By making a few simple changes cotton growers can significantly enhance their water storages. Well designed watercourses on cotton farms can aid in the removal of sediment, nutrients and pesticides from irrigation water and enhance their habitat value for native plants and animals.

The Cotton CRC has funded a number of water management research projects over the past seven years which provide cotton growers with guidelines and tools to improve on-farm water quality for native plants and animals as well as minimising overall water losses.

Through good water management, economic and environmental benefits can be achieved.

**ENGINEERING DESIGN PRINCIPLES FOR STORAGES**

- During construction, ensure soil for embankments is at the optimum water content for proper compaction and stability. Place water storages and channels on impermeable soils to limit deep drainage.
- Split larger storage areas into smaller, deep cells that can be filled one at a time, to minimise evaporation.
- Mitigate erosion caused by wave action, by including a centre island or earthen barriers where feasible. Edge vegetation such as phragmites can provide further protection against erosion and can minimise evapotranspiration.
- In operation of dams, minimise structural stresses and erosion by avoiding rapid draw down. This also has benefits for habitat.

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**FIGURE 1: Storage design principles**

**TOP LEFT:** A cell with aquatic vegetation to increase sedimentation and chemical breakdown.

**TOP RIGHT:** An open cell for dirty water. Sunlight can assist in pesticide breakdown.

**BOTTOM LEFT:** A cell containing subsurface filters of woodchip, gin trash or gravel to filter sediments, nutrients and insecticides from dirty water.

**BOTTOM RIGHT:** A cell with an island that has clean water. This provides protection and habitat for different bird species as well as frogs and other invertebrates.

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PESTICIDE REMOVAL PRINCIPLES

Before irrigation
- The aim is to reduce sediment in tail water.
- Think about the pesticide being sprayed.
- Are there less hazardous alternatives available? Retain stubble and minimise field slope to reduce sediment in runoff.

After irrigation
- Aim to remove sediments in tail water, as they can carry pesticides and nutrients.

This can be achieved by:
- Slowing water velocity using deep settling ponds;
- Filtering water through mat-forming aquatic plants, like water couch or water milfoil; and,
- Reducing re-suspension caused by turbulence. This can be achieved by using aquatic plants such as phragmites and cumbungi to deposit a litter layer on the bottom surface of the tail drain or dam area.

WILDLIFE AND WATERBIRD PRINCIPLES

Diversity in design means diversity in wildlife and faster pesticide breakdown. Where possible have areas that are fast drying and areas that dry more slowly. Shallow areas and mudflats attract wading waterbirds and exposure to sunlight in…
increases pesticide breakdown rates. Avoid monocultures of aquatic plants. Combine reedbeds with other plant species. Standing trees or shrubs (dead or alive) provide habitat as well as safe roosting and breeding points.

GENERAL

Plant cotton varieties that requires less pesticide application near sensitive areas.

Where storages are compartmentalised, ‘clean’ (straight from the source) and ‘dirty water’ (reticulated off a cotton crop) can be separated. Dirty water can be returned to cells that are less attractive to wildlife — for example, steep sides, open water or reed/cumbungi monoculture.

Figure 1 depicts a storage containing all design principles explained previously. Applying any one of the design principles will contribute to better water quality and management, but when used in combination, multiple economic and environmental outcomes can be achieved.

THE ROLE OF AQUATIC PLANTS

Aquatic plants are essential for healthy aquatic ecosystems. They provide food and shelter for invertebrates (for example, insect larvae, molluscs and crustaceans), frogs, reptiles, fish and waterbirds. They reduce sediments and put oxygen into the water as well as removing nutrients and enhancing pesticide breakdown, making the water cleaner for native fauna and farm workers.

Aquatic plants don’t necessarily use more water then open ponds. This is particularly the case for submerged or floating aquatic plants, whose surface area available for transpiration is not more than the surface area for evaporation. Emergent plants that protrude above the water line, like cumbungi and phragmites, will use water quite rapidly. But evaporation can be reduced if they are planted as windbreak strips.

Some aquatic plants such as cumbungi and club rushes may cause obstructions and slow flow of water in channels. This can be managed by leaving deep open areas around pump sites and in areas where rapid water movement is required.

THE ROLE OF NATIVE ANIMALS

Water storages can provide habitat for a range of aquatic and terrestrial animals, from frogs, fish and birds through to the less visible insects. There are a diverse range of waterbird species that feed on a diversity of foods, and require several different habitats and resources. Most waterbirds move between wetlands readily and frequently, to find the resources they need. Some species (for example, ibises) are important because they eat insect pests such as locusts. Some (for example, several ducks) are hunted for sport and food. Some species (for example, brolgas, magpie geese, freckled ducks) are rare in NSW or nationally — and are valuable components of Australia’s biodiversity.

Irrigation storages now form over half the wetland area in cotton-growing districts of NSW, and they could be managed to play a valuable role in biodiversity conservation. Environmental researchers and interested community members use water birds as indicators in wetlands. Likewise cotton growers can use waterbirds as indicators of their water quality and farm health.

A brochure entitled Design principles for healthy waterways on cotton farms, which summarises the outcomes of the research in more detail is available from the Cotton Catchment Communities CRC at Narrabri. crcadmin@cotton.crc.org.au or (02) 6799 1500.

The project researchers from the University of Sydney will be participating in the 2006 Australian Cotton Conference.

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