



Saving The Endangered Australasian Bittern

A Guide to Wetland Management
and Bittern-friendly Rice Farming



The deep booming call made by the Australasian Bittern has been embedded in Indigenous Australian culture, as the sound of the mythical Bunyip, for thousands of years.



Located among the morning dew, this Australasian Bittern was busy foraging in the early light along the edge of a rice field.

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Australasian Bitterns are surprisingly cryptic for such a large waterbird, with adult males standing at around 80 cm high.



Nankeen Night-herons, especially juvenile birds like this one, are often mistaken for the Australasian Bittern. Unlike bitterns, they regularly roost in trees, occur in flocks, are much smaller and the immature birds have white spots on their wings. Photo by Mark Robb

Introducing the Bunyip Bird

Celebrated for its shadowy existence and a deep booming call, the Australasian Bittern (*Botaurus poiciloptilus*) has unfortunately become one of the world's most endangered waterbirds. For thousands of years, Indigenous Australians regularly heard the booming sound and made a connection to the mythical Bunyip, a terrifying creature lurking in swamps. Today, this sound is seldom heard and the species is now an icon for the conservation of wetland biodiversity in Australia and New Zealand. Substantial resources and effort have been devoted to its recovery, particularly over the past decade.

Australasian Bitterns are large waterbirds, similar in shape and size to herons and egrets, which, apart from other bittern species, are their closest relatives. When their long neck is stretched upright, they can stand about 80 cm high. Their wingspan is usually a little over a metre. Males weigh about 1.4 kilogram, while females are usually slightly less than 1 kilogram.

How can you find a bittern?

Australasian Bitterns are usually solitary or in loose groups of two to five birds. They are a cryptic and secretive species that goes to great lengths to avoid being seen. At first, the best way to find a bittern is to locate a potentially suitable wetland and listen for the call of a booming male in spring and summer.

Bitterns are well known for 'freezing' when detected by a human observer and have an uncanny ability of 'melting' back into wetland vegetation. If you get too close, they burst out of the vegetation and fly away. Such disturbance should be avoided. Sometimes, you can get lucky and spot one in flight, probably moving between a roost and a feeding area, or find one feeding along a wetland edge.

Australasian Bitterns were once thought to be nocturnal but, although males can boom throughout the night, the species is now known to be most active around dawn and dusk, as well as the early morning and late afternoon. In shorter vegetation, such as rice or rushes, where you can scan across the wetland with binoculars, their head can often be located sticking up just above the vegetation like a periscope. During the middle of the day, they are often roosting and largely inactive.

Beware of Nankeen Night-herons

Australasian bitterns do not roost in trees and only rarely occur in groups of more than five. Nankeen Night-herons, on the other hand, often roost in trees and occur in loose flocks. Although they are considerably smaller, night-herons are commonly mistaken for Australasian Bitterns, especially immature birds that have similar plumage.



The Riverina is fortunate to still support large wetland systems where significant bittern numbers can be found, like this Phragmites reedbed in the Lowbidgee region near Balranald.

Where are they found?

The Australasian Bittern is primarily a bird of south-eastern Australia and the North Island of New Zealand. In Australia, the largest numbers occur in the Riverina region of southern New South Wales, followed by south-western Victoria and adjacent South Australia, while small, relatively isolated subpopulations occur in Tasmania and south-western Western Australia. Among Australia's most important sites are the Barmah-Millewa wetlands along the Murray River, the Lowbidgee and Fivebough-Tuckerbil Wetlands in New South Wales, the Bool-Hacks Lagoon system in South Australia, and Hirds-Johnsons Swamp in northern Victoria. There are also historic records for New Caledonia but these may have represented vagrants rather than an established population.

How many bitterns are there?

Australasian Bitterns have declined dramatically and are now listed nationally and globally as *Endangered*. In 2021, a new

Australian population estimate was published, with 1300 individuals. There are approximately 700 remaining in New Zealand, meaning a global total of only about 2000 individuals persist. Of Australia's 1300 birds, about 950 occur in the Murray-Darling Basin, including an estimated 750 breeding in the Riverina's rice fields.

Why have they declined?

The loss of suitable wetland habitat is considered the main reason for the decline of the Australasian Bitterns. However, the relative importance of specific causes, like river regulation reducing flooding, grazing by domestic stock, and drainage for conversion to agriculture or housing, are not well understood. Similarly, other potential drivers of decline, like fox and cat predation, inappropriate wetland management, and a reduction in prey from poor water quality, are suspected but not well known.



"Australasian Bitterns have to be one of the hardest birds to study as they are so shy and secretive." **Andrew Silcocks, Birdlife Australia**



This Australasian Bittern chick, at approximately nine days old, is being fed small Common Carp by its mother.

What makes good bittern habitat?

Australasian Bitterns are birds of densely vegetated wetlands. They typically favour the largest wetlands in the landscape, usually with little or no tree cover, but with extensive stands of emergent water plants. Most bittern wetlands are ephemeral, at least in part, with a flooding and drying cycle that ensures a period of renewal and rapid growth of water plants. Australasian bitterns can walk in water up to 30 cm deep but if the vegetation can sustain their weight, then it can be deeper. Bitterns are sometimes seen feeding in more open areas, but rely on the dense cover of reeds, rushes, sedges, rice and other water plants to roost and breed in. Some of the key native water plant species in bittern wetlands, especially in the Riverina, are:

- Cumbungi / Bullrush (*Typha domingensis/orientalis*)
- Common Reed (*Phragmites australis*)
- Tall Spike-rush (*Eleocharis sphacelata*)
- Common Spike-rush (*Eleocharis acuta*)
- Giant Rush (*Juncus ingens*)
- Canegrass (*Eragrostis australasica*)
- Marsh Club-rush (*Bolboschoenus caldwellii*)
- Lignum (*Duma florulenta*)

Australasian Bitterns are visual predators, so they rely on clear water for efficient feeding. Often, they come to the edges of dense vegetation to feed, because their prey can otherwise be difficult to access. Wetlands where the vegetation has become too tall and thick mean bitterns cannot locate prey. There are many ways that wetlands can be managed to benefit bitterns and these are detailed in later sections, including how rice crops can be grown with bittern-friendly methods.

What do bitterns eat?

Australasian Bitterns feed primarily on frogs and fish but can take a wide variety of other prey, including mice, yabbies, insects and small reptiles. They are known to feed extensively on the introduced Common Carp and have been documented taking large numbers of the threatened Southern Bell Frog. Chicks are fed smaller prey like dragonfly larvae and tadpoles, but can also consume surprisingly large fish (e.g. 20 cm long when only one week old). They stalk prey or wait patiently, ready to lunge their bill forward and strike. Like several other species in the heron family, Australasian bitterns have also been recorded using bait to lure prey.



The typical clutch for an Australasian Bittern is four or five eggs. This nest, like many in Riverina rice fields, was initiated in early January.

What do we know about bittern breeding?

During the breeding season in spring and summer, males make deep booming calls that are audible for up to 2 kilometres under the right conditions. They establish breeding territories in the hope of attracting females to nest and they defend them from rivals. The booming call is a good indicator of potential breeding but evidence is emerging that many of the males either do not attract any females or no nesting occurs. In many other threatened bird species, there is a shortage of females and this may also be a key issue for bitterns.

Four or five eggs, about the size of small chicken egg, are laid in a well-hidden nest, which is a platform the size of a large dinner plate, around 10-30 cm above the water level. Often, the nest is in the middle of the wetland in the deepest water, providing there is still dense water plant cover. Incubation of the eggs is approximately 25 days and chicks fledge at about 7-8 weeks of age, but, within two weeks of age, they can leave the nest and begin roaming. Only the female incubates the eggs and raises the young. Simple pairs are common but some booming males can have up to three, and possibly more, nesting females in their territory, making them a polygamous species.



Australasian Bittern nests are well hidden in dense wetland vegetation. This one is in a Tall Spike-rush wetland in the Lowbidgee.



Catching Australasian Bitterns and attaching satellite transmitters revealed valuable information on movements, such as those between rice fields around Coleambally and the Mornington Peninsula. Pictured here is Mark Robb of Coleambally Irrigation.

What movements do bitterns make?

During the breeding season, bitterns are usually closely tied to a particular wetland, and tend to remain there, so long as there is suitable habitat. However, as conditions change, such as a wetland drying out or a rice crop being harvested, they need to move. A crowd-funded satellite tracking program showed that at harvest time bitterns disperse up to 600 kilometres from the rice fields to large, freshwater coastal wetlands in south-eastern Australia. This included both recently fledged young and adult males. Examples of such sites include Coomonderry Swamp near Shoalhaven Heads in New South Wales, Tootgarook Swamp on the Mornington Peninsula in Victoria, and Pick Swamp in South Australia.

More local sites were also used during the non-breeding season, ranging from the Barmah-Millewa system and wetland restoration sites, to storage dams and channels, emphasising the value in expanding wetland networks that are capable of supporting bitterns beyond the rice growing season. Conversely, bitterns clearly respond to flooding of ephemeral inland wetlands and the next season's rice crops, readily reoccupying them for the breeding season, sometimes from many hundreds of kilometres away. In closely related species, like the Eurasian and American Bitterns, movements of over 2000 kilometres have been recorded, so connections between south-eastern Australia, New Zealand, Tasmania, and south-western Australia are plausible for the Australasian Bittern.



"Tracking these secretive birds gave us some fascinating insights; moving from inland rice fields to coastal sites, connecting wetland networks along their journey." **Dr Inka Veltheim, Wildlife Ecologist**



These two images, taken one year apart, show the effect of major flooding and higher water levels on a bittern nesting site, preventing the growth of Tall Spike-rush. This monitoring of Lowbidgee wetlands was funded by the New South Wales Department of Planning and Environment.

How can we manage wetlands for bitterns?

The way a wetland is managed can be the difference between bitterns and no bitterns, or successful breeding and no breeding. Similarly, it can be the difference between a wetland supporting bitterns throughout the year, or for just a few hours as a stopover. With better wetland management, poor bittern habitat can be transformed into excellent bittern habitat, and there are countless opportunities to boost bittern populations with targeted wetland management.

Water

Good wetland management for bitterns begins with the water. Firstly, the water quality needs to be sufficiently high to support a healthy wetland system with the prey and water plant cover that bitterns rely on. Secondly, wetlands shouldn't be too deep, too shallow, not flooded for long enough, or flooded for too long. Thirdly, fluctuating water levels can inundate nests or cause abandonment. As a rule of thumb, water depths between 10 cm and 1 metre produce water plant communities suitable for the Australasian Bittern, and when nesting, water levels should be as steady as possible.

After a drying period, rapid vegetation growth and reproduction of bittern prey occurs after re-flooding, but it takes most water plants two

or three months before they provide sufficient cover for bitterns, particularly for nesting. Given the incubation time and fledging periods, it is therefore recommended that wetlands be flooded for a minimum of five months to provide opportunities for successful breeding. The drying phase is important, as it allows for fresh growth and the surge of new life. Ideally, inundation should be between September and March, when targeting breeding outcomes, while non-breeding habitat can be flooded throughout autumn, winter and spring. Carefully managed wetlands can potentially support bitterns year-round, with different areas serving different purposes through changing water levels and vegetation growth. Innovative work at the Wirra-Lo Wetlands, north of Kerang in Victoria, by landholders and the North Central Catchment Management Authority, has created year-round habitat for bitterns. This has been achieved by using earthworks and plantings to specially design different areas for breeding and foraging, across the year with different water depths.

During times of drought, refuges become critical for bitterns. Key sites like the Barmah-Millewa and Lowbidgee wetlands, along with rice fields, are more precious than ever. Water use can be prioritised to ensure bitterns have safe havens in the Riverina, while permanent coastal wetlands can serve as supplementary drought refuges.



Natural wetlands, as well as agricultural wetlands like this rice field, can be managed to increase the number of bitterns that are supported.

Vegetation

As a cover-dependent waterbird, wetland vegetation is critical for bitterns, but getting the balance right is key. For example, it can be too sparse or too dense. Vegetation that is too sparse may not provide sufficient cover for roosting and nesting, whereas vegetation that is too dense may inhibit feeding by bitterns or make prey inaccessible. A good height to aim for is between 80 cm and 2 metres, and patchy variation can ensure there are roosting and breeding areas, along with edges and more open areas for feeding. Some water plants, such as Cumbungi and Common Reed, can dominate a site and develop large amounts of rank growth, inhibiting bittern movement. Active management, such as ensuring a drying phase or the use of fire, can help avoid this.

Fire

Fire has been used by Indigenous Australians to manage vegetation in wetlands for thousands of years. In central and northern Australia, it is still commonplace but its use has faded in south-eastern Australia. A patchy

burn can create vegetation structure that benefits bitterns by providing more open areas and edges for foraging, while maintaining thicker areas for breeding. A fire can restart the ecological succession process of water plant communities, sparking the flurry of new growth. Recent trials in south-western Victoria and South Australia have shown great promise for improving wetland habitat for bitterns through reinstating cultural burning practices.

Grazing

Grazing by sheep and cattle can damage wetlands, but when carefully implemented it can be a tool to help manage vegetation and achieve objectives like providing ideal structure for bitterns. Grazing can reduce rank growth, help create a suitable structure and be used to manage weeds, all potentially benefiting bitterns. A key principle is to avoid grazing a site while it is flooded or still wet. This way, many of the negative impacts of grazing can be reduced or avoided, such as pugging, increased turbidity, excessive nutrient levels, and weed distribution.



"By managing the water and vegetation in key bittern wetlands, we can better accommodate them and help increase the Riverina's population, ensuring bitterns have suitable habitat year-round."

Anna Wilson, Riverina Local Land Services



Fivebough and Tuckerbil Wetlands

This internationally recognised Ramsar site, incorporating two wetlands on the doorstep of Leeton, has long been recognised for its value to the endangered Australasian Bittern. Bitterns are known to breed at Fivebough, and it also plays an important role as a non-breeding refuge. In November 2015, an aggregation of at least 34 bitterns was recorded prior to their dispersal to surrounding rice fields once the crops had developed sufficient cover and prey. The Murrumbidgee Field Naturalists' Club have been integral in championing the value of Fivebough and Tuckerbil.

Interestingly, Fivebough has a regular water supply from the local water treatment facility, which helps maintain large stands of Cumbungi in deeper water, while the more ephemerally flooded parts of the swamp are dominated Marsh Club-rush and Water Couch, and maintained by environmental water. This variation in structure seems to benefit bitterns, offering breeding, roosting and foraging opportunities under shifting conditions with different water levels. Similarly, Tuckerbil also has vast stands of club-rush, with an old storage dam at one end that supports large stands of Cumbungi.

Fivebough and Tuckerbil can also be highly valuable to other waterbirds, notably the migratory shorebirds, such as the Sharp-tailed Sandpiper, that prefer mudflats with little or no vegetation. This has presented challenging management trade-offs and grazing has been used for many years to manage vegetation so that shorebirds are accommodated alongside the bitterns. Different compartments, designated by banks, channels and fences, allow for such management partitioning. Improving the function of the different compartments and refining water delivery and the capacity to manage water levels is the subject of future works.





A Phragmites reedbed, providing bittern nesting and roosting opportunities, along the boardwalk to the Campbell's Wetland Birdhide.



River Red Gum encroachment is a key issue in some bittern wetlands, with saplings smothering the water plant habitat that bitterns depend on.

Campbell's Wetland

Campbell's Wetland, just north of Griffith and near Lake Wyangan, is also a key part of the Riverina's network of wetlands that sustain the Australasian Bittern. A regular beneficiary of environmental water, this site has seen an expansion of its stands of Cumbungi and Phragmites in recent years, providing more bittern roosting and breeding opportunities, and benefiting other cover-dependent species, as well as nesting Magpie Geese and ibis.

Extended drying phases can help avoid taller, thicker vegetation like this from eventually dominating a site while maintaining the shorter, more open foraging areas for bitterns. Campbell's Wetland is a good candidate for ecological burning trials to help restart the early stages of vegetation growth that bitterns often rely on. There is also potential for this wetland to increase its role in providing nonbreeding habitat – from late autumn, through winter and into spring – for bitterns dispersing from rice fields.

Turkey Flat

As part of the Riverina Local Land Services' "Boosting the Bunyip Bird Yield" project, the encroachment of bittern habitat by River Red Gum saplings is being addressed at Turkey Flat in the Murrumbidgee Valley National Park, near Yanco. Removing red gum saplings may seem like a strange conservation activity but without active management, too many of these trees will suppress the rushes, reeds and sedges that bitterns rely on. New water regulation structures have also been implemented to better manage water for the environment, which is being used to help restore this part of the Murrumbidgee River floodplain, reinstating water levels and flooding regimes that benefit bitterns and a whole suite of other wetland biodiversity. Cultural burning trials of the Cumbungi and Phragmites, which will benefit bitterns, are also being planned.



Each spring, the Riverina's rice fields begin as bare paddocks, transforming into bittern breeding habitat within 2-3 months.

Bitterns and Rice Farming

What makes rice fields so valuable to bitterns?

Australasian Bitterns have been known to use the Riverina's rice fields for many decades but it wasn't until 2012, when systematic surveys began, that the significance of the population was realised. Sampling across randomly selected farms revealed that these agricultural wetlands support the largest known breeding population on Earth, with conservative estimates of 500-1000 bitterns in most years. With the exception of droughts, the Riverina typically contains between 20,000 and 100,000 hectares of rice, all of which is potentially suitable for bitterns.

Traditionally, rice fields are sown and flooded in October or November, with water levels starting at about 5 cm. This is gradually increased as germination and growth occur, reaching about 25 cm deep by mid-summer. Bitterns tend not to arrive in the rice fields until December, which is later than the arrival in many natural wetlands where breeding occurs, but it still coincides with the bittern breeding season. Males begin booming and establish their territories in the hope of attracting nesting females. Bitterns typically begin nesting in rice in early January, about 77 days after flooding

and sowing has occurred on bare ground. The rice height at the time the first egg is laid is about 55cm, but it continues growing rapidly, reaching around 110 cm towards the end of the rice season.

Rice fields effectively function as ephemeral wetlands, where the cycle of flooding, sowing, drying and harvest mirrors the boom-and-bust of inland swamps where bitterns evolved. Importantly, the rice fields provide bitterns with the cover and prey they depend on. For example, rice fields support abundant populations of Spotted Marsh and Barking Marsh Frogs, as well as the Common Carp. Individual rice fields are usually large areas, often around 70-80 hectares, with interconnected bays that allow for the cycling of water through the system, and to maintain desired water depths. Each rice field typically encompasses several kilometres of edges and banks.

The Riverina's rice industry has embraced this peculiar bird and the species has become symbolic of the previously overlooked habitat values of rice farming. The appeal of agriculture and wildlife conservation working together, through partnerships and collaborations, has garnered widespread support from people and groups that are normally at odds with each other.



"We are so proud of how our rice farmers have responded to support the Australasian bittern. They tweak their farm management to deliver the best habitat they can and really appreciate the community respect for being involved."

Neil Bull, Ricegrowers' Association of Australia



This bittern chick, about 3–4 weeks old, and still 3–4 weeks from fledging, was monitored at one of the bittern-friendly rice growing incentive sites through to fledging, roaming hundreds of metres from the nest before being able to fly.

Unintended Costs of Saving water

Driven by water-use efficiency, diligent efforts by Riverina rice farmers have resulted in producing more food per megalitre of water used. And saving water is widely a considered positive for the environment and sustainability. However, there can be important trade-offs. Over the past decade, the industry standard and traditional method of ponding water from the start of the rice season – “early permanent water” – has been surpassed by water saving methods that instead use irrigation flushes and delay ponding by up to two months. This is problematic for bitterns because it contracts the ponding period – the number of days that the field is flooded – and reduces the window for successful breeding before the rice season ends.

Bittern-friendly Rice Growing Incentives

In 2019, the first financial incentives were offered to rice farmers to grow bittern-friendly rice. The program will continue for four years until 2023, but after the first three years, it has already included a total of 3115 hectares. It forms part of the Riverina Local Land Services’ “Boosting the Bunyip Bird Yield” project, supported by funding from the Australian Government’s National Landcare Program. Growers enter into agreements, with a per hectare payment that depends on how much rice there is potentially available in a given season and the demand for incentives, as well as which of the three levels of criteria a grower’s fields meet.

An early and sufficient ponding period – the traditional rice growing method – is central to



Benerembah Rice Grower, Hayden Cudmore, with Anna Wilson from Riverina Local Land Services, at a bittern-friendly rice incentive site in October, 2021, at the time of ponding commencement.

bittern-friendly rice but there is a range of other components all aimed to better accommodate bitterns and give them the best chance of breeding successfully.

1. Early Permanent Water

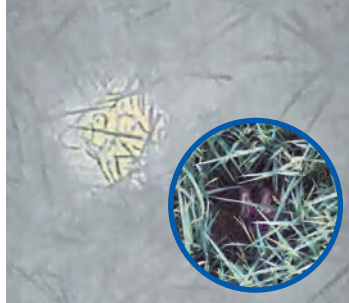
Commencing the ponding period in October, or by early November, is a key criterion for bittern-friendly rice farming. The highest incentives are offered to growers who can get the water on by October 20th while meeting all other criteria. In December and January, when bitterns begin nesting, these early crops support more prey, and have more cover, compared to alternative growing methods. This means males can establish their territories sooner and females can start nesting earlier.

2. Sufficient Ponding Period

Early permanent water crops tend to have longer ponding periods, often over 150 days. For example, inundation from October 18 to March 17 is a 150-day ponding period. When crops are dried out in preparation for harvest, water often remains in the edges, and harvest usually takes place about three weeks after drainage or ‘lock-up’, when the water supply is terminated. For a crop with 150 days of ponding this means about 171 days between ponding commencement and harvest. With nesting commencing at an average of 77 days after ponding commencement, and bitterns requiring 88 days for all eggs to hatch and those chicks to fledge, 165 days elapse between ponding commencement and the youngest chick fledging.



Storage and recycle systems like this one near Tullakool have been constructed on farms to aid in water management. With the right water depths and a flooding-drying cycle, diverse water plant communities establish. Here, there is Canegrass, Lignum, Cumbungi, Common Spike-rush and Water Couch. Not only does this site support the Australasian Bittern, but there are also Southern Bell Frogs, Australian Little Bitterns, and various other species dependent on water plants.



The use of a thermal drone is improving our ability to locate nests and monitor breeding success in the rice fields.



Rice growers gather at a bittern-friendly rice incentive site field day at Willbriggie.

3. Adjacent Habitat

Wetland refuges adjacent to rice fields can be important for bitterns. They can be natural wetlands, storage dams, recycle systems or channels, with the cover and prey that bitterns require. This adjacent habitat can complement rice fields during the growing season and provide habitat after the rice season ends, giving bitterns more time before they need to disperse, which is particularly important for young birds that haven't fully fledged. Ensuring these refuges have water and water plant cover, such as rushes and sedges, before harvest time approaches is crucial.

4. Grassy Banks

Avoiding herbicide use around rice fields and maintaining vegetated banks provides additional bittern habitat, including cover from predators, and supports other cover-dependent wetland bird species like Little Grassbirds and Buff-banded Rails. Bitterns are often seen using grassy banks, and observations of roaming chicks using these areas emphasise their importance. High yielding rice crops, with extensive stands of Barnyard Grass on the banks, indicate that grassy banks can be maintained without impacting yields.

5. Nesting Patches

To encourage earlier bittern nesting in rice fields, trials have begun by creating small nesting patches within the crop (e.g. 10–25 m²), where taller and thicker rice growth has developed sooner as a result of additional fertiliser. Although no nesting has yet been

recorded, this method shows promise in fast-tracking nesting commencement. Similarly, other vegetation like Cumbungi could be propagated in slightly deeper holes within the crop, with the added benefit of retaining both water and cover after drainage and harvesting.

6. Fox and Cat Control

Bitterns are vulnerable to foxes and cats, especially at the edges of rice fields and particularly for young, naïve birds. We know foxes and cats can take bitterns but the population level impacts remain unknown. Still, if fox and cat predation is impacting overall population numbers, then their control will give bitterns, especially young ones, better chances of surviving before dispersal, and, ultimately, being recruited into the adult population. Over 250 foxes and 82 cats have been eradicated as part of the incentive program so far.

The Results so far ...

In our standardised monitoring of bittern activity during the first three years, we have found between two and six times as many bitterns at the incentive sites compared to control sites. No nesting has been recorded at control sites, while 13 nests have been found at the incentive sites. With the help of a thermal drone, and watching for females delivering food to chicks, we attempt to monitor breeding success through to fledging but this can be difficult because they start roaming within two weeks of hatching. However, the timing of nesting for all but two of the nests (11/13 – 85%) had a sufficient period for the chicks to potentially fledge before harvest.



"We've been happy with the incentive program, helping boost the numbers up for bitterns with successful nesting in our rice crops."

Maria and Paul Andreazza, Willbriggie Rice Growers



This constructed wetland in a Canberra suburb supports shallows with a healthy and diverse water plant community. Similar sites in Canberra have supported Australasian Bitterns, albeit briefly, but such stopovers could be vital during dispersal.



The Cumbungi in this small channel had died off during winter but, because it retained water and prey, it still supported four bitterns for several weeks.

Constructed Wetlands, Farm Dams and Channels

Australasian Bitterns regularly use constructed wetlands, farm dams and channels, and although they tend not to support breeding, they still provide important habitat as stopovers or non-breeding habitat, as well as being complementary to more valuable sites. Many sites, however, do not support bitterns because of a lack of shallow wetland area and water plant cover. The simplest way of creating bittern habitat in these artificial wetlands is to incorporate water depths between 10 and 50 cm that can support rushes, sedges and other water plants.

The highest priority sites should be those near regularly used bittern sites, such as a key swamp or a rice field, and those that are largest in area. In particular, storage dams of several hectares, or stock dams with large overflow areas, have the potential to function as key bittern sites if they can support extensive water plants and shallows. To avoid excessive grazing pressure on water plants, stock access can be limited, by fencing off key areas, or excluded, with water pumped to troughs.

Moving Bittern Conservation Forward

Over the past decade, much has been achieved in better understanding what's needed for Australasian Bittern conservation

in the Riverina and beyond. For example, the significance of the Barmah-Millewa wetlands has been made clear, while the importance of bittern-friendly rice farming has been recognised. Environmental water management is now incorporating bitterns at key sites, and the rice industry has embraced bittern conservation as part of its ethos. We have a far greater understanding of fundamental aspects of bittern ecology, from breeding to movements, and how wetlands can be managed to benefit the species.

What is evident is that the key to bittern conservation, particularly in the Riverina, is targeted water management. There are still big gaps in our knowledge, such as breeding ecology in natural wetlands, and the potential impacts of fox and cat predation, but providing good bittern habitat all begins with water. There are numerous opportunities to improve our water management to benefit bitterns and to expand the network of wetlands that sustain bitterns throughout the year. There are many stakeholders that can play a part, from wetland managers and local community groups, to government and scientists, along with landholders and even rice consumers that are willing to pay extra for bittern-friendly rice. The state of Australasian Bittern persistence remains grave but there is great hope in working together to boost populations and secure the species.

Further reading

Belcher, C., Borrell, A., Davidson, I., Webster, R. (2017) Australasian Bittern Surveys in the Murray Valley and Barmah National Parks 2016-2017. Unpublished Report by New South Wales National Parks and Wildlife Service, Sydney.

Bitterns in Rice Project. (2021) Bunyip Bird Conservation. www.bitternsinrice.com.au

Department of Agriculture, Water and Environment. (2022) Draft National Recovery Plan for the Australasian Bittern. <https://www.awe.gov.au/environment/biodiversity/threatened/recovery-plans/comment/draft-recovery-plan-australasian-bittern>

Herring, M.W., Robinson, W., Zander, K.K., Garnett, S.T. (2019) Rice fields support the global stronghold for an endangered waterbird. *Agriculture Ecosystems & Environment*. 284, 106599. <https://doi.org/10.1016/j.agee.2019.106599>

Herring, M.W., Robinson, W., Zander, K.K., Garnett, S.T. (2021) Increasing water-use efficiency in rice fields threatens an endangered waterbird. *Agriculture Ecosystems & Environment*. 322, 107638. <https://doi.org/10.1016/j.agee.2021.107638>

Herring, M.W., Barratt, P., Burbidge, A.H., Carey, M., Clarke, A., Comer, S., Green, B., Pickering, R., Purnell, C., Silcocks, A., Stokes, V., Znidarsic, E., Jaensch, R.P., Garnett, S.T. (2021) Australasian Bittern *Botaurus poiciloptilus*. In *The Action Plan for Australian Birds 2020*. (Eds. S.T. Garnett and G.B. Baker) pp. 222-224. CSIRO Publishing, Melbourne.

O'Donnell, C.F.J. (2011) Breeding of the Australasian Bittern (*Botaurus poiciloptilus*) in New Zealand. *Emu* 111, 197-201. <https://doi.org/10.1071/MU10059>

Riverina Local Land Services. (2021) Landholder Guide: Growing Bittern-friendly Rice. https://www.lsl.nsw.gov.au/_data/assets/pdf_file/0011/1249328/Landholder-guide-Growing-Bittern-Friendly-Rice.pdf

Williams, E.M., Armstrong, D.P., O'Donnell, C.F.J. (2018) Modelling variation in calling rates to develop a reliable monitoring method for the Australasian Bittern *Botaurus poiciloptilus*. *Ibis* 161, 260-271. <https://doi.org/10.1111/ibi.12611>

*“Targeted water management is key
to Australasian Bittern conservation”*



Australasian Bitterns are masters of concealment, readily blending in with wetland vegetation, like this Cumbungi growing in an irrigation channel.



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