


# Clyde River Oyster Farmers

## Environmental Management System

A voluntary, industry driven,  
environmental initiative



## Review:

An EMS is an ongoing process of environmental management, requiring periodic review to update risks and to ensure that policy objectives are still relevant. Bringing oyster farmers together and undertaking a review also ensures that actions are being maintained, or introduced in line with relevant responsibilities and targets.

The original EMS was created for the Clyde River Oyster Farmers by OceanWatch Australia in 2007. The table below provides review details since adoption of the original document.

<b>Date:</b>	<b>Version:</b>	<b>Reviewed by:</b>
2007	1	Clyde River Oyster Farmers & OceanWatch Australia
2012	2	Clyde River Oyster Farmers & OceanWatch Australia

## Clyde River Oyster Farmers (CROF):

In this document, 'Clyde River Oyster Farmers' (CROF) refers to those growers who are committed to this Environmental Management System, as specified in Section 6.

The Clyde River Oyster Farmers maintain a website at [www.clyderiveroysterfarmers.com.au](http://www.clyderiveroysterfarmers.com.au)

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# 1. Introduction

The Clyde River Oyster Farmers (CROF) 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 are developed.

An Environmental Management System is a step-by-step process to identify and manage environmental impacts, risks and opportunities on a continual basis. It is an industry-based initiative that seeks to contribute to the sustainability of oyster farming, as well as increase community understanding of cultivation methods used and the management and regulations that apply to the industry.

This Environmental Management System (EMS) documents how Clyde River Oyster Farmers (CROF) are meeting this responsibility, and how they continue to improve their performance in light of future developments in technology and practice. The EMS also outlines how the CROF will cooperate with natural resource managers and the community to assist in the management of the estuary.

The oyster farmers have an intimate understanding of the Clyde River, with their livelihood dependant on the health and productivity of the estuary. Given their position and relationship with the river, the oyster farmers are a unique resource which can be utilised by natural resource managers to improve management of the local environment.

The oyster farmers of the Clyde River, like all oyster farmers, operate according to a very simple equation:

**Good water quality = Good product = Regional employment and investment**

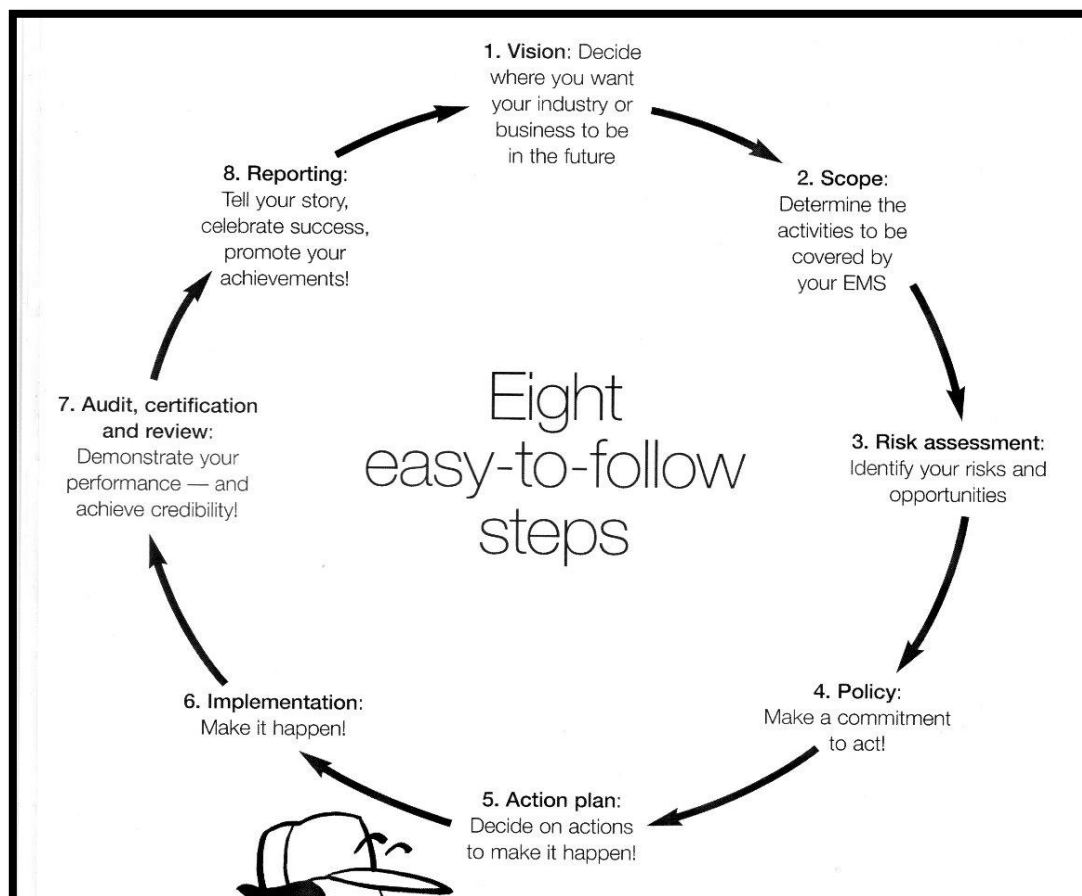
## 2. Clyde River Oyster Farmers Environmental Management System

### 2.1 Aims of Environmental Management System

This Environmental Management System (EMS) aims to:

- Provide a basis for the Clyde River Oyster Farmers to communicate and cooperate with natural resource managers and the community on the environmental management of oyster farming practices, the Clyde River and its catchment,
- Document how the Clyde River Oyster Farmers are currently meeting their responsibility to operate sustainably and responsibly,
- Manage the identification and adoption of new techniques and technology to continually improve operations, and
- Be a 'living' document that can be reviewed and updated to adapt and address new risks and opportunities.

### 2.2 EMS development



**Figure 1. The process to successfully develop and implement an Environmental Management System (adapted from Seafood Services Australia, 2005)**

Initial development of this EMS started with the formation of a 'cluster' group consisting of individual oyster farmers operating on the Clyde River. This occurred in March 2006 following an EMS workshop organised by Ross Ord from Seafood Services Australia (SSA), and presented by Col Dyke, an oyster farmer from Little Swanport Bay, Tasmania who had been involved in SSA's EMS pilot project. This cluster group then explained to the other farmers on the estuary what an EMS was and how it could benefit the oyster businesses on the river. All farmers then understood and agreed to the benefits of setting up an EMS for the river and decided to move forward with the initiative and form a larger group, the *Clyde River Oyster Farmers Cluster Group*. This step should not be understated as it required all members to have similar aspirations for their local industry. The group would like to acknowledge Seafood Services Australia, in particular Ross Ord as well as the coordinated efforts of Jillian Keating (Southern Rivers Catchment Management Authority) and Ana Rubio (researcher with the University of Wollongong) for their assistance.

The Clyde River Oyster Farmers then contributed cash to boost seed funding provided by the Department of State and Regional Development to further develop the EMS. Part of the money from the Department of State and Regional Development grant was used to fund a consultant from the SeaNet program (a national environmental extension service run by OceanWatch Australia) to assist with the writing of the document. OceanWatch Australia is a not-for-profit organisation committed to protecting fish habitats, improving water quality and promoting sustainable fisheries.

This EMS was compiled with regard an International Standard, ISO 14001:2004. This standard describes the general requirements for an Environmental Management System, establishing a common reference for communicating about environmental management issues.

A simple risk assessment process was used as a basis for this EMS (Appendices 1 & 2) and involved identifying all the apparent environmental risks associated with the operations of the Clyde River Oyster Farmers, ranking their significance, identifying current control measures and identifying feasible improvements.

If this EMS does not address a particular issue, it is likely that the issue was initially considered in the risk assessment, but did not rank significant enough to require a specific management response. Enquiries regarding the risk assessment and adequacy of management responses should be raised with the Clyde River Oyster Farmers.

Some issues that were assessed as low risk have still been included in the EMS. Such issues may be of concern to the community, so retaining them in the assessment promotes transparency and encourages community questions and engagement. It also allows the CROF to describe the current control measures already in place.

### **2.3 EMS scope**

The scope of this EMS is limited to:

- 1) Environmental aspects concerning the operations of Clyde River Oyster Farmers,
- 2) Ways in which the Clyde River Oyster Farmers may work with other stakeholders on improving the environmental quality of the Clyde River and its catchment.

**Note:** It is important to note that in future versions of this EMS the scope may broaden to cater for wider issues if required and/or become more detailed concerning specific matters.

## 2.4 EMS in relation to other management mechanisms

This EMS is designed to complement existing policies and laws that control or guide oyster farming and natural resource management in NSW. These include:

The Fisheries Management Act	1994
The Marine Parks Act	1997
Environmental Protection & Biodiversity Conservation Act	1999
Environmental Protection & Biodiversity Conservation Regulations	2000
The Fisheries Management (General) Regulation	2002
Creek Management Policies for Joes, Wimbie, Short Beach and Surfside Creeks	2004
Batemans Bay & Clyde River Estuary Management Plan	2005
Clyde River Water Management Plan	2005
New South Wales Oyster industry – Sustainable Aquaculture Strategy	2006
Batemans Bay Marine Park – Zoning Plan & User Guide	2006
Clyde River National Park – Plan of Management (Draft)	2009
Southern Rivers CMA - Catchment Action Plan	2010
NSW Shellfish Industry Manual	2011

**Table 1. Existing policies and laws that guide oyster farming in the Clyde River**

## 2.5 EMS review and communication

This EMS documents an ongoing process of environmental management, and therefore requires a periodic review to check that the policy objectives are still relevant and adequate, and actions are being maintained or introduced in line with the relevant responsibilities, timeframes and targets. The review process is outlined in objective 4 of the Action Plan and the Clyde River Oyster Farmers will strive to continually provide the community and stakeholders with regular reports on the progress towards completing actions outlined in this EMS.

Communication is one of the main aims of this EMS. This EMS is a forum for natural resource managers and the community to learn about the environmental credentials and initiatives of the Clyde River Oyster Farmers, and how they engage and work with stakeholders to continually strive for further environmental improvements.

## 2.6 EMS emergency response

The risk assessment (Appendices 1 & 2) did not identify any potential for the operations of the Clyde River Oyster Farmers to lead to an environmental emergency (i.e. a significant environmental impact that occurs over a short period of time).

The Clyde River Oyster Farmers are unlikely to contribute significantly to water pollution, but Actions 8,9 & 10 describe the response to a water pollution emergency whether it is due to the operations of oyster growers or not.

## **2.7 EMS contravention**

This EMS is a voluntary commitment by Clyde River Oyster Farmers to document and maintain environmental best practice. It is not enforceable.

Incidents where the Clyde River Oyster Farmers fail to reasonably comply with this EMS will be recorded and investigated. Failures may be:

- Intentional or unintentional
- An indication of inappropriate policy or actions in the EMS
- Due to highly unusual circumstances

Responses might include no action, a review of the EMS, and/or training for the Clyde River Oyster Farmers. Any EMS contravention will be noted in the following EMS report.

The Clyde River Oyster Farmers cannot be responsible for the actions of oyster growers in other estuaries, but will encourage all oyster growers operating in the area to work with the same duty of care outlined in this EMS.

## **3. The Clyde River**

### **3.1 Catchment summary**

The Clyde River is located on the New South Wales South Coast approximately 290km south of Sydney and 150km southwest of Canberra (figure 2). The Clyde is one of the larger rivers of NSW covering a waterway area of 30km<sup>2</sup> and draining a catchment of approximately 1800km<sup>2</sup>. The catchment is mainly undeveloped, consisting of 44% State Forest, and 47% National Park (Cavanagh *et al.*, 2005). Development is concentrated where the Clyde River meets the Tasman Sea at Batemans Bay. The entrance has a training wall on the south side behind which is the township of Batemans Bay. The southern shoreline of the bay is more densely populated than the north side; however the area to the north is expanding due to increasing population across the region.

The Clyde River waterway contains many significant areas of mangroves, seagrass, salt-marsh and wetlands and is recognised by the NSW Government as a river of 'High Conservation Value'. Several major tributaries enter the Clyde in the tidal zone (~38km from the mouth) including Cullendulla Creek, Mcleods Creek, Waterfall Creek, Buckenbowra River, Sheep Station Creek, and Cyne Mallowes Creek. The Clyde River is also one of only a few coastal rivers that deliver sand to the coastal zone (NSW Food Authority, 2005).

Recognising the importance of the local oyster industry, ~187 ha of the Clyde River is currently classified by the NSW Department of Primary Industries as priority oyster aquaculture areas (figure 3). This is down from a historical lease area exceeding 235 ha.

### **3.2 Batemans Marine Park**

The Batemans Bay Marine Park was established by the NSW Government in April 2006, with the zoning plan coming into effect in June 2007 following a lengthy community and stakeholder consultation process. The Marine Park covers approximately 85,000ha, extending from the north end of Murramarang Beach near Bawley Point, to Wallaga Lake in the south. It includes all of the seabed and waters from the mean high water mark on the coast to three nautical miles offshore. It includes all estuaries, creeks, rivers and lakes to the limit of tidal influence. The park is designated 'multi-use', although trawling, long lining and dredging are prohibited from the entire park (see figure 4).

The CROF were considered as a key stakeholder and information resource for this process and will continue to be actively involved in any ongoing marine park development, so that it is done in an inclusive and equitable manner.

The CROF support efforts to conserve estuarine and marine biodiversity, and will assist the Marine Park Authority through their intensive water quality monitoring regime, intimate understanding of the system and scheduled catchment works (outlined in the Action Plan - Section 5) to maintain the high conservation value of the Clyde River.

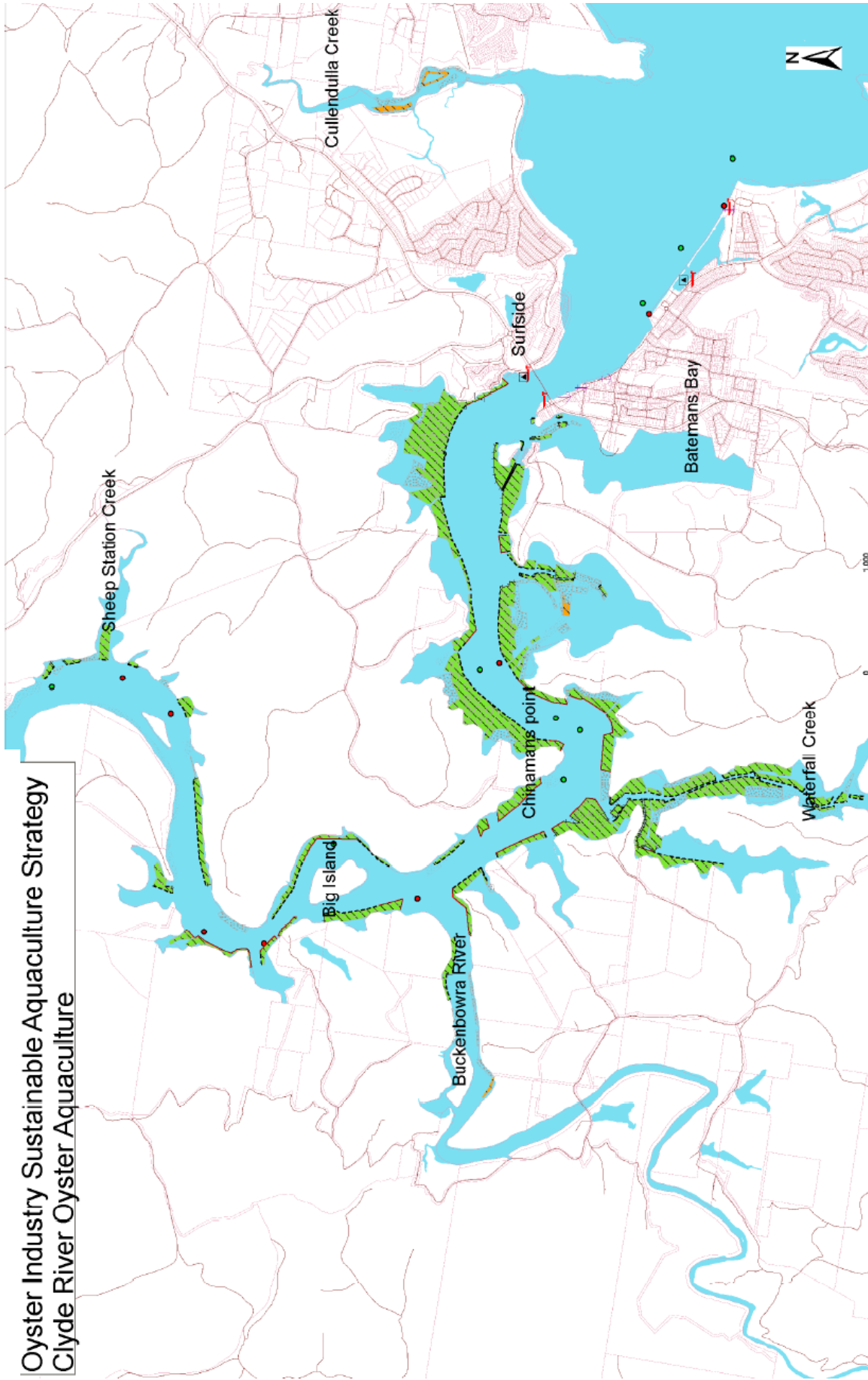
As indicated on figure 4 the vast majority of the Clyde River is designated a 'Habitat Protection Zone', with a number of 'Sanctuary Zones' classified in Buckenbowra River, Waterfall Creek and Pelican Inlet. There is also a Special Purpose Zone on the south side of the river.

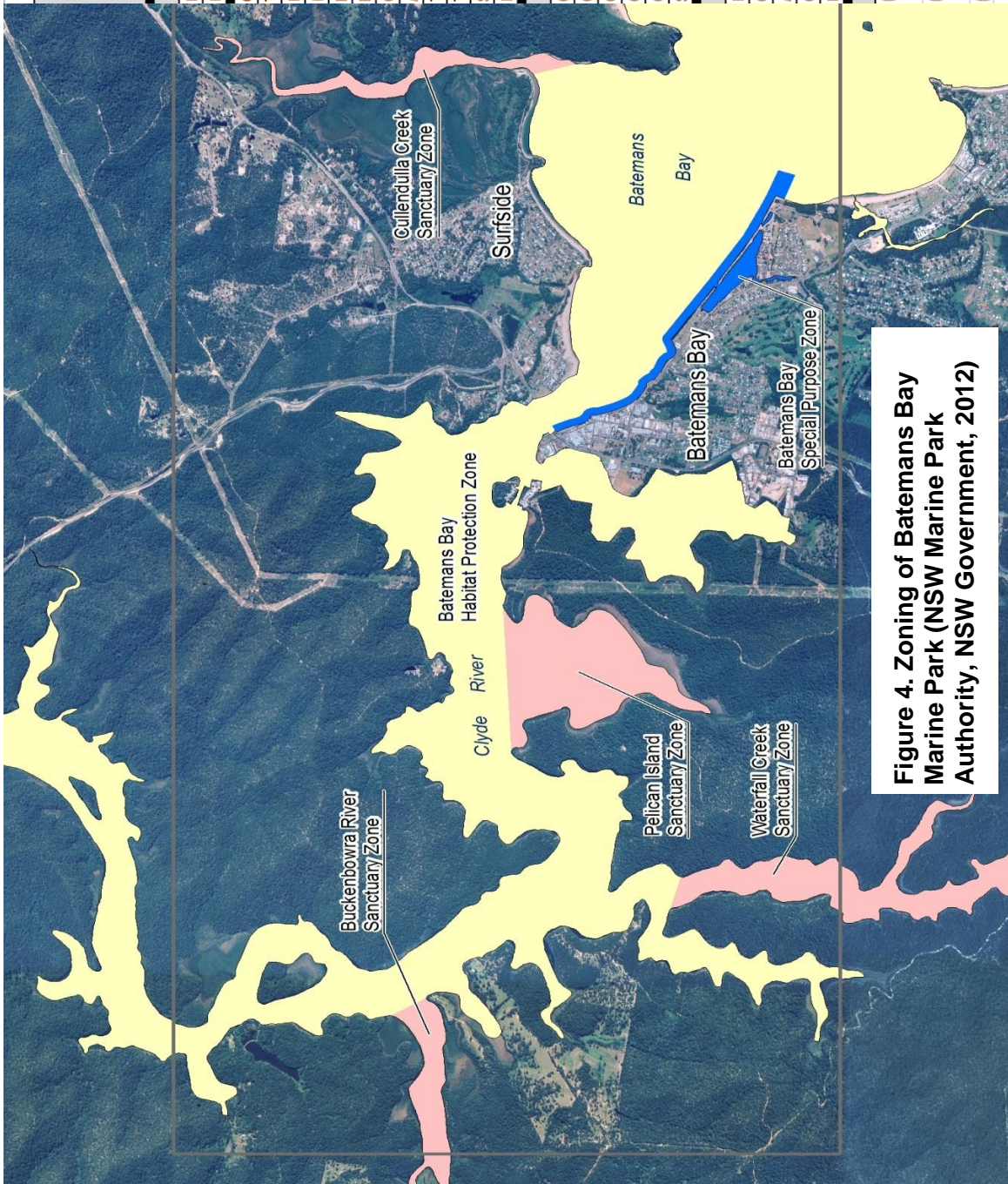
# Clyde River & Jervis Bay Catchments



**Figure 2. Clyde River catchment location and land uses (Office of Environment & Heritage, NSW Government, 2012)**

Figure 3. (NSW DPI, NSW Government, 2006)  
Oyster Industry Sustainable Aquaculture Strategy  
Clyde River Oyster Aquaculture





**Figure 4. Zoning of Batemans Bay Marine Park (NSW Marine Park Authority, NSW Government, 2012)**

Activity	Zone		
	Habitat Protection Zone	Sanctuary Zone	Special Purpose Zone
<b>Recreational fishing</b>			
Line, spear, trap & net	✓(2)	x	✓
Hand haul prawn net	x	x	x
<b>Commercial fishing</b>			
Trawl, dredge, long-line	x	x	x
Purse seine net, lift net	x	x	x
Haul net	x	x	x
Estuary prawn & haul net	x	x	x
Estuary mesh net	x	x	x
Garfish net	x	x	x
Abalone	✓	x	✓
Turban & urchin	✓	x	✓
Trapping	✓	x	✓
Set line	x	x	x
Drift line	x	x	x
<b>Fishing &amp; Collecting</b>			
Collection of baitweed by hand	✓	x	✓
Collecting of cunjevoi	x	x	x
Collecting of invertebrates	✓	x	✓
Collecting dead shells (g)	✓	x	✓
Collecting beached seaweed (h)	✓	x	✓
Sharks (except school & gummy)	x	x	x
<b>Other Activities</b>			
Research	P	P	P
Competitions and organised events	P	P	P
Anchoring	✓	✓(3)	✓
Commercial operations	P	P	P
Infrastructure development	P	P	P

✓ = Allowed, x = Prohibited, P = Permit required  
 (1) Fisheries Management Act 1994 applies (gear restrictions, bag & size limits, licence requirements)  
 (2) Seasonal fishing restrictions and/or bait collecting restrictions apply in some zones  
 (3) Not over seagrass

### **3.3 Sydney Rock Oyster (*Saccostrea glomerata*)**

The Sydney Rock Oyster (SRO) is endemic to Australia and is found in bays, inlets and sheltered estuaries from Harvey Bay in Queensland, south to Wingan Inlet in eastern Victoria. It is capable of tolerating a wide range of salinities and occupies the intertidal zone to 3 m below the low water mark. Within this range they are common on hard rocky substrates but can survive and grow on soft 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. The main spawning season in the Clyde River is from December to March. 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 the 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 will remain settled in that location for the rest of their life.

Growth rates vary with local conditions, but generally Sydney Rock Oysters reach 40–60 g 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 generally 75 % of prime eating oysters are female.

All oysters are filter feeders, straining organic material (mainly plankton) from the surrounding water. Mortality is highest in the free swimming and 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 (*Myliobatidoidei*), mud crabs (*Scylla*), whelks (*Neogastropoda*) and starfish (*Asteroidea*) all feed on adult oysters.

The Sydney Rock Oyster industry in New South Wales has been threatened by the introduction of the Pacific Oyster (*Crassostrea gigas*), which was originally introduced to Tasmania from Japan in the 1940's for aquaculture purposes. They found their way into NSW waters in the 1980's, and have now spread and invaded intertidal habitats of many coastal waterways. A 2010 survey found populations of Pacific Oysters in all NSW estuaries south of the Macleay River.

Pacific Oysters are a hardy species with fast growth and high reproductive rates. They can dislodge newly settled Sydney Rock Oysters and could potentially out-compete and smother the native species. Declared a Class 2 Noxious Species in all NSW waters except Port Stephens, the possession and sale of Pacific Oysters may only occur under a specific permit issued by the NSW Department of Primary Industries. Authorised to cultivate hatchery reared and genetically-sterile triploid Pacific oysters, there are now a number of estuaries in NSW who are trialling this species including: Wapengo Lake; Shoalhaven River; Georges River; Hawkesbury River, Port Stephens and the Manning River.

### 3.4 Flat Oyster (*Ostrea angasi*)

Flat Oysters, also known as Angasi Oysters, are found naturally along the NSW, VIC, TAS, SA and southern WA coasts. These oysters were first referred to as 'Mud Oysters' as it was initially thought that the oyster lived under mud. It was later discovered that the larvae of Angasi settle on hard substrates before breaking free later in life to rest on sand or soft mud. Flat Oysters cultivated in the Clyde River reach market size in about the same time as the SRO oysters, i.e. ~3 years. Compared with Sydney Rocks, Flat Oysters are more difficult to cultivate and typically develop a stronger flavor over their life. The challenges involved in cultivation are offset with slightly higher market prices.

A number of innovative farmers (particularly on the south coast) have now set up hatcheries specifically for flat oysters in efforts to grow this market. NSW DPI have also been trialing hatchery production for some time as a means to help the Sydney Rock Oyster industry to develop new product lines suitable for both local consumption and for export. The hatchery spat produced by NSW DPI is supplied to oyster farmers with field sites in Pambula Lake, Merimbula Lake, Wagonga Inlet, Batemans Bay, Port Stephens and the Yamba River.

### 3.5 Oyster farming and estuary health

Estuaries are highly complex, dynamic and fragile environments that support an enormous range of plant and animal species. Oysters are recognised as critical indicators of estuary health because they are filter feeders, extracting plankton, bacteria, suspended solids and inorganic particles from the surrounding water. In this way, they concentrate substances in the water and their reactions provide clear and early warnings of potential declines in estuary health.

No anthropogenic inputs such as pesticides, fertilisers or artificial feeds are used in oyster farming, so productivity is largely dependent on estuary health. In turn, estuary health depends on an enormous range of factors, most of which oyster farmers have little or no control over.

Over 75% of the NSW population live, work or holiday near estuaries. This means there is a range of potential impacts on fragile estuaries, many of which have a detrimental effect on the oyster industry. General impacts on NSW estuaries are listed below and specific risks outlined by the Clyde River Oyster Farmers have been included:

- **Heavy metal and oil pollution from urban runoff, industrial sites, and boating activities.**  
*Clyde River: Traces of tributyltin (TBT) in sediments at proposed new marina site; Industry zones in close proximity to salt-marsh areas (e.g. Mcleod's Creek); Large increase in boating activity with potential pollution emanating from bilge water and older carburettor style two-stroke engines; Uncapped amount of river moorings; Risk of vessels breaking away from temporary moorings; Unrestricted maintenance to vessels whilst on moorings.*
- **Elevated nutrient, chemical, bacteria and virus levels from agricultural and urban runoff, sewage effluent discharges, and leaks from septic tanks.**  
*Clyde River: Insufficient pump out facilities to cope with the large increases in boating activity; Potential contamination from poorly maintained septic systems; Lack of stormwater facilities/education; Unrestricted cattle access to river; Insufficient infrastructure to cope with population increases in peak holiday periods.*

- **Habitat destruction through development, reclamation and poor cattle management.**  
*Clyde River: Illegal land clearing at non-approved sites; Poor stock management; Development infringing on salt-marsh and mangrove areas.*
- **Changes to flows (i.e. ground water use, weirs, dams and water extraction) to provide water to industry, agriculture and homes, leading to unnatural sedimentation, changes in salinity and tidal flushing, and barriers to fish passage.**
- **Direct use of the waterway by a large number of different users and associated impacts such as boat wash and pollution.**  
*Clyde River: Emissions from older engines; Wash from recreational boating activities such as water skiing and wakeboarding – particularly between Nelligen and Shallow Crossing where significant boat-induced erosion has been recorded; Pollution emanating from primitive/illegal camp sites.*
- **Acid pollution from acid sulphate soils exposed to air due to agricultural practice, water extraction, dredging and development activities.**  
*Clyde River: Illegal land clearing at non-approved sites;*
- **Sand and gravel extraction.**
- **Elevated levels of sediments from agriculture, land clearing, roads, land reclamation and urban runoff.**  
*Clyde River: Illegal land clearing leading to erosion; Unformed crown roads crossing creeks.*
- **Changes to hydrology from dredging and armouring for boat passage.**
- **Gross pollutants (litter) and leachate from dumped waste.**  
*Clyde River: Increased litter due to increases in boating activity; Illegal camping and dumping; Insufficient pit basket maintenance.*
- **Removal and redistribution of marine organisms by recreational and commercial fishers.**

### **3.6 Water quality monitoring**

Due to the risks to estuary health outlined above, the Clyde River Oyster Farmers maintain a regular water and meat quality monitoring regime to ensure that immediate action can be taken should pollution levels threaten the health of the Clyde River and the viability of oyster stocks. An independent sampling officer is employed to conduct testing every two weeks, however should the officer be unavailable, then registered farmers are authorised to step into the role. Water and meat quality samples validate each farmer's seafood licence issued by the NSW Food Authority and they are required to pay a substantial local levy to fund costs involved with this monitoring. This information is of great benefit to the wider community in terms of monitoring general catchment health. The long-term, standardised data-set provides an invaluable record of changing environmental parameters. The CROF therefore contribute to the scientific understanding of the waterway.

There are two harvest areas in the Clyde River that have been classified by the NSW Food Authority for the harvesting of oysters. Both areas have been granted Conditional Approval in accordance with the requirements of the ASQAP (Australian Shellfish Quality Assurance

Program) manual (the Shellfish Harvest Area Classification (HAC) scheme). This accreditation allows oyster growers to directly harvest from their leases when water quality monitoring results fall within strict parameters without the need for depuration (Table 2). Depuration is a statutory process that requires oysters to be placed in a sterilised recirculation tank for the 36 hours. During this process the oysters self cleanse in recirculated water, which is sterilised using ultraviolet light (NSW Department of Primary Industries, NSW Government, 2006).

Harvest Area	Approved (Direct Harvest)	Conditional (Depurate)	Closed
Moonlight	Rainfall <30mm or Salinity ≥22ppt	Salinity <22ppt	Rainfall 30+mm/24hrs, 100+mm/7days or Salinity <18ppt or stream gauge height rise by 0.5m/24hrs
Waterfall	Rainfall <40mm or Salinity ≥25ppt	Salinity <25ppt	Rainfall 40+mm/24hrs, 100+mm/7days or Salinity <17ppt or stream gauge height rise by 0.5m/24hrs

**Table 2. Water quality parameters for direct harvest**

The water quality requirements set for conditional approval have been dramatically improved as a result of proactive testing and the diligence of the local co-ordinator. These actions have indicated that during various rainfall events, the parameters could be extended and still meet ASQAP guidelines for direct harvest. The table above shows water quality parameters for direct and conditional (need to depurate) harvest and circumstances where the estuary is closed (no harvest).

In addition to the Clyde River Oyster Farmers regular water and meat quality sampling regime, the group were one of the first estuaries in NSW to purchase and install a water quality monitoring buoy (figure 5). The buoy continuously measures temperature and salinity as part of the NSW Food Authority's 'estuary classification programme'. Readings from the buoy are accessible via the internet and a database has already been created to store this data.



**Figure 5. Water quality monitoring buoy in the Clyde River**

### **3.7 A history of oyster farming**

The Clyde River has a long history of oyster harvesting and cultivation, beginning as early as the 1870's. Before the granting of leases, oysters were gathered on Crown Land with a royalty paid to the Fisheries Department (Stasko, 2000). Methods in the early days varied from dredges winched back to the steep foreshores by hand, to 'tonging' boats that gathered the oysters from 3-4 metres of water using long nippers. Divers also worked in the winter months when the waters were clear (described in Stasko, 2000).

The concept of allocated leases took off in the 1890's, and with set areas to work the farmers soon realised that some degree of cultivation was necessary to maximise their investment (Stasko, 2000). Shell beds and stones supported on poles were used to catch and grow oysters, and by the 1930's this had come to include the use of stacked slate. As the slate was mined from local quarries, this method (referred to as 'pegstone') was unique to the area. Lines of pegstone are still visible today on many banks of the river.

Tray cultivation was used in combination with 'pegstone' until the 1950's when some stick cultivation was attempted, however most oysters continued to come from stone until the 1960's (Stasko, 2000). Around this time a number of Greek families moved into the area bringing with them a great deal of innovation until gradually sticks and trays were the most commonly used methods on the Clyde (Stasko, 2000).

Today, the Clyde River is the third largest producers of Sydney Rock Oysters (SRO) in NSW, behind only Wallis Lake and Port Stephens in terms of production. Based on 09/10 production figures, the Clyde River farmers produce 609,988 dozen SRO, or over 10% of NSW total production (5,812,934 dozen) (NSW Department of Primary Industries, 2010). Clyde River production in 09-10 was worth \$3,604,490. Some Clyde River Oyster Farmers also produce a small number of native, flat oysters.

## 4. Clyde River Oyster Farmers

### 4.1 Environmental Policy

#### Clyde River Oyster Farmers Environmental Policy

Our vision:

**To continue to cultivate oysters for the benefit of seafood consumers in a manner that is environmentally sustainable, profitable and universally respected**

The Clyde River Oyster Farmers recognise that the Clyde River and its catchment is a shared resource.

The Clyde River Oyster Farmers will continually monitor for improvements in environmental best practice relevant to their operations and work to adopt them.

In addition to complying with all relevant regulations and management mechanisms the Clyde River Oyster Farmers will strive to meet the following objectives.

1. Protect and enhance the habitat of the Clyde River and its catchment
2. Cultivate oysters in a sustainable manner – minimising resource consumption, waste production and pollution
3. Recognise and protect the cultural and aesthetic values of the Clyde River and its catchment
4. Conduct environmental management in a transparent and cooperative manner
5. Contribute to scientific research and management innovation relevant to oyster cultivation and estuarine environments

\* These objectives form the basis of our EMS Action Plan (Section 5).

## 4.2 Water based activities

Collectively the operations of the Clyde River Oyster Farmers utilize almost every existing method to commercially cultivate oysters. Techniques range from the conventional 'stick and tray' method to more recently developed cultivation techniques such as 'long-line and floating bags' and 'floating rafts'. Each method has advantages and disadvantages, and the choice of a particular method depends on personal preference as well as the location and features of the lease. Although a few growers hold endorsements to cultivate the native, flat oyster (*Ostrea angasi*), operations of the Clyde River Oyster Farmers is still predominately focused on producing high quality Sydney rock oysters.

Spat for cultivation can either be self-sourced by harvesting naturally occurring spat in the Clyde River system, or by purchasing spat from specialised catching farms where recruitment is consistently high (often from the mid-north coast region). More recently, commercial quantities of fast growing and disease resistant oyster spat have been made available for growers through the work of NSW DPI in Port Stephens. The desirable traits of fast growing and disease resistance have been bred by identifying and selecting particular family lines. This process is discussed later in this section.

There are numerous different techniques used for spat collection, but the basic principles for all methods are similar. Spat collectors must be constructed of a material that encourages settlement of spat, whilst providing the maximum amount of surface area for settlement. They must also provide juvenile oysters with enough protection from predators such as fish, and must either; 1) allow the oysters to be easily removed without damage, or 2) be able to provide a surface for on-growing in-situ. Two common methods of spat collection are illustrated below:



**Figure 6. Plastic slats used for spat collection.**



**Figure 7. Stick cultivation used for spat collection. The frames are placed, one-up, one-down.**

One method utilises thin strips of arced PVC plastic or 'slats' (figure 6). Numerous slats are arranged horizontally on a frame 5-10mm apart with the appearance resembling that of a Venetian blind. The frame and attached slats are then stacked on top of one another (3-5 high) to maximise the surface area and then laid flat on racks within leases exposed to the most natural spatfall. In the Clyde River the leases immediately west of Budd Island and Lattas Point are a productive catching area (figure 3). Some slats have fine ribs to encourage settlement, and to harvest spat the slats are removed and twisted. Once removed, the spat are then transferred to other grow out methods such as 'tumblers' (discussed later in this section).

Figure 7 illustrates spat collection used in stick cultivation. This method uses frames consisting of around five or six sticks approximately 100mm apart that are braced by two shorter sticks. The frames are stacked one up then one down (referring to the location of the brace on the sticks) to lessen the gap between the sticks and possible predation from fish. The frames are stacked about four high to increase the catching area and laid out on the racks. Traditionally, oyster farmers used tar to prolong the life of sticks, however the CROF have committed to phase out this practice. Some farmers now treat sticks with an emulsion solution, and then coat gear with a diluted concrete slurry. The concrete locks in any contaminants used to preserve the wood, whilst the hard surface promotes spat settlement. The emulsion treatment is used to aid adhesion of the concrete.

Once the spat have settled in sufficient quantities, and have grown to a size where predation is not a risk, the frames can be separated into two sets of two and moved to leases in areas compatible for 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 setting oyster larvae. After around 12-18 months they are separated further into single frames (figure 8) and moved to leases used for finishing the oysters.



**Figure 8. Single frames laid out on racks after being grown in sets of two**



**Figure 9. Polyurethane trays are now being used to replace timber trays**

Whilst oysters are attached to sticks they are repeatedly cleaned and dried. The drying process is used to cull natural oyster spatfall and other fouling organisms that settle on the maturing oysters. Although the oysters can remain on sticks until they reach a marketable size at around 3-4 years, most farmers choose to remove them from the sticks to complete the final stages of growth in trays (figure 9). Plastic trays require no maintenance and are being introduced to replace previously used treated timber and wire trays.

As shown in figure 9, trays divisions prevent oysters from clustering as a result of wind/waves, which would otherwise result in uneven growth. Snap on lids provide added protection from wave action and bird predation (figure 10). Similar to sticks, the trays are placed on rails (figure 11) so that the trays are intertidal; remaining underwater for the majority of the tide, but are fully exposed at low water. Exposing oysters for part of the tidal cycle is a technique used to manage fouling, and is also an important stage in toughening the oyster, strengthening the abductor muscle to prolong shelf life after harvesting.

Tarred and treated timber that has historically been used for rail construction is also being phased out of many operations and being replaced with materials such as PVC posts and plastic sheathed wooden rails, some of which are made from recycled sticks. The oysters remain in these trays, removed only for grading and culling until harvested.



**Figure 10. Snap on plastic lids provide protection from bird predation**



**Figure 11. Trays and sticks may be placed on a 'Rack & Rail' system**

Spat that is collected using the slat method or purchased from specialised catching farms is required to be dealt with individually as opposed to remaining on the sticks, described above, this can be done using a variety of methods and is known as **'single seed culture'**. Purchased spat can also be bought at varying stages of development, the smaller the spat the cheaper they are, however mortality and handling are increased.

Floating mesh cylinders or 'tumblers' (figure 12) are a popular method for growing spat. Once graded, the spat is placed in tumblers with an appropriate plastic mesh size. The tumblers float on the surface, and revolve around suspended ropes or PVC poles.

The tumblers are placed in lines at suitable leases allowing them to move and rotate with the wind and tide. The tumbling action reduces the tendency for the oysters to cluster together, allowing extra growing space. The method promotes even growth throughout the stock and produces a marketable cupped shaped oyster.

If the initial spat cultivated was very small, the oysters may be progressively moved to different tumblers with larger plastic mesh sizes to increase the flow of nutrients. Oysters remain in tumblers for approximately 12 months but are frequently graded and dried. After this period, subject to good growth, the oysters can be transferred to trays, or other cultivation method, for the remainder of the grow out phase.



**Figure 12. Tumblers used for on-growing individual spat ("single seed")**

**'Raft culture'** utilises floating rafts under which the oysters are suspended (figure 9). Stacks of about 10 trays are used to house the oysters. The figures below illustrate the oysters being dried to cull natural spatfall, but trays spend the majority of time suspended below the surface from the openings on the raft deck (the area adjacent to the stack, figure 13). The trays are secured in position via ropes mounted from each corner and cleated to the tension posts visible on the raft (figure 14). Stacks of trays are quite heavy and require the use of a crane mounted on oyster punts for lifting and lowering. This allows the operator to handle large quantities of oysters (for drying/culling, harvesting or movement to other leases) in a short amount of time. Because the trays are suspended, oysters spend the entire tide cycle in the feed rich upper layer of the water column. The method allows farmers to use deep areas that would have previously not been utilised using conventional methods.



**Figure 13. Floating rafts allow the operator to utilise deep-water leases**



**Figure 14. Raft culture allows the oysters to feed in the nutrient rich upper levels for the entire tidal cycle**

Another method that is used by some farmers is **'Long-line and floating bag'** cultivation. For this method, oysters are placed in polyurethane plastic mesh bags resembling pillows that measure about 500x400mm (figure 15). Strips of polyurethane floatation are then attached on either side using cable ties (figure 16). This method can be used to grow oysters that have been in tumblers or the pillows can be made with smaller plastic mesh size (8 or 10mm as opposed to 20mm in figure 15) into which purchased spat can be directly placed.



**Figure 15. Floating bags or 'pillows'**



**Figure 16. Polyurethane floatation attached to bags**

The pillows are arranged on opposite sides of a length of polyurethane rope or heavy duty monofilament line and attached via shark clips (figures 15, 16 & 17). Similar to raft culture the floating bag method allows oysters to remain in the nutrient rich upper levels of the water column for the entire tide cycle, facilitating more rapid growth. Other advantages of this cultivation technique is the lack of necessary infrastructure and the ease of handling, as each pillow can be dealt with separately and only weighs a few kilograms. To dry the oysters, the pillows on one side of line can be flipped over (as demonstrated in figure 15) and laid upside down on top of the pillows on the opposite side, with the height of combined floatation enabling the top pillow to rest clear of the water.



**Figure 17. Lines are arranged to best fit the lease dimensions and predominant wind and wave directions**

The design and construction of floating bags is generally carried out by the farmers themselves and adapted to suit each individual application; however mass-produced equivalents are available such as the '**SEAPA**' baskets (figures 18 & 19). These baskets are widely used in Pacific Oyster cultivation in South Australia but a few farmers on the Clyde are now experimenting with them. The baskets can grow about 8 dozen oysters and feature plastic clips to attach to lines (replacing expensive stainless steel clips on self made pillows) and a click open lid for ease of access. Like the floating bag technique, this system is lightweight and easily handled and has the added advantage that the baskets can be attached directly to an automated grading machine (the Clyde River Farmers have access to an automated grader) to remove the manual labour involved with grading and the redistribution of oysters back into baskets.



**Figure 18. 'SEAPA' basket showing the fabricated plastic clips for attachment to long-lines**



**Figure 19. The lid allows easy access to oysters and provides a flat base for stacking**

Although an advantage of raft, floating bag and basket culture is that the oysters remain in the feed rich area of the water column promoting faster growth, the majority of farmers prefer to tray their oysters for the final stages of growth. Reverting back to an intertidal environment encourages the oysters to take on a plumper more marketable characteristic and the tougher environmental conditions also helps to prolong shelf life. The characteristics of certain lease areas is also important in finishing the oysters as they deliver the right nutrients at the desired levels to ensure the oysters reach the highest quality prior to sale. Moonlight Flat and the area from Chinaman's Point to Big Island (figure 3) are popular lease areas for the final stages of growth.

As mentioned previously 'fast growing' and 'disease resistant' spat are also available as part of DPI Fisheries NSW research. Initial research concentrated on triploid oysters where oysters are tricked rather than genetically modified into having 3 sets of chromosomes as compared to 'normal' diploid oysters, which have 2 sets of chromosomes. Triploid oysters are functionally sterile and don't spawn allowing them to keep their condition for longer and grow faster than diploids because the energy that normal oysters put into reproduction can instead be used for growth in triploids. Although successful, research lent toward a generational breeding program whereby select individuals that have a faster growth rate than a control stock form the brood stock from which spat with inherent faster growing characteristics can be derived. Unfortunately after four years of trialling these oysters on the Georges River (Southern Sydney), QX disease affected the estuary and decimated the local oyster industry. It was discovered however that some of the trial oysters had survived the outbreak and subsequently these oysters formed the brood stock from which a fast growing, more disease resistant oyster can be bred.

The generational breeding program is now in its 12th year of production and incorporates scientific systems to maintain genetic diversity. Intellectual property of the science behind the program belongs to DPI Fisheries NSW and FRDC but the operation is managed by the Select Oyster Company (SOCo) Pty Ltd. SOCo is a non-profit company that has been set up to commercialise the Sydney Rock Oyster breeding program and to help all NSW oyster farmers improve productivity and viability (Select Oyster Company, 2012).

At present, one commercial hatchery is producing SOCo lines of stock. Southern Cross Shellfish was established at Tomaree Point in Port Stephens and commenced production with some small runs of Sydney Rocks in late 2008. Another hatchery has also recently opened on the south coast to carry out runs of the native (*Angasi*) oysters.

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 take the oysters to a more distributable size. There used to be 2 nursery farmers on the Clyde River, however these are no longer operational.

In other estuaries, oyster farms operating a nursery facility employ land-based upwellers to create a controlled environment for oyster growth (figure 20). The oysters are frequently graded over two weeks, by which time they are about 1.2mm in diameter. After this time if the oysters are sufficient in size they are moved into the natural environment of the river. Hinged nursery trays are used, so that they can be closed preventing oyster escape (figure 21).



**Figure 20. Juvenile fast growing spat are placed in land based upwellers (not currently used on the Clyde River)**



**Figure 21. Nursery trays are used when the spat are moved to the river (not currently used on the Clyde River)**

After about 8 weeks the oysters are large enough to be sold to other growers to be on-grown by one of/or a combination of the methods described previously in this section.

The currently demand for SOCo stock currently exceeds supply, and getting hold of spat remains a major issue for oyster farmers throughout the state. In January 2012, the DPI research station at Port Stephens will be undertaking hatchery runs of wild-caught stock, some contributed by growers (farmers favourites) from various estuaries along the coast. The aim is to establish 30 families which will be incorporated into a conditioning trial. The Clyde River Oyster Farmers continue to participate in research and the ongoing improvement of genetic lines.

### 4.3 Land Based Activities



**Figure 22. Aerial view of Batemans Bay showing the land based facilities of the Clyde River Oyster Farmers (Office of Environment & Heritage, NSW Government)**

The nature of commercial oyster cultivation not only requires significant water based infrastructure but also necessitates a functional land base from which efficient operations can be conducted. Each permit holder on the Clyde River has a lease arrangement with the Department of Lands allowing the farmers permissive occupancy of a small section of waterfront land and storage area for cultivation infrastructure and associated equipment. The Department of Lands holds a bond that is paid by the farmers when taking over the lease, and in 2008 the growers successfully negotiated 25 year tenures on land-based facilities. This long-term tenure provides more security for business investment, and represents a big improvement on previous arrangements that restricted framers to 1-year tenures.

The majority of the Clyde River Oyster Farmers land based facilities are situated on Latta's Point or Budd Island (figure 22). The area provides a secluded environment in which to conduct their operations, and although vehicular access to the area is difficult (via Latta's Point Road) it is only a short boat ride to Batemans Bay for pickup and deliveries.

#### 4.4 Achievements table

Achievement	Consequence	Date
1. Extensive removal of general rubbish and disused infrastructure from shed sites.	This has greatly reduced the likelihood of fire spreading and resulting in the loss of facilities.	2007-
2. Development of a fire policy	The fire policy outlines a consistent approach to mitigate the risk of fire, and actions to take during a fire event	2011
3. Applied & approved for funding from OceanWatch Australia to construct a composting toilet on Budd Island. Materials to be funded by OceanWatch, with the construction to be undertaken by oyster farmers	Improved effluent management reduces the risk of spillage and potential contamination of the waterway	2011
4. The Clyde River Oyster Farmers have undertaken extensive land and water based clean-ups of derelict infrastructure. As a result all derelict leases have been restored to a pristine condition. 77 tonnes of waste was removed, consisting of tarred and treated timber products, was dried and disposed at an approved land-fill facility.	The restoration of derelict leases improves the aesthetic value of the area, and increases the public perception of the oyster industry. The removal of tarred and treated timber also has considerable environmental benefits, preventing the leaching of contaminants into the estuary. Clyde River Oyster Farmers are committed to phase out tarred and treated timber products from the estuary.	
5. Drastic reduction in chemical usage through the phasing out of CCA (copper, chromium, arsenic) treated timber. The Clyde River Oyster Farmers are committed to the phase out of these contaminants.	Phasing out the use of CCA treated timber has considerable environmental benefits, reducing the likelihood of leaching of copper, chromium and arsenic into the environment.	2007-
6. Worked with SRCMA and engineers to develop a stormwater and sediment control management plan for Latta's Point Road	By improving the management of stormwater, this has reduced surface erosion, and the volume of sediment entering the estuary.	
7. Sediment traps have been built and Latta's Point Road regraded	By improving the management of stormwater, this has reduced surface erosion, and the volume of sediment entering the estuary.	
8. Management of grey water has improved dramatically involving the installation of facilities to hold, treat and re-use on land-based sites	The retention and treatment of grey water not only encourages the re-use of a valuable resource, but also reduces the risk of polluting the surrounding waterway	

<b>Achievement</b>	<b>Consequence</b>	<b>Date</b>
9. All farmers have installed rainwater tanks	The installation of rainwater tanks reduces the pressure on valuable resources. In the long-term this may represent a cost saving to industry.	2011-
10. Utilising their EMS as a strategic document to improve environmental management, many oyster farmers accessed a grant facilitated by OceanWatch Australia to upgrade 2-stroke outboards to more efficient and environmentally friendly 4-stroke outboards.	Upgrading outboards from 2-stroke to 4-stroke has reduced fuel costs and also provided significant environmental improvements, through increased efficiency and lower emissions.	2007-
11. Oyster Farmers continue to work with NSW Forestry and the CMA to obtain and plant native flora species around land bases re-establish riparian buffers	Riparian vegetation binds soil and serves an important role to intercept sediment, nutrients, and other materials prevent in surface run-off.	2011-
12. The Clyde River Oyster Farmers have been working with local council and NSW Maritime to scope additional facilities for houseboats and recreational waterway users.	The management of waste generated on house-boats and by other recreational waterway users can significantly impact of water quality in the river. The discharge of effluent in particular can have devastating impacts on the oyster industry, through contamination of shellfish and forced closures.	2007-
13. Farmers have helped DPI to develop and implement a Pacific Oyster Management Plan for the Clyde River. Farmers also work with SRCMA to undertake annual Pacific Oyster Culls. Pacific oysters are classified as a noxious species in most NSW estuaries.	Pacific oysters are listed as a noxious species in the Clyde River. Its ability to settle in large numbers and smother Sydney rock oysters and oyster lease infrastructure is a major concern for farmers. The cost of managing the Pacific oyster overcatch can seriously affect the commercial viability of the industry.	2010-
14. Demonstrating that they are responsible stewards of Crown Land, Clyde River Oyster Farmers have successfully negotiated renewable 25 year lease tenures on there land bases	This long-term tenure provides more security for business investment, and represents a big improvement on previous arrangements that restricted farmers to 1-year tenures.	2008

Achievement	Consequence	Date
15. Through negotiations with Country Energy and Telstra, Clyde River Oyster Farmers facilitated the removal of phone and power lines which stretched from Latta's Pt. to Budd Island. All cables are now submerged to minimise the OHS risk. Farmers re-connected at their own expense.	Overhead power and phone lines presented an OHS risk, with low hanging cables at risk of being hit by machinery and passing yachts	2011
16. The Clyde River Oyster Farmers have committed to phase out the use of tar in cultivation infrastructure. This approach has been assisted by grants from OceanWatch Australia & Southern Rivers CMA to encourage the conversion of cultivation infrastructure.	The phase out of tar improves the public perception of the oyster industry. The removal of tarred timber also has considerable environmental benefits preventing the leaching of contaminants into the estuary.	2007-
17. Budd Island Oyster Farmers partnered with SRCMA and Dept. of Lands in a joint project to regenerate Budd Island through both weed and waste removal. Over 17 tonnes of weeds and waste were removed from Budd Island through this collaboration. Following this engagement the oyster farmers on the island formed the Budd Island Oyster Farmers Environmental Group.	Budd Island supports several Ecologically Endangered Communities (EEC's). The removal of weeds and waste encourages the regeneration of these important ecosystems. The project also demonstrates the Budd Island farmers as responsible land managers and worthy stewards of the environment.	2007-
18. The Clyde River Oyster Farmers original EMS was listed on the Seafood Services Australia – EMS register. <a href="http://www.seafoodservices.com.au/ems/register.php">http://www.seafoodservices.com.au/ems/register.php</a>	Providing online details of the EMS signifies that the Clyde River Oyster Farmers are committed to environmental best practice and are transparent in their operations	2007
19. The Clyde River Oyster Farmers revised EMS was listed on the OceanWatch EMS database <a href="http://www.oceanwatch.org.au/our-work/ems-nsw-oysters/ems-database/">http://www.oceanwatch.org.au/our-work/ems-nsw-oysters/ems-database/</a>	Providing online details of the EMS signifies that the Clyde River Oyster Farmers are committed to environmental best practice and are transparent in their operations	2011
20. As early adopters of EMS within the oyster industry, CROF have stood forward as industry champions and mentors, advocating for EMS development and environmental stewardship in other NSW estuaries.	Industry champions are invaluable to the development of the industry. Not only do they inspire other oyster farmers to lift their game, but they are often in the public spotlight where they can influence public perception and attitudes.	2007-

Achievement	Consequence	Date
21. CROF have been trained by OceanWatch Australia in marine pest identification, and have been provided with appropriate marine pest identification cards.	Introduction of marine pests can have severe impacts on native species and lead to a total deterioration of ecological processes	2008-
22. CROF have also been provided with copies of the 'Protected Species Handling Manual' and the 'Protected Marine Species Identification Guide'	The CROF have the materials to enable identification of protected marine species and also have the knowledge to be able to appropriately handle such species in the unlikely event of an interaction.	2008-

## 5. Action Plan

The Clyde River Oyster Farmers have undertaken an environmental risk assessment (see Appendix 1 & 2) to identify and assess the environmental impacts of all operations for Clyde River oyster enterprises, and address any unacceptable risks that their activities pose to the environment. All risks identified have been prioritised according to the potential impact that an activity may have on the environment as well as the likelihood of that impact occurring.

Figure 23 shows a summary of the risks identified by growers and the risk level scored through the risk assessment. Risks have been split into two categories: 1) internal / industry related activities, which are those primarily controlled and managed by the oyster industry; and 2) external activities, which are those impacting the oyster industry which are beyond the control of the oyster industry. The Clyde River Oyster Farmers will seek to work with key stakeholders and the community collaboratively towards minimising the external risks.

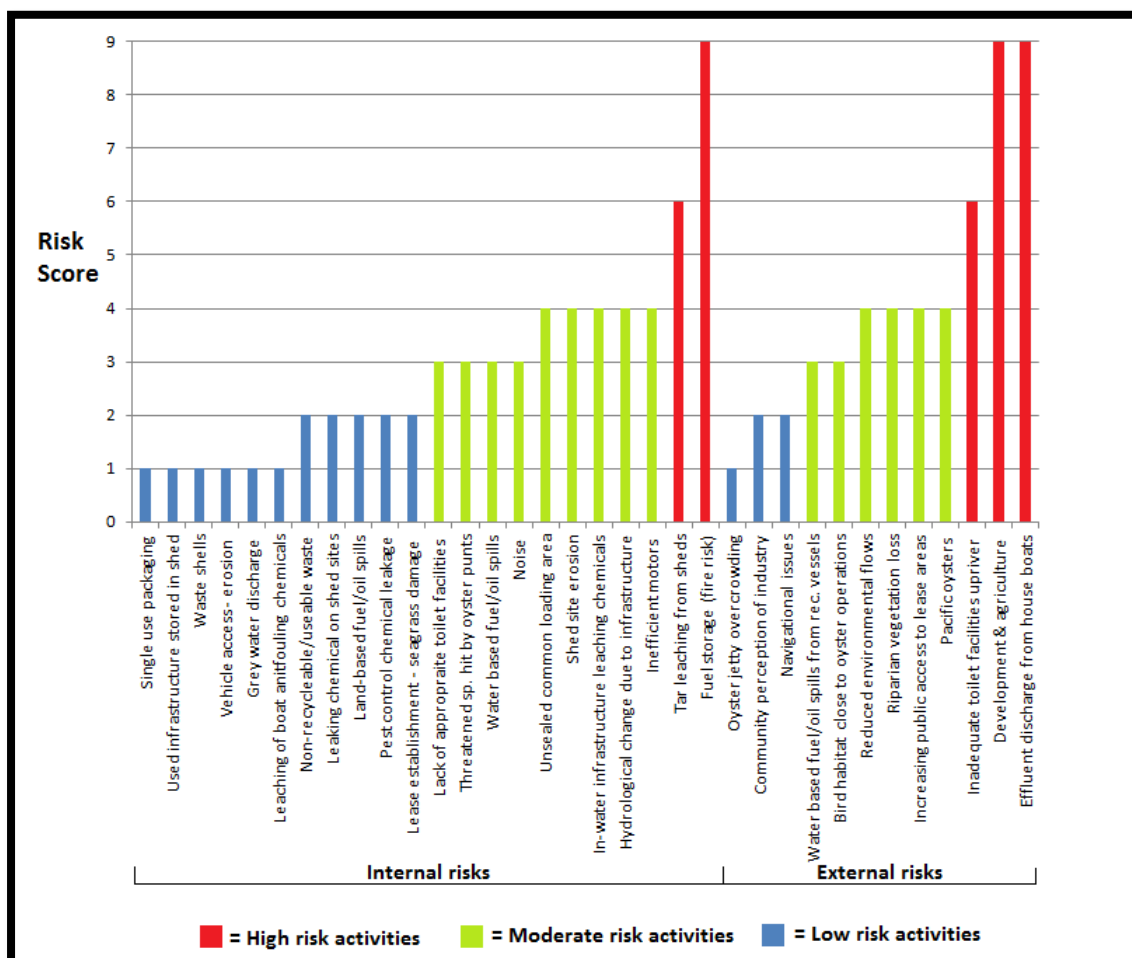


Figure 23. Summary of the risks identified by Clyde River Oyster Farmers

Demonstrating their commitment to environmental improvement and risk mitigation, the Clyde River Oyster Farmers have been proactively working to address many of the high risk activities identified through their previous EMS (see Achievements – section 4.4.) This revised action plan has therefore been formulated to address some of the new risks to oyster farming in the Clyde River, as well as the pressing issues enduring from the previous document.

## **Objective 1. Protect and enhance the habitat of the Clyde River and its catchment**

<b>Stakeholder Engagement</b>			
<b>Action</b>	<b>Who</b>	<b>Performance indicator</b>	<b>Due</b>
1. Assist SRCMA & other natural resource managers to identify priority areas requiring on-ground action	SRCMA	Work with CROF to identify high priority locations	Ongoing
	CROF	Number of projects assisted	Ongoing

**Benefits of actions:**

- On-ground environmental works will improve water quality in the estuary
- Strengthen ties with natural resource managers & relevant agencies

### **Background:**

The Clyde River contains many significant areas of mangroves, seagrass, salt-marsh and wetlands and is recognised by the NSW Government as a river of High Conservation Value (HCV). The SRCMA (and other NRM providers) are keen to invest in HCV rivers and funding is often available from various sources & programs. The SRCMA has indicated that effective and efficient investment can only be achieved through partnerships with existing land owners, land managers and industry. For example, while SRCMA may have funding, other organisations can assist projects by contributing expertise and/or labour and machinery.

Successful collaborations facilitated by the SRCMA have occurred in the Shoalhaven River in the north, such as the 'Dairy-Oyster' partnership. This project was implemented to enhance water quality through improved farming practices and has been successful in protecting 75 hectares of Endangered Ecological Communities of coastal salt-marsh and mangroves, which were under threat from grazing cattle. The community benefit of this work has already been recognised by the granting of incentive funds from the Australian and NSW Government. It is a goal of the Clyde River Oyster Farmers to mirror such projects, using their intimate understanding of the estuary and its processes to identify key areas that would benefit from on-ground works. This process has already started through the creation of this EMS, and with the establishment of the Budd Island project (see 'Environmental Stewardship' sub-section – page 30).

As part of the Shellfish Harvest Area Classification (HAC) scheme managed by NSW Food Authority, oyster harvest areas are comprehensively studied to assess influences and risks to water quality. In a relatively undeveloped catchment such as the Clyde, there is the potential to use this information as a benchmark of river status, to which water quality data (collected and maintained by the oyster growers, described in section 3.6) could be compared over a period of time. This will allow natural resource managers to see if a correlation exists between completed on-ground works and improvements in water quality.

The CROF have a long history of working closely with stakeholders including the Southern Rivers CMA, OceanWatch Australia, Eurobodalla Shire Council, NSW Marine Parks Authority, NSW Department of Primary Industries, NSW Food Authority, NSW Farmers Association, Seafood Services Australia, The University of Wollongong and the Fisheries Research & Development Corporation and many others.

## Erosion & Sedimentation

Action	Who	Performance indicator	Due
2. Work with engineers, natural resource managers & other authorities to progress control erosion works at Latta's Pt.	CROF	Erosion control measures put in place are maintained and their effectiveness increased	Ongoing
	CROF	Work with stakeholders to discuss potential solutions & funding to upgrade common loading area	Dec 2012
3. Minimise effects on natural sedimentation. Report significant changes to DPI	CROF	Reports of changes in sedimentation	Ongoing

### Benefits of actions:

- Erosion control works mitigate sediment loss & inhibit estuary sedimentation
- On-ground works will improve OHS and the productivity of common areas

### Background:

The Clyde River is affected by sediment runoff from unsealed roads, gullies and stream-bank erosion. These factors affect water clarity and consequently light penetration through the water column, which is an essential requirement for phytoplankton and seagrass growth.

Sediment from runoff and dust clouds associated with traffic loads on Latta's Point Rd has previously been highlighted as a high priority issue by CROF, Government departments and community groups. As indicated in the 'Achievements Table' (section 4.4), the Clyde River Oyster Farmers have made significant improvements in this area. Working with the SRCMA & engineers, CROF have developed a 'Stormwater & Sediment Control Management Plan' for Latta's Pt, and have also been instrumental in surface regrading, and the construction of sediment traps. They are also waiting on native tube stock to further combat sediment loss.

Having previously focused on Latta's Pt. Rd, the oyster farmers have now directed their attention to the common loading area. As this area is unsealed and the focus of significant vehicle activity, it is subject to erosion and is considered fairly unsafe. CROF will work with the immediate neighbours and relevant authorities to scope solutions, and to identify potential sources of funding for on ground improvements.

It's feasible that intensive oyster farming could increase sedimentation. As infrastructure impedes water flow, this could promote the deposition of suspended material. Dead shell could also contribute to the volume of material accumulating around lease areas. Despite being the 3<sup>rd</sup> largest producer in NSW, the Clyde River is not subject to the farming intensity required to alter sedimentation, and there has been no apparent changes in sediment build up. Crawford (2001) supports this position, and indicates that sedimentation is rarely considered a significant environmental effect associated with oyster farming in Australia. New methods are also being employed by the CROF to reduce the footprint of infrastructure, further reducing the potential to influence sedimentation rates.

In 2011 and 2012 both OceanWatch Australia and Southern Rivers CMA provided funding to assist oyster farmers to move to more environmentally friendly cultivation systems. Clyde River Oyster Farmers utilised this opportunity to reduce the footprint of infrastructure, with many farming taking up the opportunity to convert to long-line systems.

## Environmental Stewardship

Action	Who	Performance indicator	Due
4. Work to maintain the unique environment of Budd Island.	CROF	Continue to forge partnerships and source funding to improve the environment of Budd Island	Ongoing
5. Demonstrate to Government agencies and community the success of environmental stewardship initiatives of the Clyde River Oyster Farmers	CROF	Use the Budd Island initiative as a model that can be adapted by Latta's Point based farmers	Ongoing
	CROF	Number of engagement events, publications, news articles, and website stories used to promote CROF stewardship initiatives	Ongoing

### Benefits of actions:

- Maintain & enhance the unique environment of Budd Island
- Demonstrate the environmental stewardship initiatives of the CROF

### Background:

Budd Island supports several Endangered Ecological Communities (EEC) including Swamp Oak Floodplain Forest and Coastal Salt-marsh, which are listed under the NSW Threatened Species Act 1995. The area also supports numerous Forest Redgums (present among the Casuarinas) which gives the vegetation added significance. It is considered generally that the vegetation community has high recovery potential.

As well as its ecological significance, Budd Island has historically been used by a number of oyster farmers for their land-based activities. Flowing from a state-wide review of oyster leases undertaken by the Dept. of Lands, discussions subsequently identified the potential to establish a joint project between the Dept. of Lands and the Budd Island Oyster Farmers to regenerate the island through both weed and waste removal. A grant to enact the project was obtained from the SRCMA in 2007.

By 2008, a significant amount of weeding had been undertaken, including the removal of highly invasive weeds such as bridal creeper, asparagus fern and turkey rhubarb. The oyster farmers had also removed over 15 tonne of rubbish from the island. Demonstrating their commitment to ongoing environmental improvement, the oyster farmers have taken the gallant step of forming a Landcare Group, known as the Budd Island Oyster Farmers Environmental Group to oversee future conservation works. This engagement with Landcare attests to their commitment to environmental stewardship. It is hoped that this commitment is realised by the broader community so that trust is established that the Clyde River Oyster Farmers are operating in a sustainable manner.

Following on from the success of this initial project, in 2011 the Budd Island Oyster Farmers Environmental Group successfully applied for funding from OceanWatch Australia to construct a composting toilet on Budd Island. Materials are funded by OceanWatch, with the construction will be undertaken by farmers in their own time. This project will improve effluent management, and reduce the risk contamination of the waterway.

It is envisaged that lessons learnt from these projects will form a model that can be adapted to suit the needs of the Latta's Point growers.

## Seagrass & Benthic Communities

Action	Who	Performance indicator	Due
6. Minimise affects on seagrass and benthic communities. Report significant changes in seagrass to DPI NSW	CROF	Reports of changes in seagrass beds	Ongoing

### Benefits of actions:

- Maintain and improve important ecological habitat & benthic communities

### Background:

Oyster farming may affect seagrasses and benthic communities (i.e. groups of plants and animals living on the floor of a water body) via the placement of infrastructure, the shade that infrastructure casts on the floor of the water body, and the waste products produced by the oysters.

Stick and tray farming methods have been used on the Clyde River for many years. The potential impacts on seagrass and benthic communities are therefore expected to be similar to those reported in studies of other estuaries (Crawford, 2003; Lasiak and Underwood, 2002; Porat, 2001) where this farming method has not lead to any widespread impacts on seagrasses and benthic communities, with any dieback or community change strictly localised to the immediate vicinity of the oyster leases.

It should be noted that while seagrass dieback is a major concern in NSW, oyster farming is very rarely identified as one of the causes. The National Oceans Office (1997) states, "Increased sedimentation and nutrients from catchments have been linked with massive die-back of seagrasses in many areas."

Impacts from waste material generated by oysters are generally only associated with highly intensive farming (Crawford, 2003), a method not employed by the Clyde River Oyster Farmers.

The use of tumblers in early production stages (see section 1.3) raft culture and long-line and floating bags in the grow-out phase significantly reduces shading through less infrastructure, and the tendency for these methods to move with the wind and tide. Oysters have differing requirements at different ages and in order to maximise productivity trays are rotated between areas. This process also rests certain areas allowing seagrass shaded by trays or sticks to re-establish itself.

In 2011 and 2012, both OceanWatch Australia and Southern Rivers CMA had funding rounds available to assist oyster farmers to move to more environmentally friendly cultivation systems. Many Clyde River Oyster Farmers applied for funding to convert the traditional rack & rail systems to floating / suspended long-line set-ups. Compared to oyster trays, baskets and pillows have a relatively small surface area and their movement on the lines allows underlying seagrass to receive scattered light.

## Noise

Action	Who	Performance indicator	Due
7. Minimise noise associated with operations	CROF	Number of reasonable noise complaints (target = 0)	Ongoing

### Benefits of actions:

- Maintain good-natured relationships with residents and other water users

### Background:

The hours on which leases can be worked are restricted by tides and weather conditions however, within 200m of private residences programmed lease construction and unduly noisy operations should only be conducted during the period 7:00am to 6:00pm Monday to Friday (DPI, 2005). Emergency repairs and emergency stock management operations are exempt from this restriction (DPI, 2005).

Operations of the Clyde River Oyster Farmers rarely take place between the hours of 6:00pm and 7:00am and due to the forested nature of much of the Clyde River area, noise pollution is unlikely to affect catchment residents.

## Chemical & Fuel Storage

Action	Who	Performance indicator	Due
8. Investigate possibility of building a common fuel storage facility	CROF	Common fuel storage facility built	Dec 2012
	CROF	Common fuel storage facility used	Dec 2012

### Benefits of actions:

- Reduce the fire & spillage risk associated with individual point sources of fuel
- Central location from which to combat spills & other emergencies

### Background:

Currently fuel is stored at individual farms. The Clyde River Oyster Farmers would like to investigate the use of a common fuel storage facility that would allow greater security and could minimise the rapid or explosive spread from shed to shed in the event of a fire. This facility would also provide a suitable and known location to store a fuel containment kit (see Action 1.8).

## Water Quality Monitoring / Incidents

Action	Who	Performance indicator	Due
9. Maintain existing water quality monitoring program	CROF SQAP	Water quality monitoring program maintained	Ongoing
	CROF	Investigate potential to lessen expense of WQ monitoring	Ongoing
10. Report detected or suspected pollution incidents immediately to the NSW Food Authority, DPI NSW, OEH and Maritime	CROF	Number of pollution incidents reported	Ongoing
	CROF	Investigate cost of purchasing a fuel containment kit	Dec 2012

### Benefits of actions:

- Monitoring program provides consumer confidence in food safety & also contributes to scientific understanding of estuarine environments
- Potential to reduce the cost of water monitoring program to industry
- Quick response and reporting of water pollution may lessen the severity of incidents and also promotes CROF position as environmental stewards

### Background:

Agricultural and urban runoff, acid sulphate soils, fuel and chemical spills may lead to water pollution incidents. Oyster farmers have a unique understanding of the estuary, and an ability to identify point sources of pollution through their rigorous water quality testing regime.

Responsibility in the event of fuel spills falls to council and NSW Maritime, however a spill containment kit may enable the CROF to quickly inhibit the spread of the pollutant and provide absorbents to clean the affected area. The negative impacts from an accidental fuel spill could therefore be minimised through immediate action.

The Clyde River Oyster Farmers maintain a regular water and meat quality monitoring regime to ensure that immediate action can be taken should pollution levels threaten the health of the Clyde River and oyster stocks. Currently the monitoring program consists of 7 water quality (WQ) testing sites in the 'moonlight' harvest area and five in the 'waterfall' harvest area that are analysed fortnightly. Oyster meat samples are conducted monthly to monitor bio-toxins but 1 sample requires 4 testing sites in the moonlight harvest area and 3 in the waterfall harvest area. Phytoplankton levels are also tested fortnightly and all Clyde River Oyster Farmers products are required to undergo individual meat tests on a monthly basis. In addition to their regular testing, in order to maintain their Harvest Area Classification, the CROF must complete the following tests:

- Minimum 5 x year – 7 WQ samples at 'moonlight'
- Minimum 5 x year – 5 WQ samples at 'waterfall'
- Minimum 5 x year – additional meat samples
- Event testing – following a rainfall event that closes the estuary (see table 2), testing is required to see when set parameters allow a move from closed to conditional harvest. Further testing is required to move from conditional harvest to direct harvest.

Anecdotal evidence suggests that oyster industry is often the first to detect local pollution events such as toxic algae, sewage, chemical and fuel spills. Such pollution events not only threaten the oyster industry, but also have severe implications for public & ecological health.

The SQAP also uses set, standardised parameters that are comparable with other NSW estuaries. This is not true of other water quality monitoring programs (e.g. local government), which vary considerably in terms of parameters measured & sampling frequency.

The intensive testing required by all oyster farmers comes at a considerable cost to the individual. Clyde River Oyster Farmers will investigate the possibility of compensation to broaden their water quality monitoring regime to cover other agency standards (councils, MPA's etc.) in an attempt to offset the expense incurred by each grower.

Eurobodalla Shire Council conducts regular chemical and bacteria sampling once a month at 7 sites along 30km of river. The council is also proactive in monitoring the status of septic systems in upstream environments (the township of Nelligen is not on town water or sewerage system). Detailed inspections of septics are categorised using an On-site Septic Management System (OSMS) whereby each septic system in the area is ranked according to the risk it is to the surrounding environment. Septics are given a 1, 2 or 5 rating that refers to year(s) between the required follow-up inspection (i.e. a rating of one is a high risk – due to its proximity to water courses, within 100 year flood limit etc.). On inspection of septics, all associated plumbing, tank contents, absorbent trenches and transpiration beds are checked to ensure there is no contamination risk to the surrounding environment.

<b>Fire</b>			
Action	Who	Performance indicator	Due
	CROF	Fire policy circulated	Dec 2012
	CROF	Fire policy implemented	Dec 2012
11. Ensure that the fire policy is circulated and implemented by CROF	CROF	Identify and establish buffer zones	Dec 2012
	CROF	Investigate options for central fuel storage area equipped with fuel containment kit (see 'Chemical & Fuel Storage' – pg 31)	Dec 2012

**Benefits of actions:**

- A consistent approach to fire management and prevention
- Measures taken to reduces the risk of fire

**Background:**

The forested nature of the area surrounding the land-based facilities at both Latta's Point and Budd Island, and the volume of gear stored on-site pose a significant risk in the event of a fire. A fire policy has already been developed to mitigate the risk of fire, and to enable quick action in the event of such a threat. This policy needs to be circulated and implemented by all oyster farmers operating on the river.

The creation of asset protection (buffer) zones through actions associated with the removal of waste and disused infrastructure is the first step in minimising the potential for rapid spread between dwellings and to surrounding bushland in the event of fire.

## Marine Pests

Action	Who	Performance indicator	Due
12. Ensure all Clyde River Oyster Farmers have a copy of marine pest identification cards being developed by the National Introduced Marine Pest Coordination Group (NIMPCG).	OWA	Distribute marine pest identification materials to all farmers	Dec 2012
13. Report, with a sample if possible, detection of unusual plants / animals. Follow advice of Government agencies to combat marine pests.	CROF	Number of marine pest incursions reported	Ongoing

### Benefits of actions:

- Educate CROF, & reduce the risk of marine pests impacting on the Clyde River
- Reporting of marine pests enables Authorities to take remediation measures to prevent the uncontrolled spread of pests

### Background:

Translocation of marine pests and subsequent settlement is an increasing risk in Australian waters as populations become more mobile and exposure to potential sources increase (eg. Contaminated bilge water from merchant vessels, translocation of species from other regions by travelling fishers). Introduction of such species can have severe impacts on native species and lead to a total deterioration of ecological processes.

Education in the identification of pest species and correct reporting mechanisms of those with a unique understanding of the estuarine environment, such as commercial fishers and oyster farmers will greatly assist in early identification of such species, a key process in preventing the spread of marine pests. Currently a National System for the Prevention and Management of Marine Pest Incursions is being developed by the National Introduced Marine Pest Coordination Group (NIMPCG), which includes members from Commonwealth and State agencies, scientific organisations, and industry representatives. Part of the project objectives is the development and dissemination of educational material to oyster farmers, which will be incorporated into future versions of this EMS upon completion.

The CROF have been instrumental in helping NSW Department of Primary Industries to develop and implement a Pacific Oyster Management Plan for the Clyde River. Farmers also work with the SRCMA to undertake annual Pacific Oyster culls. As indicated previously, Pacific Oysters are classified as a noxious species in most NSW estuaries.

## Interactions With Wildlife

Action	Who	Performance indicator	Due
14. Stop operations immediately following interaction with protected or threatened species, whale, dolphin or turtle. Allow animal to escape & report interaction	CROF	No. of interactions with protected or threatened species, whales, dolphins or turtles (target = 0)	Ongoing
	CROF	Interactions reported	Ongoing
15. Ensure CROF have copies of the 'Protected Species Handling Manual' and the 'Protected Marine Species Identification Guide'	OWA	Clyde River Oyster Farmers have a copy of both publications	Dec 2012
16. Provide information to conservation and management organisations regarding important bird habitats	CROF / OEH	Intellectual knowledge provided to relevant organisations to identify key habitat areas	Ongoing
17. Report incidents of bird entanglements to WIRES, DEC and DPI Fisheries	CROF	Number of incidents reported	Ongoing

### Benefits of actions:

- Maintain & improve ecological communities in the Clyde River
- To ensure all interactions with wildlife are positive and to maintain the reputation of CROF as responsible environmental stewards

### Background:

Protected and threatened species include those listed at a state level, under Part 2 Div 1 of the *Fisheries Management (General) Regulation 2002*, and Schedules 1 and 2 of the *Threaten Species Conservation Act 1995*. At a Commonwealth level, approximately 2000 species are listed under the *Environment Protection and Biodiversity Conservation Act 1999*.

It is highly unlikely that any commercial oyster farming activities will interact or harm a protected or threatened species, but has been included to list the actions that would be taken by the Clyde River Oyster Farmers in the rare event of this happening.

Estuaries provide important habitat for nesting and breeding birds, including migratory and resident threatened species. The Clyde River Oyster Farmers have a unique understanding of the environment in which they work and will assist the South Coast Shorebird Recovery Program if required to identify areas that provide important habitat.

Birds can become entangled in litter and lost fishing line. Oyster farmers spend extended periods of time on the water, and are in an ideal position to report bird entanglements. The Clyde River Oyster Farmers will assist in seabird rehabilitation and release where able and report sightings of entangled or injured birds to W.I.R.E.S (Wildlife Information and Rescue Service), DEC and DPI Fisheries NSW. An informal workshop educating the oyster growers about correct handling procedures for birds could assist in this process.

## **Objective 2. Cultivate oysters in a sustainable manner – minimising resource consumption, waste production and pollution**

Outboards			
Action	Who	Performance indicator	Due
18. Upgrade outboards to meet the current USA efficiency and emissions standards.	CROF	Proportion of outboard motors in use that meet USA emission standards	Dec 2013
	OWA	Circulate details of the new Australian outboard emission standards when these are released	Dec 2012
	OWA / SRCMA	Identify funding sources that can be utilised to offset the cost of upgrading outboards	Ongoing

### Benefits of actions:

- Improved efficiency of outboards, operating with lower emissions
- Cost of replacement offset with funding

### Background:

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 in 2012, which were likely 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.

Many environmental improvements in methods rely on the initiative, time, effort and funding of individual operators. In 2007, the Department of Agriculture, Fisheries and Forestry (DAFF) developed a scheme to offset expenses that often limit changes in practice. The *EMS Incentives Program* encourages the adoption of sustainable management practices by providing primary producers with a cash reimbursement of up to 50% of the costs associated with developing and implementing an EMS. OceanWatch Australia, through the SeaNet program, successfully assisted commercial fishers and oyster farmers access this funding to upgrade older 2-stroke engines to those with a superior emission standard, reducing the consumption of fossil fuels and eliminating contaminants entering the estuary.

## Progressive Elimination of Tarred & Treated Timber

Action	Who	Performance indicator	Due
19. Work towards eliminating the use of tarred and treated timber from farming practices	CROF	% of trays converted from treated timber to polyurethane (target = 100%)	Ongoing
	CROF	% of lease areas using tarred or treated timber (target = 0%)	Ongoing
	OWA / SRCMA / CROF	Investigate potential funding sources to provide assistance	Ongoing
	CROF	All treated timber & tarred material disposed of correctly (target = 100%)	Ongoing

### Benefits of actions:

- Removal of potential contaminants from the marine environment
- Improved OHS
- Improved community perception of the industry
- Aesthetic and environmental benefits gained through appropriate disposal

### Background:

For many years, tarred or treated timber has been used on which oyster larvae are caught and grown. This increases the durability of timber, protecting it from marine borers. There is no evidence indicating that this contaminates the oysters or neighbouring species (White, 2001), however there is potential for chemicals to leach into the surrounding waters.

Oyster farmers throughout NSW are phasing out the use of tarred & treated timber by using specially produced polyurethane trays, plastic sleeved timber posts and sticks, or adopting alternative farming methods (as described in section 4.2). The CROF are progressively eliminating the use of tarred timber and have been working closely with Ausplaztik, a company that develops extruded plastic rails and posts from recycled material. Other companies offering other environmentally friendly alternatives have similarly been engaged. Converting to these new products will reduce ongoing maintenance requirements (and associated costs), and also eliminate potential contaminants entering the river.

Collectively the Clyde River Oyster Farmers are also in the process of eliminating the use of treated timber through utilising different farming methods as indicated above. Many of the growers are working toward the exclusive use of polyurethane trays, and other plastic products but it 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.

As indicated previously, in 2011 and 2012 both OceanWatch Australia and Southern Rivers CMA had funding rounds available to assist oyster farmers to move to more environmentally friendly cultivation systems. Many Clyde River Oyster Farmers applied for this funding indicating their desire to implement best management practice.

## Waste Management

Action	Who	Performance indicator	Due
20. Recycle or reuse incoming and generated waste	CROF	Reuse waste and old infrastructure where possible	Ongoing
	CROF	Percentage of recyclable product disposed of responsibly (target = 100%)	Ongoing
21. Oyster shells to be used to fill pot holes and reduce erosion	CROF	Percentage of oyster shells utilised (target = 100%)	Ongoing
22. Continue to explore options to generate income from shells	CROF	Avenue identified for shell use – value-adding using waste product	Ongoing
23. Investigate sites for a centralised shell storage area	CROF	Suitable site identified	Dec 2012
	CROF	Centralised shell storage established	Dec 2012

### Benefits of actions:

- Minimise waste production and pressure on resources
- Utilise waste products (esp. shells), and develop a market for their reuse
- Collaboration in shell management promotes the efficient use of space and increases the volume of stock for re-use

### Background:

Over the years oyster farmers accumulate old trays, sticks and various pieces of equipment. This is compounded with the gradual decommissioned of old rack and rail infrastructure as many oyster farmers make the move towards low impact floating or suspended systems.

The Clyde River Oyster Farmers have already been proactive in instigating group clean-ups. In 2006, Smorgans, a metal recycling company were approached and generously offered free removal of metal products from shed sites. Following in the footsteps of this collaboration, in 2007 the Budd Island Oyster Farmers partnered with SRCMA and Dept. of Lands in a joint project to regenerate Budd Island through both weed and waste removal. Over 17 tonnes of weeds & waste were removed from Budd Island through this collaboration. Following this engagement the oyster farmers on the island formed the Budd Island Oyster Farmers Environmental Group.

The Clyde River Oyster Farmers are committed to disposing all tarred and treated timber waste at an approved waste management facility.

With large volumes of stock in cultivation, it is common for some oysters to naturally die during production. The CROF have long speculated of how to utilise this waste product, and potentially place a value on this resource. Currently, waste shell is used to fill pot-holes and reduce erosion around shed sites. Shells have also been requested by local builders.

As an alternative option, there is continuing research into the use of ground oyster shells as crop / lime fertiliser. Initial analysis and assessment indicates some considerable benefits, however widespread application would require certainty that all shells were 'clean' (i.e. no specks of tar or meat) prior to grinding.

## Effluent Management

Action	Who	Performance indicator	Due
24. Mobilise Budd Island Oyster Farmers Environmental Group to construct composting toilet on Budd Island	BIOFEG	Members of Budd Island Oyster Farmers Environmental Group committed to construction (target = 100%)	May 2012
	BIOFEG	Construct composting toilet on Budd Island	May 2012
25. Maintain regular maintenance of current facilities	CROF	Effective effluent management (target = 100% compliance)	Ongoing
26. Investigate options & funding opportunities to upgrade toilet facilities at Latta's Pt.	CROF	Specifications for Latta's Pt toilet block upgrade determined	Dec 2012
	CROF / SRCMA / OWA	Potential funding for Latta's Pt. toilet upgrade	Dec 2012

### Benefits of actions:

- Improved effluent management reduces the risk of spillage
- Reduces potential contamination of the waterway

### Background:

As well as spending considerable amount of time on the water tending their leases, the nature of commercial oyster cultivation also requires the growers to spend extended periods at their shore based facilities, whether it be culling, grading or maintaining equipment. To cater for the groups sanitary requirements the Clyde River Oysters Farmers built and maintain a small block of toilets located at Latta's Point. Although the toilets are situated on an elevated site well behind the sheds, they are plumbed to a septic tank that requires frequent emptying to prevent potential contamination of nearby waters. The location of the toilets is also inconvenient to a large proportion of the growers, necessitating unnecessary use of time and/or fuel in order to access the facilities. The location can also be unwelcoming to visiting departmental representatives.

In 2011 the Budd Island Oyster Farmers Environmental Group successfully applied for funding from OceanWatch Australia to construct a composting toilet on Budd Island. The materials for the toilet will be funded through OceanWatch, while the construction will be undertaken by the farmers in their own time. This project will improve effluent management on the island, and reduce the risk of spillage and potential contamination of the waterway.

The unit to be installed, the Nature-Loo 2007, is certified to New Zealand and Australian Standards for Waterless Toilets, and is environmentally safe – free from odours, chemicals, pollution, pumps and high maintenance costs.

## Water Management

Action	Who	Performance indicator	Due
27. Increase uptake of grey water reuse	CROF	Percentage of farmers with facilities to hold, treat and re-use grey-water (target = 100%)	Dec 2012
28. Examine potential off funding / grants to offset rainwater tank installation	OWA / CROF	Funding stream identified and applications made for re-imburement	Dec 2012

### Benefits of actions:

- Encourages re-use of a valuable resource
- Reduces risk of polluting the waterway
- Financial reimbursement for costly improvements

### Background:

Many of the farmers land based facilities on Budd Island and Latta's Point have basic amenities such as a sink & running water to make tea/coffee. Small tanks provide water for this service and many farmers have installed facilities to hold, treat and re-use grey-water.

Recognising that water is a valuable resource, all of the Clyde River Oyster Farmers have now installed rainwater tanks, reducing their pressure on town water supplies.

## Oyster Theft

Action	Who	Performance indicator	Due
29. Report any occurrence of theft to police and NSW DPI	CROF	Alert authorities when theft or vandalism occurs	Ongoing
30. Alert the CROF and the NSW Food Authority to the unregulated sale of oysters	Local residents / CROF	No. of notifications made to relevant authorities (target = 0)	Ongoing

### Benefits of actions:

- Protect consumers from unsafe oysters
- Guard farmers investment and livelihood by combating oyster theft

### Background:

The high price per item of quality Sydney Rock Oysters has led to an increase in the occurrence of theft in recent times, especially around Christmas holiday periods. Reduction in effort of commercial estuary fishermen across NSW has also reduced the amount of regular night time activities, which historically provided an unintentional deterrent to thieves. Unregulated sale of oysters can pose serious health threats to consumers as the product may have been stolen during times when it was unsafe to directly harvest from leases.

By 2007, the scale of the problem prompted three key Government agencies (DPI NSW, NSW Food Authority and the NSW Police Force) to join forces and launch a high-tech initiative, 'Operation Trident', to tackle thefts and address the growing black market trade in oysters. Fines of up to \$275,000 and/or imprisonment apply.

### **Objective 3. Recognise and protect the cultural and aesthetic values of the Clyde River and its catchment**

<b>Aesthetics</b>			
<b>Action</b>	<b>Who</b>	<b>Performance indicator</b>	<b>Due</b>
31. Keep all leases tidy and uniform	CROF	Number of reasonable complaints regarding untidy or non-uniform leases (target = 0)	Ongoing
32. Maintain all navigation and marking requirements in line with NSW Maritime and NSW DPI requirements	CROF	Number of infringements of navigation and marking requirements (target = 0)	Ongoing
33. All leases to adhere to the best practice standards for visual amenity as outlined in the NSW Oyster Industry Sustainable Aquaculture Strategy	CROF	Percentage of leases adhering to the best practice standards outlined in OISAS (target = 100%)	Dec 2012
34. Following review of the NSW Oyster Industry Sustainable Aquaculture Strategy, ensure all farmers receive copies of the updated document	NSW DPI / OWA	Percentage of farmers who receive copies of the revised OISAS (target = 100%)	Dec 2012

#### **Benefits of actions:**

- Neat & tidy leases present the image of a professional industry which recognises its environmental stewardship responsibilities
- CROF aware of best practice guidelines for lease maintenance and aesthetics
- Farmers kept up-to-date with revisions to industry specific documents

#### **Background:**

The leases used by the Clyde River Oyster Farmers are integral to an industry that has been part of the economy, appearance and culture of the Clyde River for over 100 years.

In 2006, NSW DPI (Fisheries) developed the NSW Oyster Industry Sustainable Aquaculture Strategy (OISAS) that includes criteria for acceptable lease materials and maintenance as well as their visual amenity. The Clyde River Oyster Farmers take great pride in the appearance of their leases and a great deal of work has been undertaken to upgrade infrastructure to adhere to this strategy. In order to grow oysters in certain leases, fences are required to buffer the trays from the effects of boat wash. As with lease arrangements, the Clyde River Oyster Farmers will employ the same duty of care regarding fence uniformity and tidiness.

NSW DPI are currently undertaking a review of the NSW Oyster Industry Sustainable Aquaculture Strategy. Whilst it's unclear which sections of the document will be updated, all farmers should be provided with copies of the new planning document upon release.

## Other Waterway Users

Action	Who	Performance indicator	Due
35. Respect other users of the Clyde River	CROF	Complaints to CROF or other Authorities regarding the conduct of oyster farmers (target = 0)	Ongoing
	CROF / Council / Maritime	Additional facilities provided	Dec 2012
36. Continue working with local council, NSW maritime & others to scope additional facilities for houseboats and rec. waterway users.	CROF / Council / Maritime	Existing facilities upgraded	Dec 2012
	CROF / Council / Maritime	Funding identified to finance additional facilities / upgrades	Dec 2012

### Benefits of actions:

- Maintain good relationships with other waterway users
- Additional facilities will mitigate competition for space & amenities

### Background:

The CROF recognise the importance of maintaining & promoting a harmonious relationship with the other uses of the Clyde River estuary. Since the establishment of the Batemans Bay Marine Park, interactions are most likely to be with boaters and recreational fishers, with numbers swelling over holiday periods. Some misconceptions exist concerning commercial oyster cultivation and the CROF are happy to educate the broader community and demystify their operations to interested people.

In 2004, the oyster growers of the Clyde River diverted time, money and resources to improving the 'oyster farmers jetty' located on the western side of the Princess Highway bridge. The jetty is used daily by the farmers for the pick-up and delivery of workers and materials, boat access to town, and overnight mooring. The jetty is also a popular fishing spot for locals and tourists, providing a safe fishing platform for children, especially during peak holiday times. A crowded jetty during the Christmas period is not uncommon and competition for space can be frustrating for both user groups.

In mitigate these issues, the CROF have been working closely with local council and NSW Maritime to scope additional facilities for recreational waterway users (including house-boats). Such facilities will ease the pressure currently exerted on existing infrastructure. Additional floating pontoons have been suggested as one possible solution and discussions are ongoing as to their location and profile.

The management of effluent waste & litter generated by recreation waterway users (particularly house-boats) is of major concern to the oyster farmers. There is currently one pump-out at the Batemans Bay Marina which was installed in 2006, however considering the potential impact on water quality of unauthorised discharges, the oyster farmers would like to see additional action / facilities to mitigate this risk.

Grants to help fund some of these works may be available through the 'Recreational Fishing Trusts' or 'Habitat Action Grants' administered by NSW DPI.

## Indigenous Culture & Heritage

Action	Who	Performance indicator	Due
37. Respect the indigenous culture of the Clyde River catchment	CROF	Conduct operations with respect to the indigenous culture and heritage in the region	Ongoing
38. Engage the Local Aboriginal Land Council on relevant matters	CROF	No. of engagement events and feedback sought	Ongoing

### Benefits of actions:

- Demonstrating their position as responsible holistic land-managers, CROF respect the indigenous cultural and heritage values of the area
- Protect and enhance cultural features that are of regional significance

### Background:

The oyster industry of the Clyde River has links dating back to before European settlement. In shellfish beds of Batemans Bay provided an important and abundant food source for the people of the Walbanja language group who utilised the area.

Today Batemans Bay is home to the local Aboriginal Land Council. Engagement with the Land Council provides oysters farmers with the feedback and support the need to operate as responsible land managers.

## **Objective 4. Conduct environmental management in a transparent and cooperative manner**

<b>Promotion of Environmental Initiatives</b>			
<b>Action</b>	<b>Who</b>	<b>Performance indicator</b>	<b>Due</b>
39. Adopt revised EMS and circulate to relevant stakeholders for comment	CROF	EMS circulated to stakeholders	June 2012
	CROF	EMS commitment form signed by all members of CROF	June 2012
	CROF / OWA	New EMS uploaded to CROF and OceanWatch websites	June 2012
40. Re-launch EMS	CROF	EMS launching activities	August 2012
41. Continue to mentor oyster producing estuaries on EMS creation & implementation	CROF	No. of engagement events	Ongoing
42. Investigate opportunities to demystify industry through farm tours	CROF	No. of guided farm tours undertaken	Dec 2012
43. Utilise media opportunities, engagement events and online/written materials	CROF / SRCMA / OWA	Number of: media articles; engagement events; written materials; online presence	Dec 2012

### **Benefits of actions:**

- Promote the environmental initiatives undertaken by the CROF
- Raise the awareness of external risks that can impact on oyster farming
- Demystify the industry
- Build relationship and engage with Authorities and community groups

### **Background:**

The original EMS created in 2007 was one of the first in the state for the oyster industry. Since its development, and as evidenced by the Achievements Table in section 4.4, the farmers have been very proactive in implementing actions to improve their environmental performance. Oyster farmers on the Clyde River are industry champions, and are well-respected by other farmers in the state. As such, CROF often donate their time and effort to speak with farmers from other estuaries to talk about their experiences developing EMS, implementation, applying for funding and their interactions with other stakeholders.

Oyster farmers not only rely on a healthy environment, but also need to be able to demonstrate that they are utilising the environment in a sustainable way. As such the environmental performance and aspirations of the CROF should be available to the public and open to scrutiny. EMS registers are held by both OceanWatch Australia and Seafood Services Australia, and all opportunities should be taken to promote the EMS and the environmental credentials of the CROF.

## Continual Improvement & Feedback

Action	Who	Performance indicator	Due
44. Undertake review of EMS actions every year at the AGM	CROF	EMS reviewed yearly	Ongoing
45. Generate short progress report on the EMS following the annual review process	CROF	Progress report generated	Dec 2012
	CROF	Progress report circulated	Dec 2012
46. Provide opportunities for stakeholders to comment on the EMS & CROF operations	CROF	EMS circulated to all relevant stakeholders	June 2012
	CROF	Maintain contact details on the CROF website	Ongoing

### Benefits of actions:

- EMS is maintained, highlighting current & relevant risks to the oyster industry
- Transparency enables informed suggestions & input from key stakeholders
- Regular communication promotes understanding & encourages collaboration to address identified issues

### Background:

Continual improvement is fundamental to any EMS, and requires regular reviews. Each year, the Clyde River Oyster Farmers will review this action plan and determine if the risk assessment is still current. Reports on the progress of the EMS will be circulated to stakeholders upon completion of the review.

The EMS should be available to all stakeholders, and contact details provided to enable feedback on the document. As the EMS is an ongoing process of environmental improvement, the Clyde River Oyster Farmers welcome any comments and suggestions.

The CROF also maintain a website at: <http://clyderiveroysterfarmers.com.au> The farmers endeavour to update this website and provide relevant information in a timely manner.

## Identification of Stakeholders

Action	Who	Performance indicator	Due
47. Compile a record of stakeholders	CROF	List compiled	June 2012

### Benefits of actions:

- Quick and easy communication with key stakeholders

### Background:

n/a

## **Objective 5. Contribute to scientific research and management innovation relevant to oyster cultivation and estuarine environments**

<b>Trialling Products &amp; Techniques</b>			
Action	Who	Performance indicator	Due
48. Continue to investigate new cultivation methods & techniques	CROF	No. of different cultivation methods and techniques trialled	Ongoing
49. Disseminate relevant information to the wider industry	CROF	Communication with the wider industry	Ongoing

**Benefits of actions:**

- New products and techniques are important to the future development of the industry

### **Background:**

The Clyde River Oyster Farmers utilise almost every available method to cultivate oysters. Most growers within the group are experimenting with infrastructure or subtle changes in cultivation techniques. The Clyde River Farmers have also had a few younger operators enter the industry recently and it is vital that this trend continues for the future development and long-term viability of the industry.

<b>Contributing to Research</b>			
Action	Who	Performance indicator	Due
50. Assist Government agencies & researchers in studies that may improve farming practices & environmental management	CROF	Projects assisted	Ongoing

**Benefits of actions:**

- Research is fundamental to furthering our scientific understanding of the waterway and the future development of the industry

### **Background:**

CROF are happy to assist in any research projects relative to their operation on the Clyde River and issues that affect the waterway. The combination of oyster grower's understanding of the estuarine environment and the existing water quality monitoring, places the operators in this industry in a unique position to assist catchment managers and working groups in the assessment of issues and any proposed remedial work.



## Appendix 1. Risk assessment ratings

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

Risk Analysis involves consideration of:

- 1) the source of the risk
- 2) the consequences and likelihood that those consequences may occur

A risk assessment can help to separate and highlight major unacceptable risks from minor acceptable risks.

Each specific risk has been ranked, based upon the tables below, according to the consequence and likelihood of the risk.

### Likelihood ranking

Likelihood	Score	Definition
Rare	1 – Low	May occur in exceptional circumstances (i.e. once every 10 years)
Possible	2 – Moderate	Uncommon some evidence to suggest this may occur (i.e. once in 1-3 years)
Likely	3- High	Highly probable to occur in most circumstances (i.e. 2-4 times a year)

### Consequence ranking

Consequence	Score	Definition
Minor	1 – Low	Insufficient or minimal impact. Unlikely to measure from the existing natural background variability.
Severe	2 – Moderate	Maximum acceptable level of impact on environment (time frame for recovery more months than years)
Major	3- High	Very serious impacts occurring now with long time frame and/or permanent/irreversible damage or loss (recovery years/decades/never)

**Risk Matrix**

		Consequence		
		Minor (1)	Severe (2)	Major (3)
Likelihood	Rare (1)	1	2	3
	Possible (2)	2	4	6
	Likely (3)	3	6	9

**Management Response**

Risk Level	Description	Likely Management
<b>Low (1-2)</b>	Acceptable – no specific control measures needed but recommendable	None specific
<b>Moderate (3-5)</b>	Acceptable – with current risk control measures in place	Specific response required (continue current arrangement?)
<b>High (6-9)</b>	Not desirable – continue strong management action – new or further risk control measures to be introduced in near future	Immediate / Specific response with urgency

## Appendix 2A. Risk assessment table: Internal risks

### INTERNAL - Land-based risks (1 of 4)

Description	Potential / actual consequence	Risk Assessment	Risk	Current action	Action
Fuel storage areas pose a <b>fire</b> risk	<ul style="list-style-type: none"> <li>Injury and loss of facilities.</li> <li>Multiple storage areas could result in the explosive spread of fire.</li> </ul>	Likelihood	High	<ul style="list-style-type: none"> <li>Fuel stored in a secure area.</li> <li>Timely removal of rubbish</li> <li>Group has staff trained in first aid, fire control and management</li> <li>Fire policy has been developed</li> </ul>	<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Circulate and implement the fire policy</li> <li><input checked="" type="checkbox"/> Identify and establish buffer zones</li> <li><input checked="" type="checkbox"/> Investigate options for a centralised fuel storage area equipped with a fuel containment kit</li> </ul>
		3			
		Consequence			
		3			
Risk Score	9				
<b>PAST ACHEIVEMENTS:</b> See section 4.4 – No. 1, 2					
Tar leaching from the application area and also from infrastructure in the water	<ul style="list-style-type: none"> <li>Reduced water quality</li> <li>Issue is high on the public agenda</li> </ul>	Likelihood	High	<ul style="list-style-type: none"> <li>Use of tar is being phased out</li> <li>Mitigate leaching by ensuring tar is dry before setting</li> <li>Some farmers use concrete to seal</li> </ul>	<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Continue phase out of tar in the estuary</li> </ul>
		3			
		Consequence			
		2			
Risk Score	6				
<b>PAST ACHEIVEMENTS:</b> See section 4.4 – No. 4, 16, 17					
Unsealed common loading area	<ul style="list-style-type: none"> <li>Surface erosion reduces light penetration.</li> <li>Area unsafe &amp; could result in injury &amp; equipment damage.</li> </ul>	Likelihood	Moderate	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Contact relevant authorities, neighbours and farmers to discuss solutions.</li> <li><input checked="" type="checkbox"/> Identify funding to upgrade site to accommodate industry needs &amp; improve public access.</li> </ul>
		2			
		Consequence			
		2			
Risk Score	4				

## INTERNAL - Land-based risks (...continued 2 of 4)

Description	Potential / actual consequence	Risk Assessment	Risk	Current action	Action
Lack of appropriate toilet facilities	<ul style="list-style-type: none"> <li>Potential pollution from septic tanks</li> <li>Time and fuel used to access facilities</li> </ul>	Likelihood	Moderate	<ul style="list-style-type: none"> <li>Regular maintenance of current facilities by the farmers.</li> <li>Centralised toilet facility under construction on Budd Island.</li> </ul>	<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Continue ongoing maintenance of current facilities.</li> <li><input checked="" type="checkbox"/> Construct Budd Island composting toilet utilising approved funding.</li> <li><input checked="" type="checkbox"/> Composting toilets for Latta's Pt</li> </ul>
		1			
		Consequence			
		3			
Risk Score	3				
<b>PAST ACHEIVEMENTS:</b> See section 4.4 – No. 3					
Shed site erosion (increased as a result of fork-lift activity and other machinery)	<ul style="list-style-type: none"> <li>Sediment plume emitted from shed sites</li> <li>Reduced light penetration &amp; seagrass smotherin</li> </ul>	Likelihood	Moderate	<ul style="list-style-type: none"> <li>Oyster shells are used to fill pot holes and contribute to road base</li> <li>No gear washed over unsealed ground</li> </ul>	<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Investigate funding to manage shed-site erosion (possible regrading or sealing)</li> </ul>
		2			
		Consequence			
		2			
Risk Score	4				
Single use packaging used for the transport of shucked product	<ul style="list-style-type: none"> <li>Resource wastage</li> </ul>	Likelihood	Low	<ul style="list-style-type: none"> <li>Shucked product must be transported in single use packaging.</li> <li>Regulations prohibit using reusable packaging</li> </ul>	None
		1			
		Consequence			
		1			
Risk Score	1				
Tarred / treated timber removed from derelict leases is stored at land-base	<ul style="list-style-type: none"> <li>Over time chemicals leach into environment</li> <li>Damages public perception of industry</li> </ul>	Likelihood	Low	<ul style="list-style-type: none"> <li>Clyde River Oysters Farmers committed to phase out tarred and treated timber products</li> </ul>	<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Maintain commitment to phase out tarred and treated timber products</li> </ul>
		1			
		Consequence			
		1			
Risk Score	1				
<b>PAST ACHEIVEMENTS:</b> See section 4.4 – No. 4, 17					

## INTERNAL - Land-based risks (...continued 3 of 4)

Description	Potential / actual consequence	Risk Assessment	Risk	Current action	Action
<b>Waste</b> that is not recycled / not recyclable	<ul style="list-style-type: none"> <li>Use of limited landfill resources</li> </ul>	Likelihood	Low	<ul style="list-style-type: none"> <li>Use recyclable material where possible and recycle</li> </ul>	None
		1			
		Consequence			
		2			
Risk Score	2				
<b>Waste shells</b>	<ul style="list-style-type: none"> <li>Use of limited landfill resources</li> <li>Wasted potential resource</li> </ul>	Likelihood	Low	<ul style="list-style-type: none"> <li>Used as road-base and as erosion control around land based activities</li> </ul>	<input checked="" type="checkbox"/> Investigate options to dispose or sell oyster shells (potential income from a waste product) <input checked="" type="checkbox"/> First stage may be a centralised storage area
		1			
		Consequence			
		1			
Risk Score	1				
<b>Chemicals</b> that leak through poor storage or an adverse event	<ul style="list-style-type: none"> <li>Reduced water quality</li> <li>Local fish kills</li> </ul>	Likelihood	Low	<ul style="list-style-type: none"> <li>Very few chemicals stored on site, and only in small quantities</li> </ul>	<input checked="" type="checkbox"/> Continue phase out of chemically treated infrastructure
		1			
		Consequence			
		2			
Risk Score	2				
<b>PAST ACHEIVEMENTS:</b> See section 4.4 – No. 5					
<b>Vehicular access</b> along Latta's Point Road - potential for erosion	<ul style="list-style-type: none"> <li>Reduced light penetration smothering seagrass and phytoplankton</li> </ul>	Likelihood	Low	<ul style="list-style-type: none"> <li>Stormwater and sediment control plan is in effect</li> <li>Oyster shells are used to fill pot holes</li> </ul>	<input checked="" type="checkbox"/> Work with engineers to increase the effectiveness of sediment traps <input checked="" type="checkbox"/> Ongoing maintenance
		1			
		Consequence			
		1			
Risk Score	1				
<b>PAST ACHEIVEMENTS:</b> See section 4.4 – No. 6, 7, 11					

## INTERNAL - Land-based risks (...continued 4 of 4)

Description	Potential / actual consequence	Risk Assessment	Risk	Current action	Action
<b>Grey water</b> discharge, including that used to wash equipment and oysters	<ul style="list-style-type: none"> <li>Potential pollution of surrounding waterway through increased nutrients, salt and soaps</li> </ul>	Likelihood	Low	<ul style="list-style-type: none"> <li>Grey water is diverted into sumps that allows grey water to be held, treated and re-used</li> <li>All farmers have rainwater tanks</li> </ul>	<input checked="" type="checkbox"/> Examine potential of funding / grants through rainwater tank installation
		1			
		Consequence			
		1			
		Risk Score			
		1			
<b>PAST ACHIEVEMENTS:</b> See section 4.4 – No. 8,9					
Land-based <b>fuel/oil spills</b>	<ul style="list-style-type: none"> <li>Land-based spills could run-off resulting in water quality issues</li> <li>Potential to fuel fires</li> </ul>	Likelihood	Low	<ul style="list-style-type: none"> <li>Alert and work with authorities to aid containment following spills</li> <li>Maintain machinery in a good working condition</li> </ul>	<input checked="" type="checkbox"/> Purchase a containment kit
		1			
		Consequence			
		2			
		Risk Score			
		2			
<b>Pest control</b> chemicals leaking into the environment	<ul style="list-style-type: none"> <li>Reduced water quality</li> </ul>	Likelihood	Low	<ul style="list-style-type: none"> <li>No chemicals used other than rodent control in shed</li> </ul>	None
		1			
		Consequence			
		2			
		Risk Score			
		2			

## INTERNAL - Water based risks (1 of 2)

Description	Potential / actual consequence	Risk Assessment	Risk	Current action	Action
<b>Threatened species struck</b> by oyster punt	<ul style="list-style-type: none"> <li>Injury or kill wildlife</li> </ul>	Likelihood	Moderate	<ul style="list-style-type: none"> <li>Report incidents</li> </ul>	<input checked="" type="checkbox"/> Threatened species identification guides and handling manuals distributed to growers
		1			
		Consequence			
		3			
Risk Score	3				
<b>PAST ACHEIVEMENTS:</b> See section 4.4 – No. 22					
<b>Chemicals</b> from tar and treated timber leaching into the water	<ul style="list-style-type: none"> <li>Reduced water quality</li> <li>Issue is high on the public agenda</li> </ul>	Likelihood	Moderate	<ul style="list-style-type: none"> <li>Use of tarred and treated timber is being phased out</li> </ul>	<input checked="" type="checkbox"/> Continue phase out of chemically treated infrastructure
		2			
		Consequence			
		2			
Risk Score	4				
<b>PAST ACHEIVEMENTS:</b> See section 4.4 – No. 4, 5, 16, 17					
<b>Changes in hydrology</b> due to infrastructure causes sediment to build up	<ul style="list-style-type: none"> <li>Disruption of natural processes</li> </ul>	Likelihood	Moderate	<ul style="list-style-type: none"> <li>There is increasing use of long-line systems. Compared with racks these systems encourage water flow</li> </ul>	<input checked="" type="checkbox"/> Continue moving towards cultivation techniques with less infrastructure
		2			
		Consequence			
		2			
Risk Score	4				
Water-based <b>fuel/oil spills</b> from oyster punts	<ul style="list-style-type: none"> <li>Spills of fuel and oil has the potential to impact on estuarine ecosystems and decrease water quality</li> </ul>	Likelihood	Moderate	<ul style="list-style-type: none"> <li>Alert appropriate authorities</li> <li>Work with authorities to aid containment following spills</li> </ul>	<input checked="" type="checkbox"/> Purchase a containment kit
		1			
		Consequence			
		3			
Risk Score	3				

## INTERNAL - Water based risks (...continued 2 of 2)

Description	Potential / actual consequence	Risk Assessment	Risk	Current action	Action
Inefficient motors resulting in pollution and increased fuel use	<ul style="list-style-type: none"> <li>Reduced water quality</li> </ul>	Likelihood	Moderate	<ul style="list-style-type: none"> <li>Gradual phase out of 2-strokes</li> <li>Limit unnecessary use of outboard</li> <li>Maintain motors in good condition</li> </ul>	<input checked="" type="checkbox"/> Upgrade to EPA approved motor when time to replace <input checked="" type="checkbox"/> Use grant opportunities to help phase out
		2			
		Consequence			
		2			
Risk Score	4				
<b>PAST ACHEIVEMENTS:</b> See section 4.4 – No. 10					
Noise	<ul style="list-style-type: none"> <li>Irritation of neighbours</li> </ul>	Likelihood	Moderate		<input checked="" type="checkbox"/> Follow DPI guidelines as outlined in OISAS
		3			
		Consequence			
		1			
Risk Score	3				
Lease establishment leading to habitat, seagrass or substrate damage	<ul style="list-style-type: none"> <li>Shading, and physical presence of leases may disrupt the ecological function of the estuary</li> </ul>	Likelihood	Low	<ul style="list-style-type: none"> <li>Increasing plastic use &amp; long-lines to reduce shading and substrate disturbance</li> <li>Every lease undergoes EIS before approval</li> </ul>	<input checked="" type="checkbox"/> Work with researchers to learn more about the relationship between oysters, seagrass and infrastructure type
		1			
		Consequence			
		2			
Risk Score	2				
Boat antifouling chemicals that leak into the environment	<ul style="list-style-type: none"> <li>Reduced water quality</li> </ul>	Likelihood	Low	<ul style="list-style-type: none"> <li>Very few Clyde River Oyster Farmers use antifouling on punts</li> </ul>	None
		1			
		Consequence			
		1			
Risk Score	1				

## Appendix 2B. Risk assessment table: External risks

### EXTERNAL - Land-based risks (1 of 1)

Description	Potential / actual consequence	Risk Assessment	Risk	Current action	Action
Development & agriculture causing erosion, run-off and vegetation loss	<ul style="list-style-type: none"> <li>Reduced water quality</li> <li>Reduced oyster health</li> </ul>	Likelihood	High	<ul style="list-style-type: none"> <li>Water quality monitoring program</li> <li>Promote importance of water quality for oysters, public benefits and estuary</li> </ul>	<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Contribute to on-ground works &amp; projects in the catchment</li> <li><input checked="" type="checkbox"/> Promote farmers profile in monitoring water quality</li> <li><input checked="" type="checkbox"/> Engage &amp; educate community</li> <li><input checked="" type="checkbox"/> Investigate options to fund QAP</li> </ul>
		3			
		Consequence			
		3			
Risk Score	9				
Inadequate toilet facilities upriver	<ul style="list-style-type: none"> <li>Potential run-off of human effluent into the river</li> <li>Contamination of shellfish</li> </ul>	Likelihood	High	<ul style="list-style-type: none"> <li>Water quality monitoring</li> </ul>	<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Work with key stakeholders (NPWS, Council, CMA etc) to identify key sites and investigate options to mitigate the risk of contamination</li> </ul>
		2			
		Consequence			
		3			
Risk Score	6				
Reduction in natural environmental flows through water extraction	<ul style="list-style-type: none"> <li>Disruption of natural processes</li> </ul>	Likelihood	Moderate	<ul style="list-style-type: none"> <li>Beyond the scope of Clyde River Oyster Farmers</li> </ul>	None
		2			
		Consequence			
		2			
Risk Score	4				
Riparian vegetation loss through clearing and poor cattle fencing upriver	<ul style="list-style-type: none"> <li>Poor water quality</li> <li>Sediment mobilisation and then settlement</li> <li>Reduced oyster health</li> </ul>	Likelihood	Moderate	<ul style="list-style-type: none"> <li>Regulations for cattle control</li> <li>Re-vegetating erosion channel at Latta's Pt.</li> <li>Work closely with CMA on cattle grazing issues</li> </ul>	<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Work with farmers &amp; SRCMA for improved fencing upriver</li> <li><input checked="" type="checkbox"/> Contribute to on-ground works &amp; projects in the catchment</li> <li><input checked="" type="checkbox"/> Investigate option to stabilise banks with stone</li> </ul>
		2			
		Consequence			
		2			
Risk Score	4				
<b>PAST ACHEIVEMENTS:</b> See section 4.4 – No. 11					

## EXTERNAL - Water based risks (1 of 2)

Description	Potential / actual consequence	Risk Assessment	Risk	Current action	Action
<b>House-boats discharging effluent</b> through poorly located pump-outs & lack of awareness	<ul style="list-style-type: none"> <li>Contamination of shellfish</li> <li>Closure of harvest areas</li> <li>Reduced water quality</li> </ul>	<b>Likelihood</b>	High	<ul style="list-style-type: none"> <li>Working with Maritime &amp; Food Authority to scope additional pump-out sites &amp; more signage</li> </ul>	<input checked="" type="checkbox"/> Continue talking to council on monitoring houseboat discharge <input checked="" type="checkbox"/> Work with Maritime & FA on pump-out awareness signage <input checked="" type="checkbox"/> Potential to work with ET to educate other waterway users
		3			
		<b>Consequence</b>			
		3			
<b>Risk Score</b>	9				
<b>PAST ACHEIVEMENTS:</b> See section 4.4 – No. 12					
<b>Increasing public access to lease</b> damage through boat strike and tying up	<ul style="list-style-type: none"> <li>Damage to infrastructure</li> <li>Loss of oysters &amp; income</li> </ul>	<b>Likelihood</b>	Moderate	<ul style="list-style-type: none"> <li>Working with stakeholders to increase awareness of lease areas and requirements of industry</li> </ul>	<input checked="" type="checkbox"/> Improve signage <input checked="" type="checkbox"/> Work with stakeholders to establish educational signage <input checked="" type="checkbox"/> Submission into OISAS review
		2			
		<b>Consequence</b>			
		2			
<b>Risk Score</b>	4				
Water-based <b>fuel/oil spills</b> from recreational vessels	<ul style="list-style-type: none"> <li>Spills of fuel and oil has the potential to impact on estuarine ecosystems and decrease water quality</li> </ul>	<b>Likelihood</b>	Moderate	<ul style="list-style-type: none"> <li>Alert appropriate authorities</li> <li>Work with authorities to aid containment following spills</li> </ul>	<input checked="" type="checkbox"/> Purchase a containment kit
		1			
		<b>Consequence</b>			
		3			
<b>Risk Score</b>	3				
<b>Pacific oysters</b> overcatch and competition for resources	<ul style="list-style-type: none"> <li>Competition for resources and space with SRO</li> <li>Time and cost associated with management</li> </ul>	<b>Likelihood</b>	Moderate	<ul style="list-style-type: none"> <li>Follow Pacific Oyster Management Plan developed with DPI</li> <li>Annual Pacific oyster culls with the CMA</li> </ul>	None
		2			
		<b>Consequence</b>			
		2			
<b>Risk Score</b>	4				
<b>PAST ACHEIVEMENTS:</b> See section 4.4 – No. 13, 21					

## EXTERNAL - Water based risks (...continued 2 of 2)

Description	Potential / actual consequence	Risk Assessment	Risk	Current action	Action
Sensitive migratory <b>bird habitat</b> close to boat operations and leases	<ul style="list-style-type: none"> <li>Loss of biodiversity</li> </ul>	Likelihood	Moderate	<ul style="list-style-type: none"> <li>Boating activity of Clyde River Oyster Farmers does not interfere with bird habitats</li> </ul>	<input checked="" type="checkbox"/> Workshop to educate growers on proper handling techniques
		1			
		Consequence			
		3			
Risk Score	3				
<b>Community unhappy</b> with look / presence of leases through lack of understanding and respect	<ul style="list-style-type: none"> <li>Poor community perception</li> <li>Reduced resource security</li> </ul>	Likelihood	Low	<ul style="list-style-type: none"> <li>Leases maintained as best practice, as described in OISAS</li> <li>Opportunities to engage &amp; educate public are utilised</li> </ul>	<input checked="" type="checkbox"/> Distribute EMS <input checked="" type="checkbox"/> Promote history of oyster farming on the river & contribution to local economy <input checked="" type="checkbox"/> Involvement in awareness raising events & education
		1			
		Consequence			
		2			
Risk Score	2				
<b>PAST ACHEIVEMENTS:</b> See section 4.4 – No. 4, 17					
<b>Oyster jetty overcrowding</b> during peak periods with rec. fishers	<ul style="list-style-type: none"> <li>Public safety risk through loading of oyster gear, infrastructure and product</li> </ul>	Likelihood	Low	<ul style="list-style-type: none"> <li>Working with Maritime to scope location for new floating jetty for rec. users</li> </ul>	<input checked="" type="checkbox"/> Following installation of floating jetty, secure oyster jetty with gate
		1			
		Consequence			
		1			
Risk Score	1				
<b>PAST ACHEIVEMENTS:</b> See section 4.4 – No. 12					
<b>Navigational issues</b> could cause boating accidents	<ul style="list-style-type: none"> <li>Damage to infrastructure</li> <li>Physical injury</li> </ul>	Likelihood	Low	<ul style="list-style-type: none"> <li>Clearly marked lease boundaries, regulated by DPI &amp; NSW Maritime</li> <li>Leases maintained as per best practice as described in OISAS</li> </ul>	<input checked="" type="checkbox"/> Maintain clearly marked lease boundaries <input checked="" type="checkbox"/> Look at more stickers to attach to leases
		1			
		Consequence			
		2			
Risk Score	2				

## Appendix 3. 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	<a href="mailto:cheryl.pope@dpi.nsw.gov.au">cheryl.pope@dpi.nsw.gov.au</a>
GRAFTON	Jan Bruce	6640 1600	0427 257 191	<a href="mailto:jan.bruce@pi.nsw.gov.au">jan.bruce@pi.nsw.gov.au</a>
GUNNEDAH	Jenny Croft	6741 8336	0429 446 417	<a href="mailto:jenny.croft@dpi.nsw.gov.au">jenny.croft@dpi.nsw.gov.au</a>
DUBBO	Pip Brown	6881 1266	0429 396 697	<a href="mailto:pip.brown@dpi.nsw.gov.au">pip.brown@dpi.nsw.gov.au</a>
SCONE	Caroline Long	6544 4900	0428 296 332	<a href="mailto:caroline.long@dpi.nsw.gov.au">caroline.long@dpi.nsw.gov.au</a>
GOULBURN	Dick Kearins	4828 6600	0427 781 514	<a href="mailto:dick.kearins@dpi.nsw.gov.au">dick.kearins@dpi.nsw.gov.au</a>
HAY	Danny Byrnes	6993 1608	0428 973 141	<a href="mailto:danny.byrnes@dpi.nsw.gov.au">danny.byrnes@dpi.nsw.gov.au</a>
ALBURY	Di Pritchard	6051 7703	0417 231 852	<a href="mailto:di.pritchard@dpi.nsw.gov.au">di.pritchard@dpi.nsw.gov.au</a>

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