquaculture activities in an environmentally responsible manner, appropriate to the nature and scale of operations.

The aim is to ensure that aquaculture activities do not cause environmental pollution, and that oyster growers operate under the principles of ecologically sustainable development.

To achieve this Manning River Oyster Farmers should:

- Comply with relevant laws and regulations and implement industry best practice (OISAS)
- Plan for environmental hazards and work towards mitigating their potential impacts
- Recognise and protect the cultural and aesthetic values of the Manning River and its catchment
- Cultivate oysters in a manner that minimises: resource consumption; waste production; pollution
- Communicate openly with relevant stakeholders on environmental matters
- Contribute to scientific research and innovation relevant to oyster cultivation and estuarine environments
- Strive for continual improvement



6. ANNUAL REVIEW FORM

Review compiled by:

Date of review:

Review period:

Actions:		Who:	Measured Improvement:	Measure:
1.	Identify key sites subject to effluent input & forward to key stakeholders	Oyster farmers	Map developed indicating hotspots subject to effluent input	Yes / No
		Oyster farmers	Map forwarded to key stakeholders (CMA, OceanWatch, WetlandCare Australia, Council)	Yes / No
2.	Engage with landholders and, where possible, facilitate on ground works	Oyster farmers	No. of engagements with landholders with regards to fencing, stock exclusion projects	.....
3.	Promote successful 'effluent' projects and partnerships	Oyster farmers	No. of promotional opportunities utilised to publicise successful projects	.....
4.	Report unexpected test results to council	Oyster farmers	No. of times unexpected water test results reported to council (due to <i>E.coli</i> reading)	.....
5.	Encourage regular maintenance & upgrade of pump-stations & holding tanks	Oyster farmers	No. of engagements with council about holding tanks and maintenance of pumping stations	.....
			Were these engagements successful?	Yes / No
6.	Maintain representation on the Estuary & Coastline Management Committee	Oyster farmers	Representation continued on the Estuary & Coastline Management Committee	Yes / No
7.	Contribute to the comprehensive review of the dredging strategy undertaken by council every 5 years (next is 2015)	Oyster farmers	Engaged in review process	Yes / No
8.	Report all earthworks of concern to council	Oyster farmers	No. of earthworks of concern reported to council	.....
9.	Identify key erosion sites for remediation	Oyster farmers	Map developed indicating hotspots subject to erosion	Yes / No
		Oyster farmers	Map forwarded to stakeholders	Yes / No

Actions:		Who:	Measured Improvement:	Measure:
10.	Engage with landholders, authorities and other organisations to facilitate on-ground improvements	Oyster farmers	No. of engagements with landholders with regards to bank stabilisation projects (revegetation, stock exclusion etc.)	.....
11.	Promote successful 'erosion / sedimentation' projects and partnerships	Oyster farmers	No. of promotional opportunities utilised to publicise successful projects	.....
12.	Report all earthworks of concern to council and the CMA	Oyster farmers	No. of earthworks of concern reported to council and the CMA	.....
13.	Report unexpected water test results to council	Oyster farmers	No. of times unexpected water test results reported to council (due to pH reading)	.....
14.	Request council develop and maintain a register of floodgate management plans	Oyster farmers	Request made to council	Yes / No
15.	Educate community about land-water interactions and the needs of the oyster industry	Oyster farmers	No. of educational engagement events attended	.....
		Oyster farmers	No. of educational materials distributed	.....
16.	Purchase spill containment kit	Oyster farmers	Spill containment kit purchased	Yes / No
17.	Alert RMS (T: 131256) if spills noticed and assist with containment	Oyster farmers	No. of times RMS alerted to spills	.....
		Oyster farmers	Details of any assistance provided	.....
18.	Develop Emergency Response Plans to manage emergency situations	Oyster farmers	Emergency Response Plan developed	Yes / No
19.	Educate community about land-water interactions and the needs of the oyster industry	Oyster farmers	No. of opportunities utilised to educate community regarding land-water interactions & needs of industry	.....
		Oyster farmers	Estimated no. of people educated	.....
20.	Continue working to improve estuary and catchment health to increase oyster resilience	Oyster farmers	No. of catchment projects oyster farmers have engaged in to improve estuary health	.....
21.	Report mortalities above 5% to NSW DPI	Oyster farmers	No. of reports made to NSW DPI	.....
22.	Further understanding of POMS and those cultivation techniques that mitigate virus impact	Oyster farmers	Furthered knowledge of POMS and cultivation techniques that reduce exposure	.....

Actions:		Who:	Measured Improvement:	Measure:
23.	Engage with researchers working on mudworm and its management	Oyster farmers	No. of engagements with researchers working on mudworm and its management	.....
24.	Monitor for, and report any significant damage to fauna & flora as a result of deep water oyster harvesting	Oyster farmers	Incidence of damage to fauna & flora from deep water oyster harvesting	.....
25.	Continue to cull wild pacific oysters when encountered	Oyster farmers	Estimate of wild pacific oysters culled through the year	.....
26.	Maintain leases for visual amenity as outlined in the Oyster Industry Sustainable Aquaculture Strategy (OISAS)	Oyster farmers	No. of reasonable complaints received regarding the visual aspects of oyster leases	.....
27.	Launch and distribute EMS to educate community and local authorities	Oyster farmers, OceanWatch	EMS launched	Yes / No
		Oyster farmers, OceanWatch	EMS distributed to key stakeholders & authorities	Yes / No
28.	Utilise opportunities to engage & educate community about farming practices	Oyster farmers	No. of publicity / promotional opportunities utilised to discuss oyster farming practices	.....
29.	Follow NSW DPI best practice guidelines for noise as outlined in the NSW Oyster Industry Sustainable Aquaculture Strategy (OISAS)	Oyster farmers	No. of reasonable noise complaints received	.....
30.	Install rainwater tanks to minimise use of potable water	Oyster farmers	No. of rainwater tanks installed	.....
31.	Reuse grey water where appropriate	Oyster farmers	No. of grey water initiatives developed	.....
		Oyster farmers	% estimate of grey water reused	%
32.	Install solar panels to minimise resource use and carbon emissions	Oyster farmers	No. of solar panels installed	.....

Actions:		Who:	Measured Improvement:	Measure:
33.	Upgrade to EPA approved motors when replacing	Oyster farmers	No. of outboards replaced with EPA approved motors	.....
34.	Australian outboard emission standards circulated to farmers upon release	OceanWatch	Australian Outboard Emission Standards Circulated	Yes / No
35.	Where no environmental harm may result, adopt principles of reuse and recycle	Oyster farmers	% estimate of oyster infrastructure removed from estuary that has been reused / recycled	%
36.	Other material to be disposed of at licenced EPA approved waste management facilities	Oyster farmers	Amount of oyster infrastructure that has been disposed at licenced waste management facilities	kg
37.	Continue phase out of treated & tarred timber infrastructure	Oyster farmers	Amount of treated & tarred infrastructure removed from the estuary	kg
38.	See Action 35.			
39.	See Action 36.			
40.	Decommission & remove tar pits	Oyster farmers	No. of tar pits remaining in the local industry	.....
41.	Upgrade port-a-loos to OSMS	Oyster farmers	No. of port-a-loos in use at shed sites	.....
42.	Continue to inspect and maintain current OSMS facilities	Oyster farmers	No. of times toilet facilities have failed	.....
43.	Where option exists, pursue connection to the reticulated sewerage system	Oyster farmers	No. of sheds not connected to the reticulated sewerage network	.....
44.	Store chemicals as indicated by manufacturers with the appropriate safety data sheet	Oyster farmers	No. of chemicals containers stored inappropriately or without the correct safety data sheet	.....
45.	Ensure all staff know how to use the chemicals and have access to the appropriate protective equipment	Oyster farmers	Does all staff know how to use chemicals on site?	Yes / No
		Oyster farmers	Is the appropriate protective equipment available and in good working order?	Yes / No
46.	See Action 16.			

Actions:		Who:	Measured Improvement:	Measure:
47.	Only small volumes of fuel and oil stored on site if no secondary containment	Oyster farmers	No. of fuel / oil containers larger than 20l stored at shed sites without secondary containment	.....
48.	Consider secondary containment of chemicals, fuel and oil (e.g. bunding)	Oyster farmers	No. of secondary containment measures put in place	.....
49.	Improve erosion control at shed sites to minimise impact of machinery	Oyster farmers	No. of physical improvements to shed sites that help manage erosion caused by machinery	.....
		Oyster farmers	No. of changes in practice that have occurred to help manage erosion caused by machinery	.....
50.	Wash gear in appropriate locations to minimise erosion	Oyster farmers	No. of changes in practice that have occurred to help manage erosion caused by washing down	.....
51.	Develop means to capture sediment mobilised in washing down activities	Oyster farmers	No. of collection sumps / sediment collection mechanisms in place	.....
52.	Ensure that all Manning River oyster farmers are aware of the knot limits within the estuary	OceanWatch	Knot limits distributed	Yes / No

7. SUPPORT FOR OYSTER FARMERS

RURAL SUPPORT PROGRAM



The Rural Support Program works with rural communities to improve their attributes of resilience through greater knowledge, skills and practices and the development of plans to face future adverse climatic events. Rural communities and individuals are also assisted during dry periods and to recover following other emergencies, such as Natural Disasters.

The program interfaces with existing programs within NSW DPI, such as climate adaptation and emergency management and networks with other agencies to develop human skills that contribute to the attributes of resilience. Existing programs are strengthened by integrating initiatives focused on climate variability and natural disasters, within NSW Primary Industries and the other providers of support to rural communities.

The primary audience is individuals, farm businesses and the rural communities in which they reside. Particular attention is given to disaster risk identification and reduction through planning and management at the prevention, preparation and recovery phases of natural disaster management

Contact your local Rural Support Worker for a specific projects and activities:

Location	Rural Support Worker	Office number	Mobile	Email
ORANGE	Cheryl Pope (Team Leader)	6391 3948	0428 435 593	cheryl.pope@dpi.nsw.gov.au
GRAFTON	Jan Bruce	6640 1600	0427 257 191	jan.bruce@pi.nsw.gov.au
GUNNEDAH	Jenny Croft	6741 8336	0429 446 417	jenny.croft@dpi.nsw.gov.au
DUBBO	Pip Brown	6881 1266	0429 396 697	pip.brown@dpi.nsw.gov.au
SCONE	Caroline Long	6544 4900	0428 296 332	caroline.long@dpi.nsw.gov.au
GOULBURN	Dick Kearins	4828 6600	0427 781 514	dick.kearins@dpi.nsw.gov.au
HAY	Danny Byrnes	6993 1608	0428 973 141	danny.byrnes@dpi.nsw.gov.au
ALBURY	Di Pritchard	6051 7703	0417 231 852	di.pritchard@dpi.nsw.gov.au

A large rectangular area with a solid black border, containing numerous horizontal dashed lines for writing.