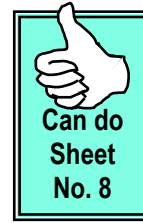


# GETTING TO KNOW THE ENVIRONMENTAL VULNERABILITIES OF YOUR PROPERTY

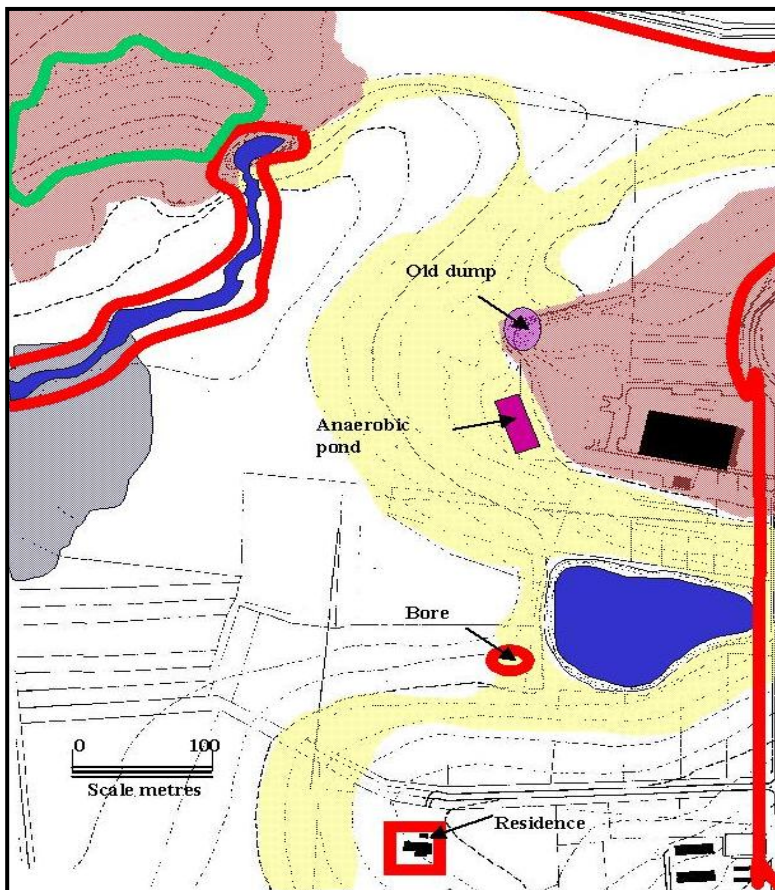


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Pam Pittaway, National Centre for Engineering in Agriculture  
University of Southern Queensland, Toowoomba

**Sustainable farming** depends on optimising production output, and **at the same time**, maintaining or improving the natural resource base. Therefore managing the environmental vulnerabilities of a property is an essential component of a **sustainable** production system. Technological advances in the evaluation of the spatial, physical, chemical and biological attributes of a landscape, now make it possible for land owners to assess the **management potential** of their property.

To do this, a manager must assess the environmental and social **vulnerabilities** of the property. The hypothetical farm described in **figure 1**, will be used in this 'can do' sheet to show how environmental planning on paper can improve sustainable management in the paddock.



**Figure 1: Legend to hypothetical piggery property vulnerability map**

- buildings
- water course or dam
- anaerobic pond
- old dump site
- buffer zones
- bush block not to be cleared
- Red podzolic soil slopes not suitable for cultivation
- Coarse structured clay with highly saline subsoil
- alluvial redbrown earth suitable for irrigation
- slope greater than 4%

## Getting A Map Of Your Property

Useful off-the-shelf maps include aerial photographs (usually 1:25,000 scale), topographic maps and contour (orthographic) maps. Aerial photographs can be enlarged to a scale of 1:1,000, most useful for making plans of properties of about 100 h a. Check the availability of maps for your property by contacting the Department of Natural Resources (DNR) or Sunmap. DNR have also produced a range of **Land Fact sheets** to assist in the development of property plans.

**Orthographic (Figure 1)** or **topographic** maps are preferred, because they show accurate contours, which assist in the development of specific management strategies for different sections of the property. Existing buildings, water courses, dams, bores, roads, fence lines, solid/liquid waste disposal areas, old dump sites, remnant vegetation and other features can be traced onto **tracing paper** (as in **Figure 1**), available from newsagents or art supply outlets.

### **Accessing Soil Type Information For Your Property**

The Queensland Department of Primary Industries (DPI) has compiled information on the geology and soil types of Queensland into a series of **Land Management Manuals**. Each manual comes with a 1:250,000 scale map of the Land Resource Areas, a Resource Information guide, and a Field Manual. Each 'self help' kit covers the climate, geology, land resources, agricultural land management, land degradation and management, and the water resources of a given region. Outline likely vulnerable areas on a property plan, using the **management guidelines** to mark in recommended buffers to watercourses, and the likely boundaries of soil types requiring more specific management.

In our hypothetical example (**Figure 1**), **Best Management Practices (BMPs)** suggest that :-

- Slopes greater than 8% on red podzolic soils should not be cleared (implemented by the green buffer zone). Trickle irrigation is recommended on cultivated soils, along with contour banks, stubble mulching and crop rotations. These soils are very infertile, originally covered with open forests of silver-leaved and narrow-leaved ironbark, spotted gum and Moreton Bay ash (the bush block in **Figure 1**).
- Red-brown earths are more fertile, suitable for most irrigation strategies and earthworks. However the stream banks are extremely susceptible to rill and sheet erosion. BMPs recommend no cultivation within 20 m of the stream bank (red buffer zone to the stream in **Figure 1**), and avoidance of summer cultivation in flood-prone areas.
- Coarse structured clays are not considered to be good quality agricultural land. Poor drainage and high subsoil salinity (**sodic soils**) renders them unsuitable for irrigation or for cultivation.

### **Groundwater vulnerability, irrigation and riparian filter strip issues**

Water filtering through the soil profile, accumulating in underground aquifers (groundwater) is potentially the most pure water source. However where the overlying rocks are deeply **fractured**, overlying clay is absent and the slope is **less than 6%**, where the aquifer is **close** to the surface and water recharge is **high**, there is a high risk of contamination with nutrients, pesticides or other harmful compounds. Agencies like the DNR use ranking systems such as **DRASTIC** to rate the **groundwater vulnerability** of a particular region. **DRASTIC** ranks :-

- **Depth to water**,
- the net **Recharge**,
- the **Aquifer media** (underlying dirt),
- the **Soil media**,
- the **Topography** (slope),
- the **Impact** of the unsaturated zone above the water body, and
- the hydraulic **Conductivity** of the aquifer (permeability of overlying dirt and soil to water).

In locations where the **groundwater vulnerability (DRASTIC)** rating is high, management practices such as irrigation, fertiliser use, manure and effluent management associated with intensive animal production, septic systems and landfill waste disposal have the potential to **contaminate** groundwater. Nitrogen fertiliser is included as potentially toxic, because of its transformation to nitrite at depth. Nitrite is toxic to animals, posing the greatest risk to babies.

The **leaching** of non-toxic minerals to the groundwater may also reduce water quality by increasing the **salinity** of the supply. BMPs suggest leaving a **buffer strip** (20-50 m if used for human consumption) around a bore, or where the aquifer is less than 5 m below the surface. Information on local ground water depth and quality is available from DNR.

**Riparian land** is that part of the landscape adjacent to water bodies which exerts a direct influence on streams or lake margins, and on the water and the organisms contained within. In **Figure 1**, the **riparian zone** should be extended to 20 m out from the banks, because of the sensitivity of the redbrown earth soil type to rill and sheet erosion. Improving the management of the riparian zone is now a high priority because of the relationship between **land management** and **water quality**, and because we now know the effects of past bad management practices. For example in one Darling Downs creek bed, over 3 meters of silt has accumulated over the past 70 years. Not only is this bad for the fertility and productivity of the land up-slope, but water quality, flood management and the ecology of the stream itself has been adversely affected.

Currently BMPs focus on minimising sediment transport from cleared riparian lands using **filter strips** to trap eroded sediments and nutrients. The recommended width of the **filter strips** is determined by the stability of the water course itself, and by the rate of sediment loss from the lands up-slope. The **Universal Soil Loss Equation (USLE)** is used to rate sediment loss (**erodibility**) from land. Rainfall intensity is one factor affecting the **erodibility** of the soil, as well as **soil texture, soil structure** and **organic matter content**. **Slope length** and **gradient** are also included, as well as the role of **vegetation** in protecting the soil.

Slopes of 1-3% represent a low risk, 4-7% are moderate, whereas 8-10% are high risk. Erosion risk can be managed using practices such as permanent pasture with a litter layer (surface protection, high organic matter), or no-till. This information is summarised in the **Land Management Manuals**, and is covered in more detail in **Guidelines for Riparian Filter Strips for Queensland Irrigators** (LE Karssies and IP Prosser, CSIRO Technical Report 1999). **Fact sheets** on stream bank revegetation and riparian management are available from DNR

### **Remnant Vegetation and Regional Vegetation Management Plans**

In **Figure 2**, the hypothetical property owners left the scrub block on the slopes, despite past government encouragement to clear it. Thanks to these very good land conservation practices, this scrub block continues to support a diverse range of local flora and fauna. Given the active endorsement of land clearing in the past, remnants such as this may now be very important for nature conservation in the local region.

Regional differences based on the occurrence of plants and animals, geological structures and local climatic conditions have been used by DNR to divide the state into 13 **bioregions**. The first versions of **regional ecosystem maps** have been produced, categorising the recorded remnant vegetation within each bioregion. The categories are :-

- **endangered** (less than 10% of the original area remains uncleared, **or** the original extent was less than 10,000 ha and now only 10 to 30% remains uncleared),
- **of concern** (10 to 30% of the original area remains uncleared, **or** the original extent was less than 10,000 ha and more than 30% remains) and
- **not of concern** (more than 30% of the original area remains uncleared, **and** the original extent was more than 10,000 ha).

**The Regional Vegetation Management** initiative depends on local involvement, the first stage of which is checking the accuracy of these maps. Land-owners can access these maps through DNR, to help verify the vegetation ratings on their property. In **Figure 1**, the vegetation type is **not of concern**, but the owners wish to register this area as **Land for Wildlife**, with their **local council**. **Land for Wildlife** is a voluntary partnership between land-owners and Qld. Parks and Wildlife Service, providing support and advice on flora and fauna conservation and management. More information on the **Regional Vegetation Management** initiative is available from DNR.

### **When Is A Property Management Plan Needed?**

A property management plan is a valuable management tool for any landowner wishing to make the best use of the natural resources present, in an environmentally sustainable manner. However property owners are required to produce plans for irrigation developments, vegetation management, soil conservation, and where the manager is involved in **Environmentally Relevant Activities (ERAs)**. ERAs are typically associated with intensive animal production, where odour and manure spreading activities have the potential to impact adversely on the local environment. Guidelines for preparing property management plans are available in the DNR Land Facts and Water Facts series. The *Futureprofit* program co-ordinated by the DPI facilitates the development of property management plans, by property owners.

Guidance on what should be included in a plan can be obtained from specific industry **Environmental Codes of Practice** (for example Qld. Reference Manual for the Operation of Feedlots), or from industry-sponsored training programs (for example **Environmental Training for Piggery Managers** sponsored by APL). The Environmental Protection Agency also provides advice on the availability of environmental codes for specific rural industries. Information on irrigation BMP can also be obtained by contacting the DNR or Qld Fruit and Vegetable Growers (QFVG) about the **Water Use Efficiency Initiative**.

More specific information on effluent or manure management can be obtained from the **DPI Notes** series on intensive livestock management, and from the **Australian and New Zealand Environment and Conservation Council (ANZECC)**. To-date ANZECC have published guidelines on Groundwater Protection, Rural Land Uses and Water Quality, and a series on Effluent Management for Dairy Sheds, Dairy Processing Plants, Intensive Piggeries, Sewerage Systems, Aqueous Wool Scouring, Tanning and Related Industries, and Wineries and Distilleries. These publications are available through Commonwealth Government Bookshops, for \$15 to \$25 each.

Information sources such as the DPI notes, the DNR Fact sheets, and the ANZECC publication list are available on the internet. If you're not 'on-line', a trip to your local DNR and/or DPI office will provide you with this information. Then **you** can get to know the vulnerabilities of **your** property, to manage **your** resources wisely!

Sheet updated 05/2002