

Woodland bird conservation in Murray-Darling Basin floodplain habitat

In brief

The Murray-Darling Basin (MDB) provides vital habitat for many species, including terrestrial bird species that depend on floodplain forests and woodlands. The ecological condition of floodplain vegetation is in decline due to an array of threats, including changed hydrologic regimes, and pressures from invasive species. We aimed to provide decision support for MDB managers by identifying priority habitat areas for floodplain-associated terrestrial bird species.

We used the spatial prioritisation tool Zonation to create maps of floodplain vegetation habitat zones. The maps showed the locations of terrestrial floodplain bird habit based on a prioritisation ranking. The predictions were based on data

that was collected over a 21-year period (1998–2018).

The priority locations we identified differed depending on management objectives. When the focus was to identify core habitat for threatened bird species, floodplains along the western reaches of the Murray River had the highest priority. Conversely, when non-threatened floodplain-dependent species were examined, the highest priority sites were concentrated in the north of the MDB to the east of Cunnamulla and east of Lightning Ridge.

Our findings can be used to efficiently allocate management resources, such as environmental water, so that conservation outcomes for these bird species are optimised.

Background

Floodplain ecosystems in south-eastern Australia's Murray-Darling Basin (MDB) are under stress from changes to the hydrologic regimes, grazing and vegetation clearing. Many species, including waterbirds and terrestrial birds, rely on floodplain habitats for parts of their life cycles, with floodplain ecosystems representing some of the largest continuous stretches of habitat for terrestrial woodland birds. Threatened terrestrial bird species that are associated with MDB floodplain habitats include the painted honeyeater (*Grantiella picta*), regent parrot (*Polytelis anthopeplus monarchoides*), and the superb parrot (*Polytelis swainsonii*). The management of these ecosystems has important ramifications for the conservation of these species.

State and federal governments have used management actions aimed at improving the health of the MBD system. For example, 16 wetlands have been listed as Wetlands of International Importance under the Ramsar Convention. In addition, statutory environmental water holders have been established to manage portfolios of water holdings for achieving environmental outcomes in floodplain, wetland and riverine environments, and



Superb parrot. Image: Patrick_K59, CC BY 2.0 Wikimedia Commons



Background (continued)

numerous other environmental restoration activities are taking place throughout the MDB. These factors represent opportunities for improving outcomes for native species who use the floodplain habitats at various points in their life cycle.

Terrestrial birds are not commonly considered in the management of floodplain ecosystems, and as such, further research and targeted management strategies are required for this community. Climate change-induced increases in the frequency and severity of drought in the MDB will increase the importance of the region's floodplains for the bird communities they support. Conservation planning can help identify habitats and locations which support key biodiversity. Knowing where to target management actions and resources could assist conservation of floodplain-dependent terrestrial birds and their habitats.

Main aims

This project aimed to identify which locations within the Murray-Darling Basin are the most important habitat for threatened bird species, floodplain-dependent species and floodplain-associated bird species. Overall, we wanted to identify where protection and conservation efforts could be best concentrated within the MBD for the benefit of both threatened and floodplain-dependent native birds.

What we did

We compiled a database of 4,555,939 presence records from existing data sources for 108 bird species that had previously been identified as occurring commonly in MDB floodplain vegetation. We focused on data collected over a 21-year period between 1998 and 2018. These data were used to build individual habitat suitability models for each bird species. Two separate models were produced for each species, one for the breeding season and one for the non-breeding season. We created maps to visually display habitat suitability for each bird species in each of the 21 years from 1998 to 2018.

We used a spatial prioritisation approach called Zonation to identify the most important habitat areas within MDB floodplains. The modelling identified floodplain areas that consistently provided habitat with high suitability during the 21-year study period. This timespan included periods of extreme drought (e.g., the Millennium Drought) as well as years with above average rainfall.

We developed habitat suitability models by modelling the relationship between species

occurrence and a set of environmental variables that indicated terrestrial bird occurrence. The environmental variables included measures of habitat extent, habitat condition and variables that affect bird distribution through their effects on physiology (e.g., longest run of consecutive hot and dry days). Some variables were constant across years (e.g., elevation), whereas other variables were dynamic across years (e.g., cumulative rainfall).

We examined three different scenarios for prioritising habitat zones for terrestrial birds. First, we identified priority areas that maximised the core habitat for three threatened terrestrial birds, the painted honeyeater (*Grantiella picta*), regent parrot (*Polytelis anthopeplus monarchoides*), and the superb parrot (*Polytelis swainsonii*). Second, we identified priority areas that would maximise the habitat for 50 floodplain-dependent terrestrial bird species. Finally, we identified priority areas that would maximise the habitat for all floodplain-associated terrestrial bird species. Maps were produced to identify areas of conservation prioritisation for each of these three scenarios.



Floodplain-dependent yellow rosella.
Image: Rowan Mott



Key findings

We produced predicted habitat suitability maps with good predictive performance for 72 of the 108 bird species associated with floodplain vegetation. Bird species we could not produce satisfactory models for had a widespread occurrence, and therefore did not have a strong affinity with any habitat type.

For most of the bird species examined, the seasonal habitat suitability predictions varied little between years throughout the 21-year study period. This was the case during both the breeding and non-breeding seasons for the regent parrot, superb parrot and painted honeyeater.

However, for a few bird species variations were noticeable in the predicted habitat suitability from one year to the next. This was the case for the little friarbird and the barking owl during non-breeding seasons.

We produced a set of maps that clearly identify the priority areas that would maximise bird habitat under each of the following three scenarios.

Scenario 1. Threatened terrestrial bird species

Floodplains along the Murray River from Swan Hill westward were identified as the highest priority habitat for the threatened painted honeyeater, regent parrot and superb parrot. (See Figure 1.) Under this scenario the model also identified high priority floodplains along the eastern reaches of the Murrumbidgee River, Yanco Creek, Billabong Creek and Tuppall Creek east of Deniliquin.

Only 15% of the highest priority areas (top 10% rankings) occurred within protected areas. These protected areas included the Murray Valley

National Park, Barmah National Park, and Hattah-Kulkyne National Park, as well as the New South Wales Central Murray State Forests Ramsar site, Barmah Forest Ramsar Site and Riverland Ramsar Site.

Some Ramsar wetlands, such as the Barmah Forest and Hattah Lakes Ramsar Sites, were almost entirely ranked within the top 10% of priorities when focusing on habitat for threatened species.

The regent parrot had a very restricted range, with a strong preference for floodplains, and was the main driver of these patterns. On the other hand, the superb parrot and painted honeyeater have a wider distribution, and have areas with high habitat suitability in both floodplain and non-floodplain areas.

Scenario 2. Floodplain-dependent terrestrial bird species

Floodplains along the Barwon, Boomi and Macintyre Rivers east of Lightning Ridge were ranked as high priorities for floodplain-dependent birds. Similarly, floodplains extending west from the Nebine Creek east of Cunnamulla, and floodplains along scattered creeks west of Menindee also ranked highly in this scenario.

Scenario 3. Floodplain-associated terrestrial bird species

Floodplains east of Cunnamulla along the Mungallala, Paterson and Widgegoara Creeks, and floodplains in the headwaters of the Warrego and Paroo Rivers were ranked as high priorities for all floodplain-associated taxa.

When the prioritisation model included non-threatened species, less than 1.5% of the highest priority areas occurred in protected areas.



*Painted honeyeater. Image: Stuart Harris
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Only very small areas of individual Ramsar sites were represented in the top 10% of priorities for floodplain-dependent species and floodplain-associated species. Floodplains in the very south of the MDB, such as those along the Murray River from Swan Hill eastward were consistently ranked as lower priorities for these bird groups.

For all three scenarios, floodplains along the Darling River between Bourke and Menindee were never ranked as high priority habitat for terrestrial birds. Floodplains along the Darling River and floodplains in the very south of the MDB were also ranked low for floodplain-associated terrestrial birds. Lower-ranked areas are still likely to be of high conservation value, particularly given the relative importance of floodplains compared to other areas. However, these sites have a lower priority for conservation management activities relative to other floodplains in this basin.

Cited material

Rowan Mott, Katherine E. Selwood and Brendan Wintle. August 2020. Threatened bird conservation in Murray-Darling Basin wetland and floodplain habitat. NESP Threatened Species Recovery Hub Project 4.4.7 report, Brisbane.

Further Information

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Implications and recommendations

Areas identified as high priority for floodplain-dependent and floodplain-associated birds are species-rich locations. Targeting management actions to these locations would benefit multiple species and could yield the most efficient conservation returns.

Conservation return is similarly likely to be maximised when management actions benefit the floodplain associated terrestrial bird community more generally. For example, increasing habitat condition through environmental watering, fencing to improve understorey regeneration, or targeted additions to the protected area network will provide benefits to multiple species.

Alternatively, management actions targeted to the floodplains along the Murray River west of Swan Hill could improve the trajectory of at-risk bird species, such as the regent parrot.

Habitat suitability predictions for many of the species varied little across time, indicating that management actions do not need to coincide with a given season for high priority status sites.

The top 10% of high-priority sites are unlikely to represent the area needed to maintain viable populations of terrestrial birds, particularly given these species have already experienced widespread habitat loss. Only a small percentage of top-ranked locations occurred within protected areas. This suggests

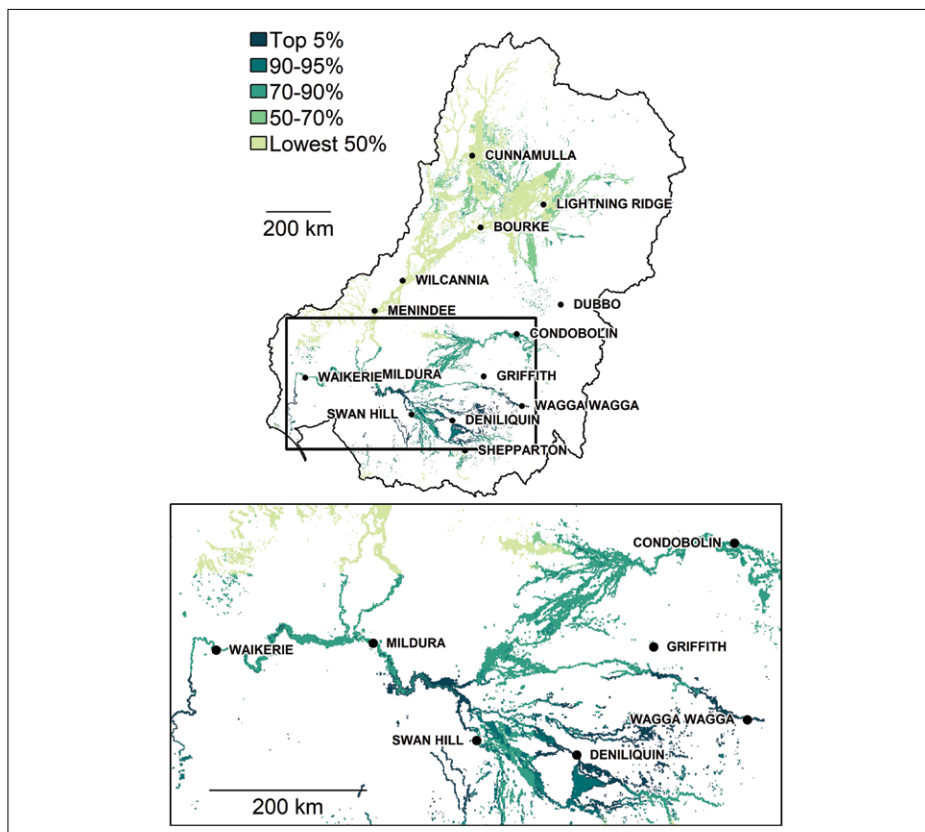


Figure 1: The floodplain habitats identified as priority habitats within the Murray-Darling Basin for the conservation of threatened terrestrial bird species. The rectangular insets show enlargements of the corresponding regions indicated by the black rectangles on the main map. The darker the colour, the higher the conservation priority.

that management actions on unreserved and private lands are important for the long-term conservation of floodplain-associated terrestrial birds in the MDB. This could include incentives to landholders to carry out conservation works to ensure high priority areas are suitably managed.

This study included the Millennium Drought period (1998–2009), which was one of the longest and most severe droughts in Australia's recorded history. Therefore,

floodplains identified as priorities for management in this study are likely to remain important under a future, more extreme climate.

The locations identified as high-priority bird habitats could be used to inform the assessment of other wetlands for listing under Ramsar, and identify where management activities within river red gum park systems in Victoria and New South Wales could be focused for the benefit of floodplain bird communities.