

# Fact sheet 4

**Improving water quality at the edge of block.**

*A guide to help extension and NRM officers identify edge of block water quality management initiatives and how to implement them.*

## **ON THE FARM: TECHNIQUES IN DISCUSSING AND CHOOSING A WATER QUALITY MANAGEMENT ACTION.**



## **Build your own map – see example overleaf.**

Before you go out to a farm, it's a good idea to get an understanding of how the farms sits within its broader catchment. Going to a farm with a map provides a great foundation for discussing soil types, water movement and farm management. Ideally you should have maps at two scales:

1. Property scale map, which clearly shows the farm blocks, main infrastructure (drains, tracks, irrigation channels) and any key landscape features (creek, ridge, gully),
2. Catchment scale map, which shows the property in the context of the local rivers, creeks, drainage lines, wetlands, mountains, roads, other farms, native vegetation and towns.

The creeks, drains and wetlands should be marked, with recent aerial photos. There are a few ways to create these maps. Your internal GIS system may provide you with all you require, however there are a number of freely available on-line tools you can use (google maps, Queensland Globe, WetlandMaps). An example of a farm map is provided overleaf.

Precisely where on the farm you should you investigate for a water quality management action is a collaborative process with the farmer. Generally speaking, you're looking for the opportunity to intercept ground or surface water. This will likely occur at the:

1. End of a headland,
2. End of a paddock / block, or
3. At the end of drainage line/lines

At these locations, you're looking for a means by which to "treat" the water. For **sediment**, that means filtration and sedimentation, for **Nutrients**, that means biological processing (refer to Fact Sheet 3)

The choice of an edge of block action needs to be informed by information provided by the farmer (see Box 1), knowledge of the priority pollutants (type and concentration), farm management, physical features of the property and the installation practicalities, available funding and any planning restrictions that may influence the design of the system.

Once you have a general idea on how the farm operates and an understanding on how the ground and surface water moves into, within and out of the farm, you are in a position to consider the most applicable water quality management initiative. A few combined water quality management initiatives, often referred to as a treatment train, is also an option to sequentially remove pollutants from coarse particles (sediment) to fine or dissolved nutrients or pesticides, e.g. having a vegetated drain prior to a treatment wetland.

Table 1 presented at the end of this fact sheet provides a summary of the key water quality management initiatives and the general site characteristics that suit their application. This table can be used as a quick reference guide to check which system/s might work best where.

There are many factors that could and should be assessed and considered at a site and sub-catchment scale when planning a water quality management initiative, some of these factors include:

- water regime
- connectivity
- sub-catchment size and shape
- natural and artificial drainage systems
- climate
- land uses
- geology/soils
- topography
- vegetation
- fauna
- barriers to flow, supplementary flows (irrigation) and other landscape modifications
- type, quantity and concentration of pollutants being generated in the sub-catchment
- agricultural production areas, management practices implemented and farm operations.

This level of assessment may involve considerable effort and thus take time and resources to complete. It is suggested that these considerations be undertaken when you are confident that you have a site suitable for a edge of block action. Please refer to WetlandInfo and search 'understand your location' (<http://bit.ly/UnderstandYourLocation>)

### Example of farm map:

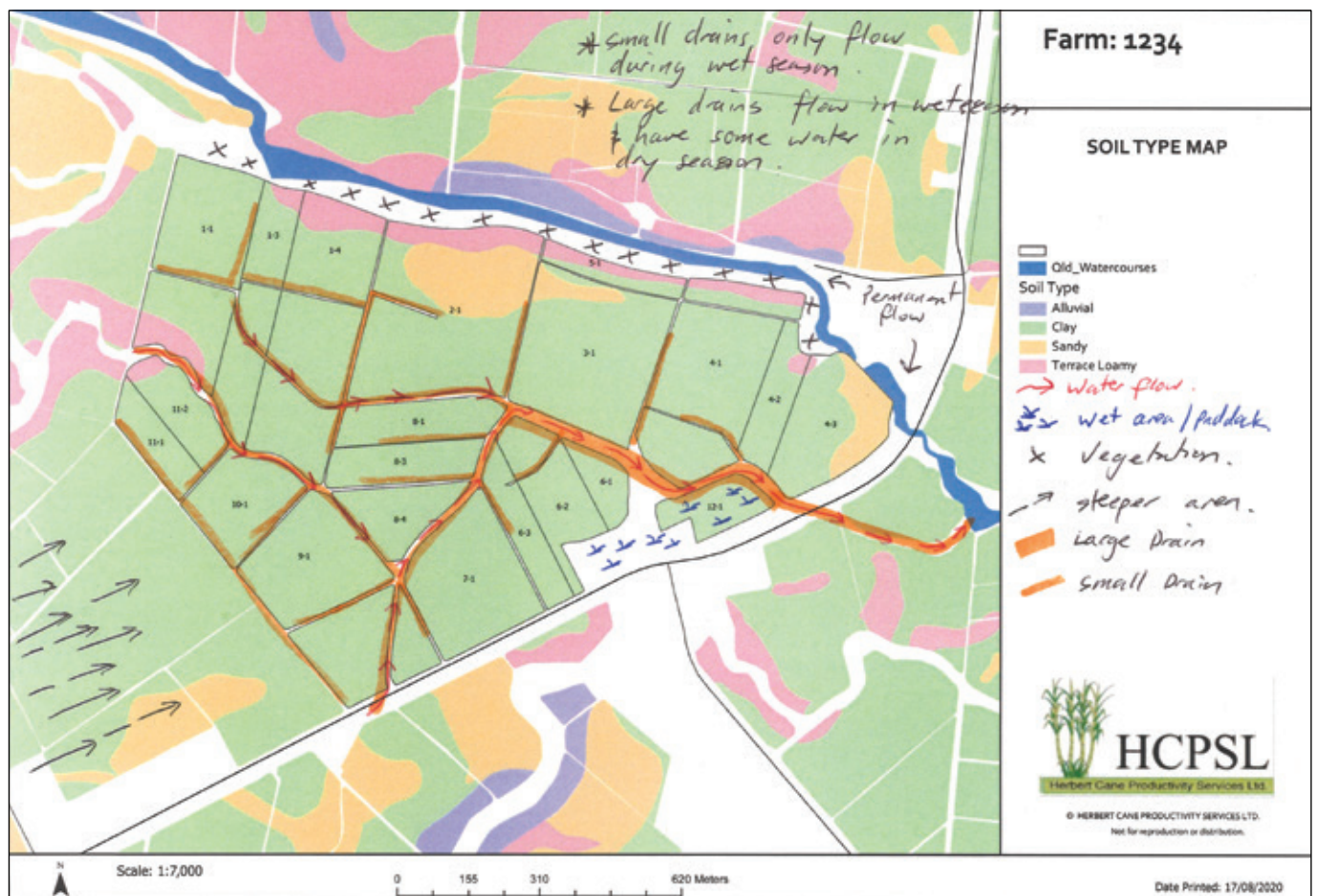


Figure 1: Example of Farm Map

## Key questions and discussion topics with the farmer

**Why are we here:** Clarifying the objectives of the project / problem with the landholder is very important. This ensures that everyone is on the same page, and that the key 'driver' for the potential project is established – for both the farmer and the extension officer. Additionally, any concerns or issues can be discussed and addressed early in the projects conception.

**Farm drainage** – a good start to any discussion is to get the farmer to discuss how water moves across the farm, in both the wet and dry seasons. This discussion can create good dialog and 'get the conversation happening'. A good idea is to use a map and get the farmer to draw the catchment and key drainage features. Using this 'map' some key question could be:

- How does water moves under low, medium and high rainfall events?
- Is there any subsurface / tile / Ag drainage?
- What's the water level in the drains during the wet / dry season?
- Where does it flood?
- Where are existing drains and how are they currently managed?
- Are there any wetlands or creeks on or adjacent to the property?
- If so, how are they managed?

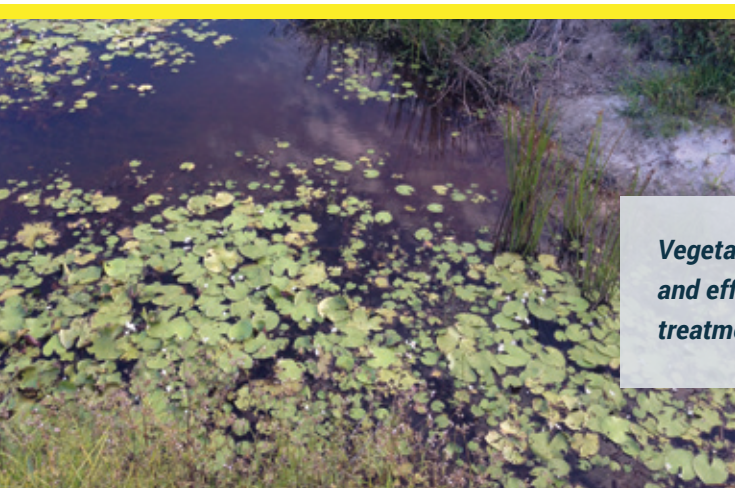
**Identifying unproductive parts of a farm** – ask the landholder about any poorly performing areas on the farm and the reasons for the poor production. Unproductive areas on a farm should, at least initially, be seen as a potential location for an edge of block action. Learning what areas on a farm are consistently underperforming or have been taken out of production may lead quickly to the identification of a potential site. When discussing possible remediation options for these areas (e.g. weed/pest management, soil amelioration), edge of block actions should also be discussed as an option. With emerging funding models such as Reef Credits, alternatives other than cane may provide more consistent and viable income for poorly performing areas.

**Any waterlogging/drainage issues?** – drainage and waterlogging can often be where unproductive parts of the farm and drainage infrastructure merge. These areas, if present, should be assessed for their potential to locate an edge of block action..

**Soils** – what is the soil type? Does the soil change significantly at depth? Is there bedrock? Is there Acid Sulphate Soil present?

**Farm management** – it's important to understand how different areas of the farm are used, at different times of the year. Any potential water quality management initiative needs to take into consideration all farming actions and future access for maintenance.

**Natural systems** - Are there any wetlands or creeks on or adjacent to the property and how are they managed/ are there any management concerns such as erosion, weeds, degraded riparian vegetation?



***Vegetation within drains can provide a simple and effective edge of block water quality treatment measure***

**Table 1:** Key water quality management initiatives and the generalized site characteristics that suit their application.

Site characteristics (refer to example farm map)	Prevention Action			Treatment actions		
	Vegetated drains	Grass buffer strips / grassed swale	Riparian Buffer	Treatment wetlands	Landscape wetlands	Bioreactors
Space required	Medium (50-1000m <sup>2</sup> plus)	Small to medium (2000-5000m <sup>2</sup> plus)	Small – large 0.5 – 2 ha	Medium 0.2-3 ha	Large 2 ha +	Small 20-100 m <sup>2</sup>
Suitable soil type	Soil type will vary depending on the position in the landscape.	All soil types	Dispersive soils, on slope.	Clay loam topsoil, with clay subsoil	Clay loam topsoil, with clay subsoil	Sandy / sandy loam topsoil of >1m depth with clay subsoil for bioreactor wall to intercept groundwater If heavy clays to surface, a bioreactor bed is more suitable to capture surface runoff
Position on farm	Drains exist on most farms and may only require a change in management. Or - Drains should be broad and shallow to allow for maintenance through the use of slashing.	Generally adjacent to cane blocks or headlands, just before drains / creeks	Any areas that run parallel to drainage lines or creeks	Lower part of farm in unproductive area that is adjoining existing drainage lines. Or - Possibility converting an existing drain via benching and widening	Lower part of a catchment on an unproductive area (e.g. may have been abandoned for agricultural production (because of high water table, waterlogging or flooding issues)	Located at the end of cane rows (bioreactor wall), along a headland. Run perpendicular to the fall of the land. Or - Located within or adjacent to a drain (bioreactor bed). Ideally have a slight gradient to facilitate water movement through the woodchip
Ground and surface water characteristics	Moderately high water level within the drain during the wet season, such that aquatic vegetation can be established	Groundwater conditions irrelevant, as buffer strips / swales accept surface water runoff only from cane blocks	For bank stabilisation groundwater conditions are irrelevant. For treatment, groundwater should be shallow so, the roots of the vegetation within the riparian buffer can intercept the groundwater. Surface water from creek/drain should only interact with riparian zone in moderate to high flood events	Moderately high water table during wet season, but less important as surface water will be directed into the wetland via the farm drainage system	High water table during wet season, possibly expressing at the surface for a large part of the season. Existing surface water drainage used will direct water into and out of the system	Moderately high-water table during wet season for bioreactor wall. No specific groundwater characteristics for a bioreactor bed. Surface water should be directed into bioreactor bed and adequate sediment management is provided
Existing site vegetation characteristics	Drain should be dominated by reeds and rushes Or - Grass species present that can be slashed and will not become problematic weeds	Presumably little to none	Ideally there would be some existing riparian vegetation but often there is little to none. Many farms have a few large trees, but no recruitment of canopy species or understorey due to use of broad spectrum herbicides to control weeds.	Disturbance of exist riparian vegetation should be avoided. Using endemic species that already exist (and collecting seeds/specimens) may be beneficial in establishing new vegetation once constructed.	Site should show signs of vegetation adapted to water ponding.	Disturbance of existing riparian vegetation should be avoided.