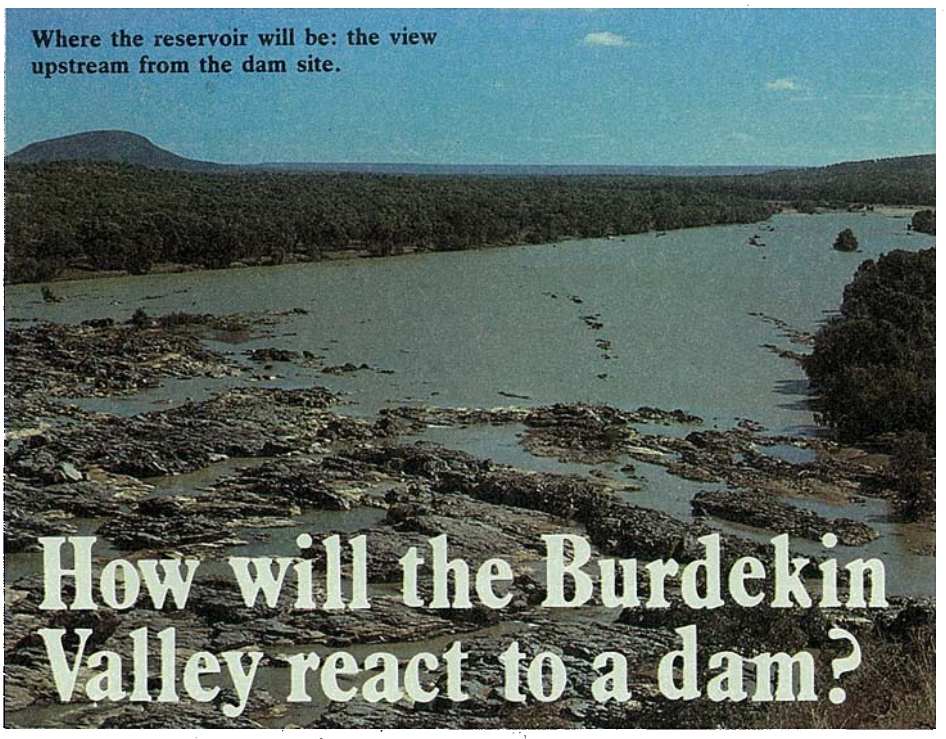


Where the reservoir will be: the view upstream from the dam site.

How will the Burdekin Valley react to a dam?

The recent prolonged dry spell over much of Australia must have made many farmers wish they were 'drought-proofed' by suitable river dams.

The continent's very variable rainfall causes great fluctuations in the flows along rivers. Because dams store some of a wet year's excess for use in dry years, they have helped to expand the areas in which people can grow crops. Australia now has more than 300 large dams, including 117 on the Murray–Darling system alone.

The idea of obstructing a river and holding back a large volume of water may seem simple, but in practice a dam may have many far-reaching and unexpected influences on the landscape, its flora and fauna, and even the success of the very enterprise it is designed to sustain. An example of the complexities that may arise is provided by the plan to dam Queensland's Burdekin River.

The valley of the lower Burdekin supports a variety of crops, predominantly sugar cane and rice, and the region's four sugar mills achieve about 16% of Australia's sugar production. These crops grow under irrigation: 39 000 ha receive their water from shallow underground aquifers around the towns of Giru, Ayr, and Home Hill, and water is pumped from the Burdekin onto another 4500 ha.

The Queensland government would like to double the cultivated area, but the present regulated water resources are not adequate to irrigate more land. The Burdekin carries a great deal of water, on average 9 million megalitres a year, but too irregularly — nearly nine-tenths of the flow comes during the wet season, from January to April. The other months are relatively dry, and every year in October and November there is an even chance that the river will stop flowing altogether.

As for the aquifers, they are already over-exploited. All the suitable groundwater is being used up faster than it is being naturally replenished, and each year the aquifers are 'topped up' with water pumped out of the river into special recharge works — up to 60 000 megalitres in some years, when the river flow permits.

The State government has therefore decided to make a large reservoir by damming the Burdekin. The idea is not new: various dam sites have been suggested for almost a century, but last year the Queensland government decided on a site above Burdekin Falls, 160 km from the river mouth, and in August the Commonwealth announced that it would pay for the dam. The State is to meet the

cost of preliminary works, such as access roads, and the development of the new irrigation area.

The proposed dam would probably have a spillway 600 m wide and 32 m high, retaining 1·75 million megalitres of water. The design allows later heightening of the dam by 14·6 m, to create a reservoir of 8·5 million megalitres and permit hydro-electricity generation.

Under the proposal, the dam would take 5–7 years to build. Water would flow from the dam down 100 km of the river channel to Clare Weir, where it would be lifted 20 m into canals and pipelines to supply developing farmlands and perhaps the city of Townsville. This project would, over about 20 years, increase the area of irrigated land by 45 000 ha.

The scheme would also create an inland fresh-water lake not far from some of northern Queensland's major towns. This lake could prove particularly popular for recreation in summer, when marine 'stingers' (box jellyfish) are a hazard on the coast.

Ecological study

The federal government, before agreeing to participate in the scheme, asked CSIRO and the Commonwealth Department of National Development and Energy to set up a joint study group to assess the ecological implications of the project.

The group, formed in March 1980, was requested to report by the end of the following July, and so had little opportunity for original observations. The study team relied substantially on a large body of information already compiled by other people — particularly officers of the Queensland government, but also researchers at James Cook University of North Queensland, the Queensland Medical Research Institute, and the University of Western Australia.

Valuable as this information was, it left many gaps in the full picture needed for confident predictions and detailed planning. The Burdekin catchment is a large area, and no single comprehensive environmental study of it has ever been made. Research has either been on restricted topics or on smaller catchments within the region. The study group's report therefore strongly recommends detailed surveys, especially of the aquifers and native ecosystems of the proposed new irrigation area.

The team did not find any major obstacle to the project, but it did identify two particular hazards: pollution and salinity.

It would have been convenient if the present irrigation system could have supplied clues to the environmental impact of the proposed new scheme. Unfortunately it cannot; the two schemes are different. At present most water is pumped from shallow aquifers onto permeable soils with no co-ordinated drainage system. Chemicals such as fertilizers and pesticides are leached into the soils and excess water eventually finds its way back into the local aquifers.

The proposed new development areas would have supply channels and co-ordinated drainage systems discharging ultimately into the sea at Bowling Green and Upstart Bays. The report estimates that, when development is complete, some 900 tonnes of nitrogen from fertilizers and more than 1 tonne of organochlorine insecticides could drain into the sea each year. The authors add that these are conservative estimates, as the area of land developed could eventually exceed that used in the calculations.

Mangroves, saltflats, and grassland fringe Bowling Green Bay. The sand spit, Cape Bowling Green, shelters the bay.

The team did not find any major obstacle to the project, but it did identify two particular hazards: pollution and salinity.

These chemicals could seriously affect the animals and plants of the littoral and marine communities along that part of the coast. The estuaries and tidal creeks are the breeding grounds and nurseries of many fish with commercial and sporting value, such as mangrove jack and barramundi, and the littoral zone also supports an unusually large number of birds (98 species), including brolga and magpie goose. The corresponding habitats in the Townsville and Ingham districts attract only 66 and 57 species respectively.

Salt of the earth

Salinity could pose problems, and even affect the productivity of the new development, unless the project designers take adequate precautions. The proposed new irrigation area straddles the Burdekin River, and includes a variety of soils with contrasting drainage characteristics; the risk of salinity affecting crops therefore takes different forms in different places within the area.

Farms on the right bank would, under the proposal, be fed by a perimeter canal running over slopes of a relatively permeable soil overlying a less permeable one. The deeper layers hold some salt, but in the past deep-rooted native trees have prevented all but a little downslope drainage.

Already some clearing has led to increased drainage and localized salinization; any leakage from the proposed irrigation canal could cause more extensive salinization. The study group recommends that irrigation channels should be lined wherever they cross relatively permeable soils.

A different hazard faces parts of the right bank area between Molongle Creek and the Elliot River. Under the irrigable soils run some old stream channels (prior streams), and the regional groundwater is

quite saline. If water leaks from irrigation channels or drains from irrigated farms into the prior streams, these could become 'pressure aquifers', causing salinization of the surface soils.

The proposed developments on the left bank mostly involve heavier soils overlying an old delta of the Burdekin. This old delta consists of an aquifer system, saline in parts. Although the scientists rate the hazard here below those on the right bank, they do recommend a more intensive survey of these aquifers, to help minimize the risk of irrigation shifting the salt to places where it could affect crops.

Major floods

The lower Burdekin valley is subject to periodic serious flooding, and the proposed dam cannot do much to alleviate that problem. About two-thirds of all floods develop in the catchment area above Burdekin Falls, and most of these should be contained by the dam, but the wide spillway would hardly reduce the flow of major floods developing above the Falls, or of those originating from the Bowen River, which joins the Burdekin below the Falls.

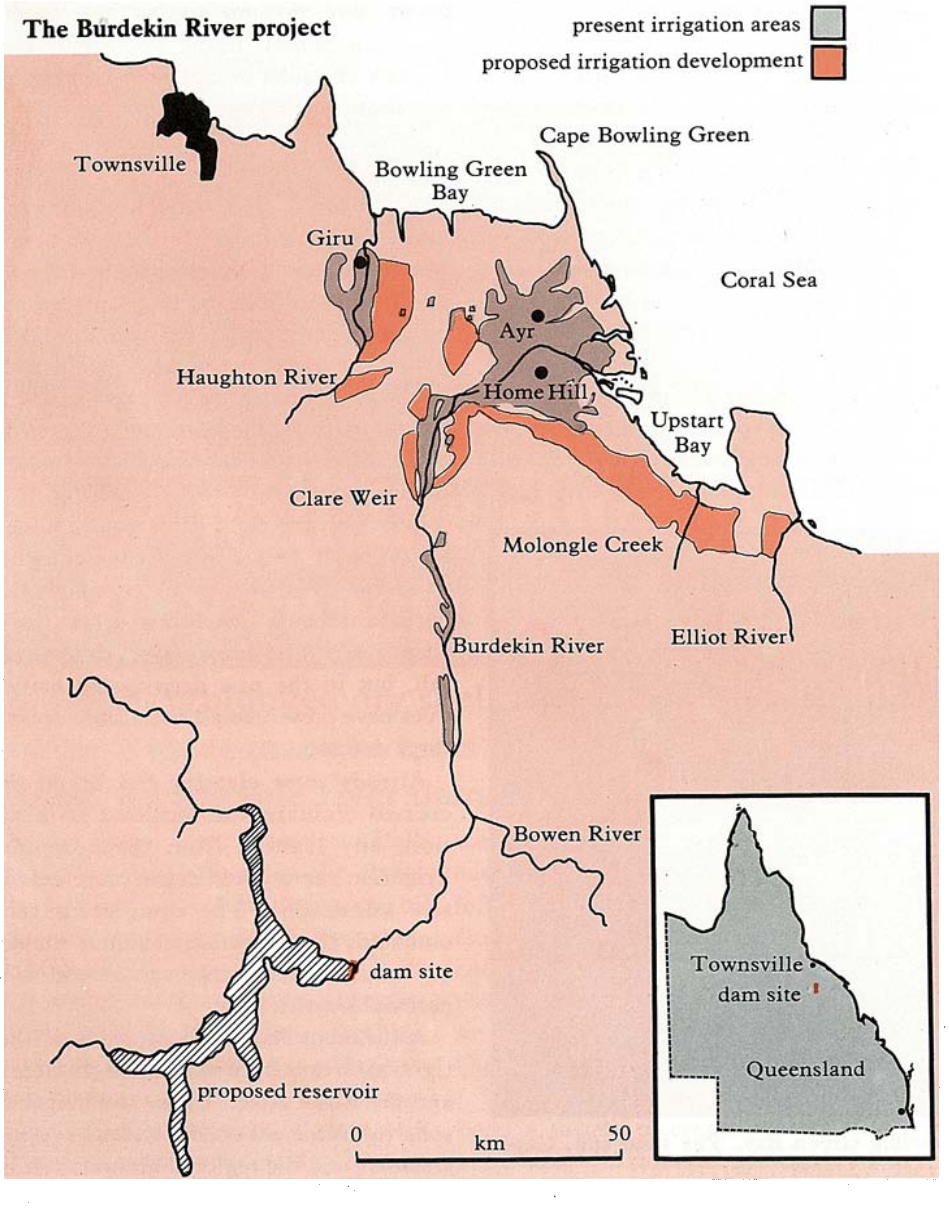
The report urges that the implications of flooding should form an important part of the detailed planning of the project. Computer modelling could predict the behaviour of flood-waters, and help designers decide, for example, whether and where to construct levees.

When full, the first-stage reservoir would submerge 22 000 ha, and a further 32 000 ha would be liable to inundation during large floods. This land supports woodland communities that are apparently well represented elsewhere.

The report points out that scientists do not know enough about the composition of the woodland communities in the proposed new development area to say whether all the local native animals and plants are already adequately protected in national parks. The authors argue that, even if none of the communities threatened proves to be unique, every effort should be made to conserve as much natural vegetation as possible, as the lower Burdekin valley holds one of the largest remaining areas of the woodland communities of the coastal plain.

Big rivers carry enormous quantities of sediment — in the case of the Burdekin, prhaps 3·5 million tonnes a year. The intervention of a dam would change the pattern of erosion and deposition in ways that are difficult to forecast without much more information, but one possible outcome is the eventual disappearance of a prominent spit of land, Cape Bowling Green.

The spit formed over a long period from sand carried down the Burdekin and then along the coast by sea currents. It is unstable land: like a bank balance, the cape is the fluctuating product of deposits and withdrawals. At present, it is holding its own. What waves erode, the river renews.



The project would, over about 20 years, increase the area of irrigated land by 45 000 ha.

The scientists cannot make confident predictions about the spit's future until surveys have provided enough facts to feed mathematical models, but they do warn that the dam will cut off the supply of coarse sediments from higher up the river. Eventually, although perhaps only after decades or even centuries, so much of the sand now in the lower Burdekin channel will have been flushed out of the river that the spit may be unable to make good its losses.

Severe damage, like that inflicted by Cyclone Althea in 1971, when the spit was nearly breached, would not be repaired. If the cape did disappear, Bowling Green Bay would lose its protection against waves and currents, and the bay's prawn and crab industries could be threatened.

John Seymour

More about the topic

'Burdekin Project Ecological Study.' Ed. P.M. Fleming, R.H. Gunn, A.M. Reece, and J.R. McAlpine. (Australian Government Publishing Service: Canberra 1981.)