Water and Rivers Commission | WN7 January 2000

Water notes

Natural Heritage Trust

GOVERNMENT OF WESTERN AUSTRALIA

ADVISORY NOTES FOR LAND MANAGERS ON RIVER AND WETLAND RESTORATION

Livestock management: Watering points and pumps

Traditional agricultural practices have often involved unrestricted livestock access to rivers and riparian zones and many continue to be used to provide livestock watering and summer feed. Unrestricted stock access causes disturbance and pollution resulting in environmental degradation and loss of productivity. Restricting livestock access is an important river restoration management tool and this water note addresses the alternatives for the provision of water to livestock.

Problems with livestock

Controlling livestock access is the single most important management tool in the protection and restoration of riparian zones in rural areas. This can be achieved through fencing, the provision of off-site or restricted access watering points, and the implementation of sustainable grazing systems.

Unrestricted stock access causes disturbance and pollution resulting in environmental degradation and loss of productivity[i]. Problems related to unrestricted livestock access include:

- loss of native fringing vegetation;
- weed invasion;
- compacted soils;
- erosion; and
- poor water quality.

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Benefits of alternative water sources

Limiting stream access or providing alternative water sources protects livestock and the river from the problems associated with unrestricted access. The benefits include:

- improved water quality by limiting sedimentation and nutrient enrichment;
- enhanced livestock health through access to cleaner water;
- reduced loss of productive land;
- reduced livestock deaths;
- reduced erosion of river banks and bed; and
- improved riparian vegetation and riverine habitats.

There are a variety of alternatives to direct river access for watering stock. These include providing limited river access watering points, using an alternative water supply (e.g. reticulated water supply, dam or bore), or piping or pumping water from existing sources.

Carting water — a temporary solution

The cost in time, labour and fuel of carting water and the installation of tanks and troughs makes this a solution for temporary situations only where few stock require water during periods of drought. However, carting water to a drinking point may be the most economical solution if there

are few stock close to the water source or if the stock are to be excluded from the stream for a short time only. Depending on the existing facilities it may be necessary to install tanks and drinking troughs and to regularly inspect them to keep them full.

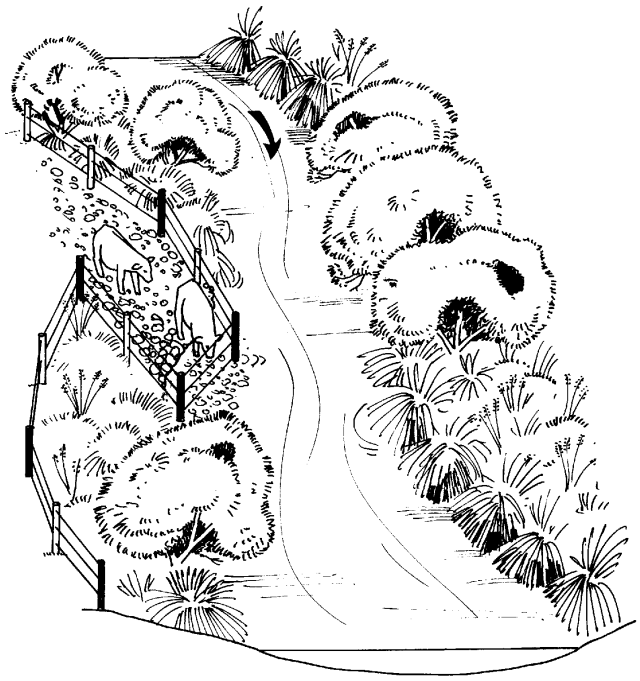
Limiting river access points

This is one of the cheapest and simplest methods of supplying water to stock. Limited access points allow stock to drink from a short section of the stream, while reducing trampling and the amount of urine and faeces deposited in stream. If constructed properly, access points require very little maintenance apart from occasional repairs after flooding.

Design guidelines

One of the simplest ways to build a limited access watering point is to shape the bank to form a slope of 1:6. This should be paved with flat field stone or compacted gravel. Other 'fillers'may include half or whole rough surfaced logs bound together with heavy gauge wire or strapping and laid horizontally up a slight slope.

The width of the access point can vary from 2 - 20 metres and will depend on the number of sites available and the number of stock requiring water. The access points are made by putting a break in the riparian zone fencing and running two fences out into the water to the low water mark and fencing off the end to prevent the stock wading further into the stream. If floods occur regularly, then a permanent fence can be replaced with live electrical tape, as it is easily replaced should it be washed away.



Stock watering point.

Where to locate an access point

When siting an access point, the following factors should be considered:

- maximum slope of 1:6 to prevent erosion and make it easy for the stock to reach the water's edge;
- a lack of shelter will prevent stock from lingering;
- locating of the access point on the inside of a bend where water movement is slowest, will reduce the risk of scour and erosion;
- angle the access ramp away from the direction of flow;
- the ramp surface should consist of compacted soil or gravel, or be covered with flat stone or concrete to minimise damage to the bank and water's edge as well as providing a sure footing for the stock; and
- commencement of the ramp should be *at least* 1 metre back from the top of the bank.

Limitations

While limited access points prevent damage caused by trampling, they do not completely prevent manure or nutrients from entering the stream, although it is reduced substantially. Serious erosion can occur at the ramp and further downstream if care is not taken with the location, construction and maintenance of the access ramp[ii].

Piping water

If there is a dam upslope, or a reticulated water supply is located nearby, then piping water from these sources may be an economical alternative to pumping water from the stream. A tank and trough may need to be installed and regularly inspected (frequency depending on the reliability of supply and equipment) to check the water supply and clean out the trough.

Pumping water

This option involves pumping water from the stream or a bore directly into a tank or trough. Pumping systems are quite often set up in remote areas. As a result, they have to be reliable and easy to maintain, as well as being able to deliver the required volume of water. There are a large variety of systems available which are suitable for use in remote areas. It is up to the individual landowner to decide on the most appropriate system to use.

Pump and water requirements

The volume of water to be delivered and the height to which the water is to travel need to be taken into consideration when choosing a pump system. This will give an indication of the head the pump will need to develop in

order to move the water from the stream or bore to the watering point at the desired flow rate.

The local Agriculture WA office can be contacted to obtain the water requirement figures as they vary depending on type of livestock, the number of animals, type of feed, location, etc. However, Agriculture WA advises that the following figures can be used as a guide.

Type of stock	litres/animal/day summer requirement
Sheep	7
Beef cattle	30
Dairy cattle	50+

Choosing a power source for your pump

There are six common power sources suitable for use in Western Australia. These are:

- electrical mains power;
- solar power;
- wind power;
- petrol or diesel;
- stock operated systems; and
- air.

Electrical mains power

The easiest way to power a pump is with electrical mains power. Connecting to the power grid ensures a continuous reliable and low cost supply. Electrical systems are efficient, relatively inexpensive, easy to maintain and are well suited to automation.

Switches can be installed to start/stop the pump with changes in pressure or water level. Electric motors can be connected to a wide range of pump types, allowing flexibility in the amount of water pumped and the pumping pressure.

The main limitation is that they can only be operated at sites where mains power already exists as it can become uneconomical to extend a transmission line more than a couple of hundred metres.

Solar power

Solar power technology has progressed to a point where it is now a technically and economically viable way of supplying electricity. They are often ideally suited to remote stock water supplies which require low volumes of water. They usually pump into a storage tank with a 5-day capacity.

Solar systems have three components: the solar array - which consists of a number of panels which convert light from the sun into electricity; the controller - which is either a set of inverters, which convert the DC voltage from the array into AC, or a maximum power point tracker (MPPT), which alters the voltage to maximise the total power output of the array; and the pump.

The total amount of power which can be produced by the system depends on the location of the array and the local climate. The number of sunny days has a large impact on the amount of power produced by the cells as does the latitude. Pumping performance varies during the year with more water pumped in summer than in winter. However, livestock water demand in summer exceeds that for winter.

The arrays are generally mounted facing north on an angle close to the latitude to make full use of the midday sun. The arrays may be stationary or tracking. Tracking arrays follow the movement of the sun from sunrise to sunset. They produce about 30% more power than equivalent stationary arrays, but are more expensive to install.

Wind power

The windmill is the traditional source of pumping power in rural Australia. In recent years, however, the cost and amount of maintenance required, along with the fall in cost of solar power, has caused a decline in their use for small applications.

The amount of power produced by the mill depends upon it’s location. To obtain the best performance from a windmill it should be located clear of the ground and any obstructions.

The important dimensions which affect the performance of a windmill are the diameter of the fan, the height of the tower and the pump size. The bigger the diameter of the fan, the more wind intercepted and, thus, the greater the power output by the mill. The higher the fan tower, the greater the wind speed intercepted and the lower the effect of ground turbulence, which reduces performance.

The size of the pump also needs to be considered. Fitting a large pump will increase the amount of water pumped with every stroke, but will also increase the wind speed required to start the pump. This may result in less water being pumped during the day. To compensate for the fickle nature of the wind, windmills usually require a storage tank with a capacity of about 7 - 10 days supply.

Petrol and Diesel

Portable engines connected to pumps are another common water supply power source. Petrol pumps are generally used for small applications where portability and occasional

use are important. Diesel powered pumps are favoured whenever a continuous or regular supply of water is required, irrespective of volume.

The limitations of petrol and diesel engines include high maintenance requirements, the constant need for refuelling and the fact that they are difficult to automate.

Stock operated systems

Stock themselves can provide the pumping power required. It is not difficult to train the stock to pump water by pushing their nose or part of their body against a lever which, in turn, drives a piston or some other mechanism to pump water.

To enable smaller animals, such as sheep and goats, or those with more sensitive noses, such as horses, to use the system, the nose lever can be attached to a ramp. The animal walks up the ramp, which falls under the weight of the animal and depresses the lever, which works the pump.

These systems can only pump low volumes of water and can not be used to pump water over large heads or for long distances, however, they can be used to pump water from a well with a high water table. They are relatively cheap to buy and operate and can be mounted on a skid and towed from one location to another to suit rotational grazing systems.

A nose pump draws water from the fenced stream. *J. Oates*

Air

There are a number of pumps available which are powered by compressed air. The air is supplied by a compressor, which requires a second power source - usually mains power.

An advantage of air powered systems is that the compressor can be located up to 2000 metres away from the pump as air can be piped over a considerable distance without losing significant pressure. This allows the pump to be located in remote areas while utilising the benefits of mains power electricity. The air can be transmitted via 12 mm polyethylene pipe, however, detecting leaks over a 2 km length of 12 mm pipe can be difficult.

Further reading

Available from the Water and Rivers Commission

[i] Water note WN10 *Protecting riparian vegetation*.

[ii] Water note WN6 *Livestock Management: Construction of Livestock Crossings.*

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LWRRDC (1996) *Managing Stock*. Riparian Management Series (6) Land and Water Resources Research and Development Corporation, Canberra.

Acknowledgment

Much of the information stated above is an edited version of the Kondinin Group *Stock Watering Research Report* printed in Farming Ahead No. 54, June 1996. Full copies of the Report are available for purchase from the Kondinin Group, phone 1800 677 761 to order.

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This water note is produced as part of the Waterways WA Program. Managing and enhancing our waterways for the future.
Text by Mark Warner. Illustrations by Dickinson Art.
Water note project coordination by Jodie Oates and Heidi Oswald.
Printed on recycled paper January 2000
ISSN 1442-6900