

COOBIDGE CREEK CATCHMENT

MANAGEMENT PLAN
2022



looking after where we live

South Coast NRM is an incorporated not for profit natural resource management organisation on the South Coast of WA. It is the peak regional body that brings, people, organisations and information together so that the regional community can drive sustainable management of natural resources with positive environmental and economic outcomes.

We acknowledge the Noongar/Nyungar peoples of the South Coast region as the traditional custodians of this land and we pay our respects to their Elders past and present.

PHOTO FRONT PAGE: Coobidge Creek Cascade Rd taken by Nathan McQuoid



Coobidge Creek Catchment Management Plan
South Coast Natural Resource Management Inc
June 2022

Prepared by
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Coobidge Creek below its culvert under South Coast Highway (Photo credit: Nathan McQuoid)

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natural resource
management program



Purpose of the Coobidge Creek Catchment Management Plan

This management plan is the result of community concern for the health of Coobidge Creek arising from the impacts of flooding from heavy rainfall in early 2017.

The principal purpose of this management plan is to provide guidance and recommendations for farmers and other landowners in the Coobidge Creek catchment to implement, to mitigate erosion and sedimentation, principally during high rainfall events.

Additional aims are to provide guidance and recommendations for on-ground and additional information actions to maintain and restore the ecological health of Coobidge Creek, in line with the land management goals of participating landowners, consistent with Southern Prospects biodiversity, soil health and water values. In addition, it serves as a foundation from which to apply for funding and related resources for mitigation and conservation works.



Coobidge Creek West Speddingup Nature Reserve Robins Rd (Photo credit: Nathan McQuoid)



Coobidge Creek Cascade Rd (Photo credit: Nathan McQuoid)

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Summary

This catchment management plan is a long-term initiative to restore the health of Coobidge Creek west of Esperance (Figure 1). Coobidge Creek flows into an unnamed swamp in the wetland system that includes Lake Kubitch, Lake Carbal and Lake Gidong. This wetland system sits to the immediate west of Lake Gore - a Ramsar listed wetland (Figure 2, Figure 3; Hopkinson 2001).

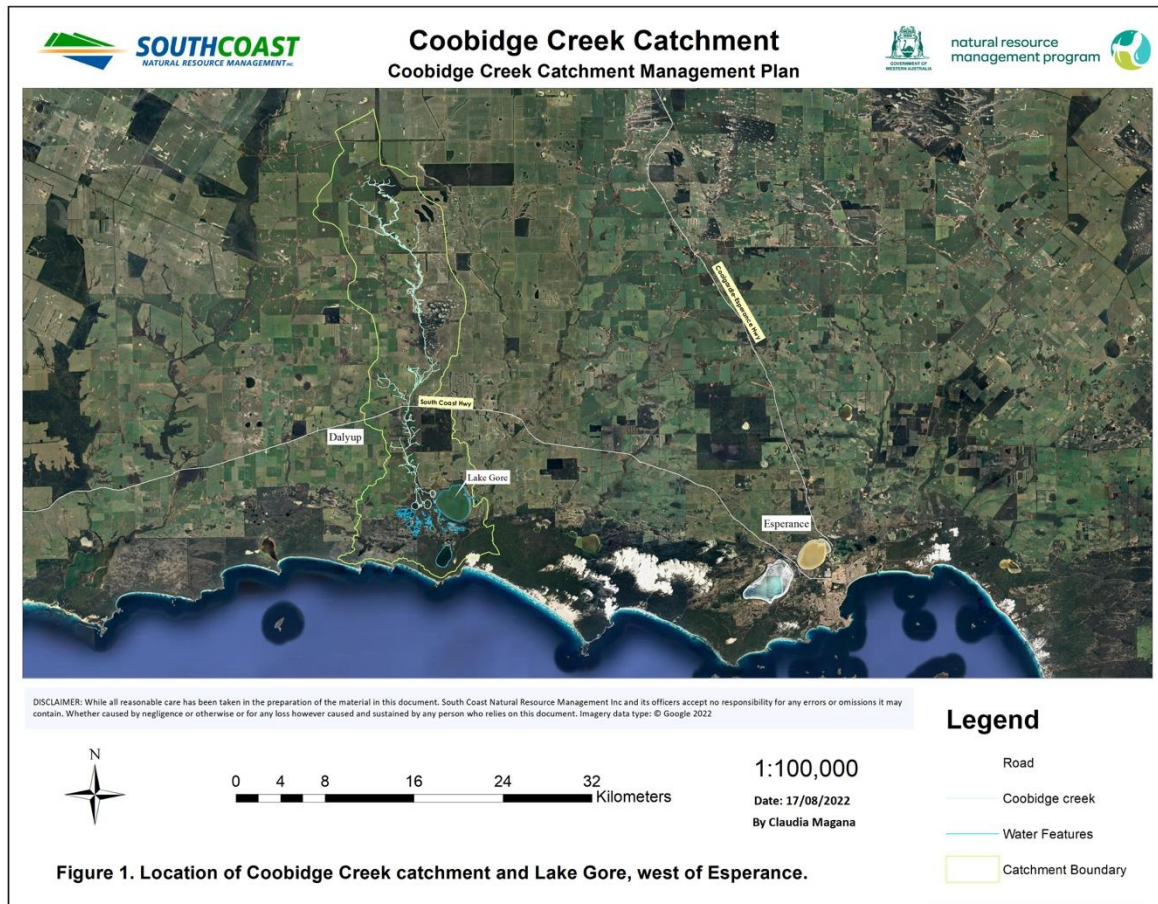
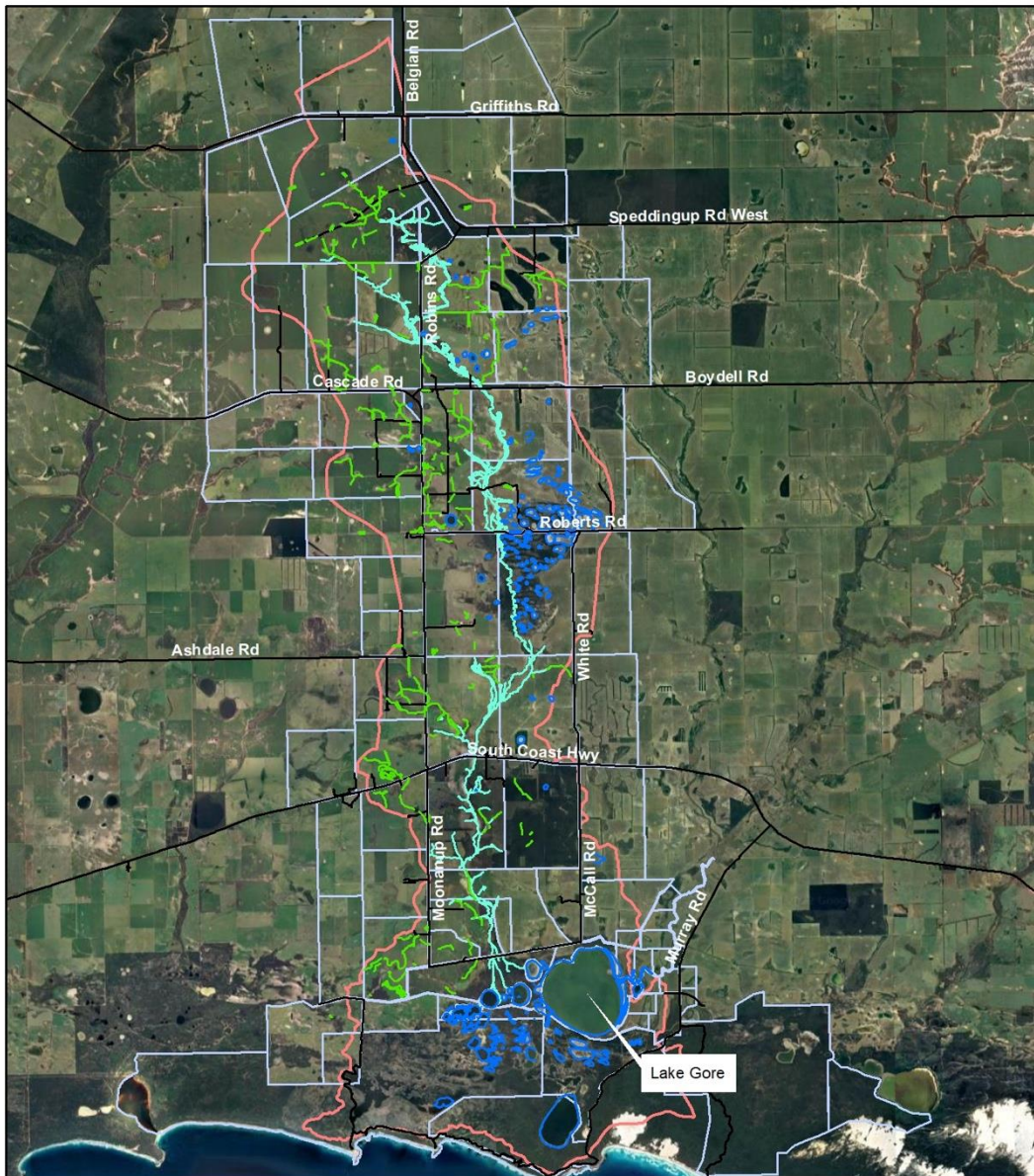


Figure 1. Location of Coobidge Creek catchment and Lake Gore, west of Esperance.

Figure 1. Location of Coobidge Creek catchment and Lake Gore west of Esperance



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Legend

- Lake
- Drainage
- Road
- Coobidge creek
- Property boundaries
- Catchment Boundary



0 1.5 3 6 9 12 Kilometers

1:210,000

Date: 18/08/2022

By Claudia Magana

Figure 2. Coobidge Creek Catchment and the Ramsar listed Lake Gore

Figure 2. Coobidge Creek Catchment and the Ramsar listed Lake Gore

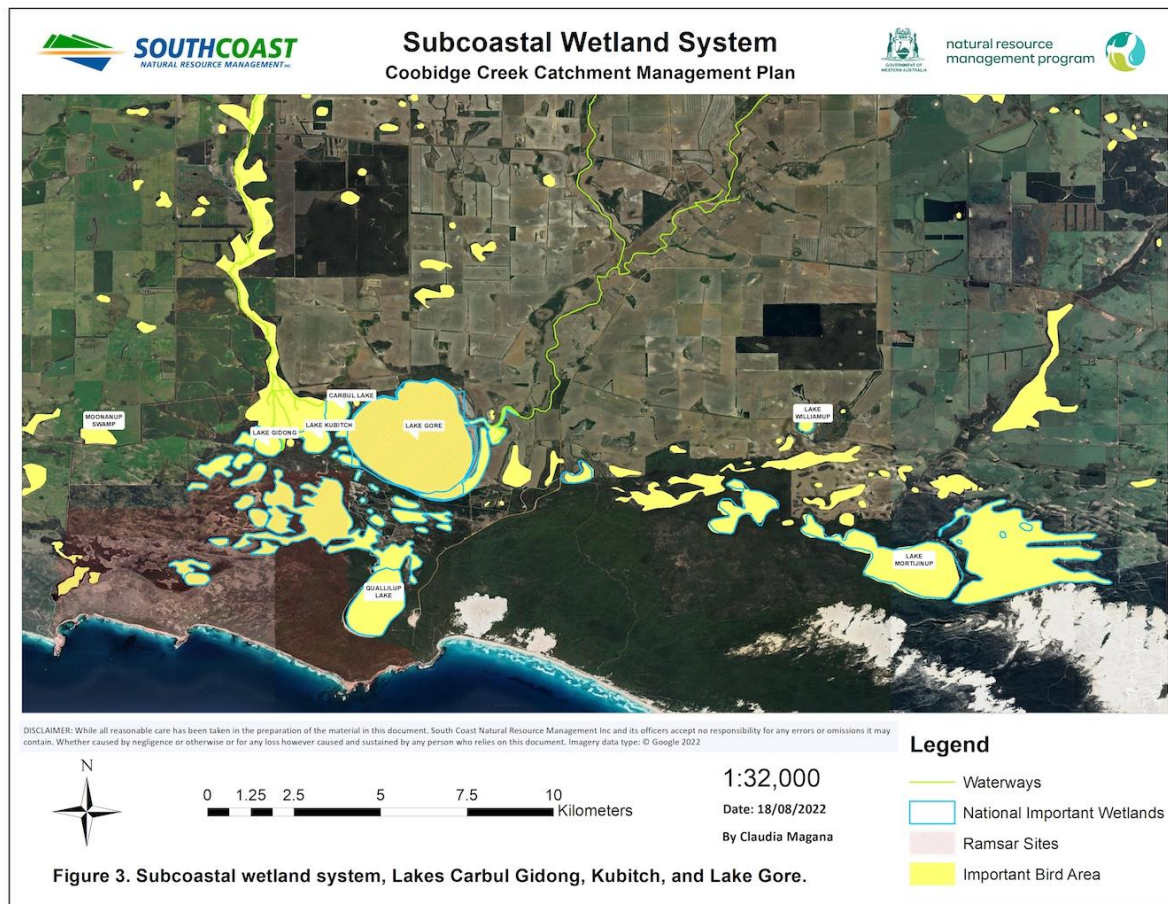


Figure 3. Subcoastal wetland system, Lakes Carbul, Gidong, Kubitch, and Lake Gore

The Coobidge Creek catchment (Figure 2) was heavily impacted by extreme flooding in 2017. This plan defines information relating to remnant vegetation protection, environmental engineering, riparian restoration and other revegetation recommendations required to restore Coobidge Creek and mitigate against further degradation to environmental values, water quality and agricultural lands.

The catchment plan is designed for use by the catchment farmers to conduct appropriate on-ground actions on the creek and surrounding catchment with co-invested resources and to leverage potential future funding.

Plan Objectives

1. Produce a catchment management plan for farmers to implement to mitigate erosion and sedimentation issues during short lived high rainfall events. This plan is to include maps, rudimentary farm designs, recommendations, and future actions.
2. Ensure all recommendations contained within the plan are consistent with Southern Prospects (biodiversity and soil health values) and goals of the participating farmers.

This catchment management plan is formed from its dual objectives, based on the input and knowledge of landowners and managers, and guided by previous knowledge and the design of catchment plans for drainage systems in the Esperance area of Western Australia (Froend and van der Moezel 1990; GHD 1990; Hopkinson 2001; GHD 2021). It also takes lead from the management plan for the adjacent coastal national parks and nature reserves (DPAW 2016), including Ramsar wetlands, which are wetlands of international significance

and protected under Treaty arrangements with other countries for the conservation of the habitats of migratory waterbirds.

The input by landowners, managers and other stakeholders is from the results of the consultation process undertaken during May and June 2022. Stakeholders provided input as their goals, case studies, evidence from impact sites and experiences, remnant vegetation protection, riparian vegetation conservation and restoration, fencing initiatives, earthworks designs, and collaborations for mitigation works.

Based upon input from consultation discussions, the goals for the landowners for the health of Coobidge Creek and the protection of their land, biodiversity and water assets are:

- Re-establish the Coobidge Creek channel immediately south of South Coast Highway, where the flood removed large amounts of sand and deposited it in the creek bed further south.
- Alongside the re-established channel, bund with clay from channel earthworks, batter the eroded sand edge to the bund, and revegetate the repaired riparian area with locally native vegetation suitable for wetland and riparian areas.
- Investigate and trial brush mulching and other revegetation techniques that use locally sourced native vegetative material to restore damaged and repaired riparian areas.
- Establish locally native vegetation suitable for wetland and riparian areas along all flood damaged parts of Coobidge Creek.
- Establish locally native vegetation suitable for wetland and riparian areas along drainages and associated lowlands, wetlands and other waterlogged sites that flow into Coobidge Creek.
- Fence off the remaining unfenced remnant bushland, wetland and creeks in the catchment.
- Financial support for planning and design, restoration and fencing works required.

The results of the landowner consultation and goals identified are presented as six themes for consideration and attention:

1. The priority landscape, water and environmental health issues for attention.
2. Location of the priority issues in the landscape.
3. How to best approach or manage priority issues.
4. Initiatives and works already in place.
5. Initiatives and works to be scoped and implemented.
6. Assistance to scope and implement planned works.

An additional theme 7, Previous studies, considers the implementation status and results of implemented works as an additional guide, and continuation of previous investment, for added management and restoration recommendations. The management and restoration recommendations are aligned with the initial six themes, with the seventh (previous studies) recommendations provided first for time-based and evaluation of previous investment order:

GHD (1990) recommendations

- Evaluate the implementation of the GHD (1990) report recommendations. In particular assess whether and how the four main points were addressed, and the implementation or otherwise of the ten recommendations of the study relating to Coobidge Creek.

Hopkinson (2001) recommendations

- Review and evaluate the implementation and results of the recommended management activities Action Plan table (Table 1, 2). Including assessment of fenced areas, recovery of fenced remnants, waterways and wetlands, and revegetation extent and success.

GHD (2021) recommendations

- Assess and evaluate the views of responsible regulating and managing Authorities (DWER, DPIRD, DBCA), and affected landholders on their consideration of the options and recommended option.

Theme 1. Priority landscape, water and environmental health issues for attention

- Coobidge Creek main drainage.
- Unfenced remnants on private land.
- Watercourses, wetlands, salt lakes, waterlogged land and otherwise unproductive land parcels.
- Ultimately the health of the subcoastal wetland system, including Lakes Kubitch, Carbul and Gidong into which Coobidge Creek flows, and the adjacent, associated and Ramsar listed Lake Gore.

Theme 2. Location of the issues in the landscape

- Coobidge Creek main drainage system (Figure 2).
- Unfenced remnants on private land.
- Watercourses, wetlands, salt lakes, waterlogged land and otherwise unproductive land parcels.
- The salt lake/playa wetlands in the upper catchment, as examples of saline wetlands with good remnant vegetation surrounds and relatively intact habitats.
- The subcoastal wetland system, including Lakes Kubitch, Carbul and Gidong into which Coobidge Creek flows, and the adjacent, associated and Ramsar listed Lake Gore (Figure 3).

Theme 3. How best to approach or manage priority issues

- Restore the main drainage of Coobidge Creek in a collaborative project with landowners. A combination of planning and design in line with the GHD (2021) report to include environmental engineering assessment, earthworks and native vegetation restoration.
- Fence all unfenced remnants as an overarching theme.
- Revegetate all watercourses and water and salt affected and otherwise unproductive land as an overarching theme.
- Support landowners with easy to attain financial resources for Coobidge Creek restoration planning and design as a collaborative approach, and restoration, fencing and revegetation of priority places and throughout the catchment.

- Evaluation and monitoring of previous projects and their recommendations as a consideration and assessment of their prior investment.

Theme 4. Initiatives or works already in place

- The efforts, information and investment of the four previous studies.
- The considerable habitat values and conservation listings of the coastal and sub coastal wetland system, as Lakes Kubitch, Carbul, Gidong and the adjacent Gore.
- The Esperance Coast National Parks and Reserves Management Plan (DPAW 2016) of the Department of Biodiversity, Biodiversity, Conservation and Attractions Parks and Wildlife Service.
- Most remnants including watercourses and wetlands throughout the catchment are already fenced (Hopkinson 2001). However, the most effective land, biodiversity and water conservation will occur when all remnants, watercourses, wetlands and low-value agricultural land is fenced and effectively revegetated.
- The February 2017 flood altered the Coobidge Creek channel below the bridge on South Coast Highway, it also removed some 17,000 m² of sand from the paddock adjacent and placed it hundreds of metres downstream as a sand slug (GHD 2021; K Scott, G Burnett pers comm.). The landowner has offered to provide earthworks and restoration assistance for this damaged section, including the repair of the channel, reforming of the creek sides and restoration of riparian zones.
- Shallow surface water drainage networks have been constructed across significant areas where waterlogging occurs in paddocks, with water drained into natural drainages in the Coobidge Creek system.

Theme 5. Initiatives and works to be scoped and implemented

- Review and evaluate implementation of GHD (1990), Hopkinson (2001) and GHD (2021), including the number and amount of recommended works completed and the success of mitigating impacts and the restoration of habitats resulting from the works. Noting that the GHD (2021) recommendation/s have yet to be implemented, and that there is not yet agreement on the recommended option between the landowner and regulators. See point 4 below.
- Liaison with DBCA on the implementation of the Esperance Coast National Parks and Reserves Management Plan (DPAW 2016), as it relates to Coobidge Creek catchment. Including the extension of the Ramsar listing to include lakes Carbul, Gidong and Kubitch.
- Extend the Ecologically Sensitive Area (ESA), which currently encompasses the lower Coobidge Creek Catchment, to include the whole of Coobidge Creek Catchment. This will support the Ramsar listing extension of Lakes Carbul, Gidong and Kubitch (as above), and to support the availability of public and other resources to improve the conservation values of the catchment, including the implementation of this plan.
- Liaison between stakeholders involved with the Coobidge Creek erosion site south of the South Coast Highway Bridge, to meet, discuss, find agreement and collaborate on the implementation of the GHD 2021 report option/s, or other options as agreed. Liaison and discussions to be facilitated by an independent person. Stakeholders being landowners and

managers, state agency staff (DPIRD, DWER and DBCA), South Coast NRM, GHD staff and others with expertise as appropriate.

- Identify remnant native vegetation yet to be fenced.
- Identify problem areas such as waterlogged sites, flood zones, saline areas and otherwise degraded areas, which are of low agricultural productivity, for restoration revegetation attention.
- Investigate the use of long-lived wattle and sheoak vegetation as nitrogen-fixing soil stabilisers in and along shallow surface water drainage lines. This system is predicted to use water, provide habitat and wind protection, and add nitrogen to support rather than impede adjacent crops and pastures. Suitable species include jam wattle *Acacia acuminata*, coast wattle *Acacia cyclops*, rock wattle *Acacia lasiocalyx*, rock sheoak *Allocasuarina hugeliana*, tamma *Allocasuarina campestris*, and swamp sheoak *Casuarina obesa*.

Theme 6. Assistance to scope and implement planned works

- Funding support for a focused project to evaluate the implementation of the GHD (1990) and Hopkinson (2001) studies. An evaluation project of previous investments may find improved uptake with catchment landowners. Use the information to identify specific gaps and further works needed.
- Develop a financially and practically attractive remnant fencing and revegetation works funding package specifically for Coobidge Creek Catchment landowners.
- Funding support for planning and design of earthworks and restoration works, and for restoration works including revegetation, for solutions agreed for mitigating the erosion damage to Coobidge Creek below the culvert on South Coast Highway, as part of implementing the GHD (2021) option/s.
- Funding for monitoring and evaluation of the health of the salt lake/playa system in the upper catchment, and the lower outflow wetland system of Lakes Kubitch, Carbul and Gidong.
- A finessed extension support program to encourage and incentivise landowners to be involved.

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Introduction

This project will design a long-term management plan to restore Coobidge Creek, which flows into an unnamed swamp in the wetland system that includes Lake Kubitch, Lake Carbal and Lake Gidong (Figure 1). This wetland system sits to the immediate west of Lake Gore - a Ramsar listed wetland west of Esperance (Figure 2; Figure 3 Hopkinson 2001).

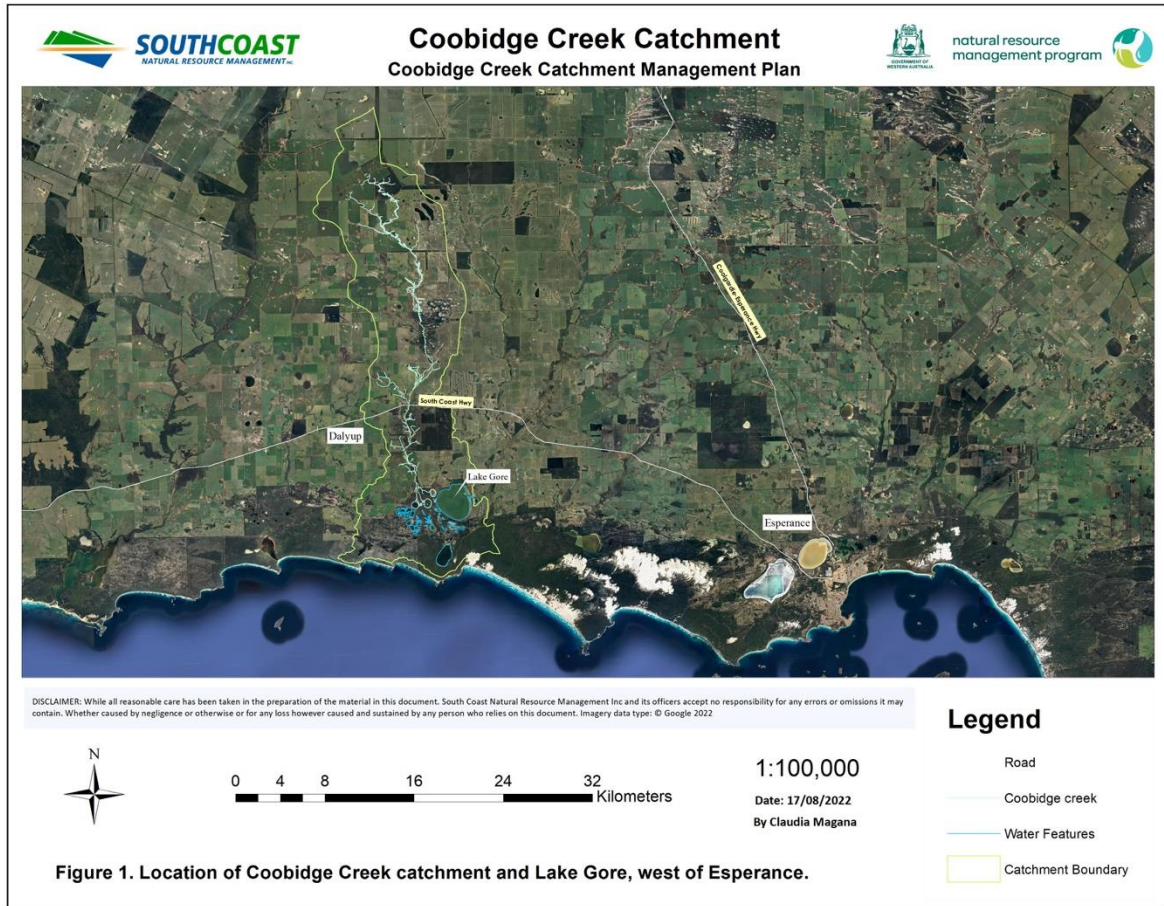


Figure 1. Location of Coobidge Creek Catchment and Lake Gore west of Esperance

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The plan is designed for use by the catchment farmers to conduct appropriate on-ground actions on the creek and surrounding catchment with co-invested resources and to leverage potential future funding.

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Approach to catchment management and restoration

This catchment management plan is formed from its dual objectives, based on the input and knowledge of landowners and managers, and guided by previous knowledge and the design of catchment plans for drainage systems in the Esperance area of Western Australia (Froend and van der Moezel 1990; GHD 1990; Hopkinson 2001; GHD 2021)). It also takes lead from the management plan for the adjacent coastal national parks and nature reserves (DPAW 2016), including Ramsar Wetlands, which are wetlands of international significance and protected under Treaty arrangements with other countries for the conservation of the habitats of migratory waterbirds.

The input by landowners, managers and other stakeholders is from the results of the consultation process undertaken during May and June 2022. Stakeholders provided input as their goals, case studies, evidence from impact sites and experiences, remnant vegetation protection, riparian vegetation conservation and restoration, fencing initiatives, earthworks designs, and collaborations for mitigation works.

Intentions for the future of Coobidge Creek

The principle stakeholders of Coobidge Creek catchment are the landowners of farming properties along the catchment, and the managers of public lands primarily conservation lands and waters at the discharge end of Coobidge Creek.

Based upon input from consultation discussions, the goals for the landowners for the health of Coobidge Creek and the protection of their land, biodiversity and water assets are:

- Re-establish the Coobidge Creek channel immediately south of South Coast Highway, where the flood removed large amounts of sand and deposited it in the creek bed further south.
- Alongside the re-established channel, bund with clay from channel earthworks, batter the eroded sand edge to the bund, and revegetate the repaired riparian area with locally native vegetation suitable for wetland and riparian areas.
- Investigate and trial brush mulching and other revegetation techniques that use locally sourced native vegetative material to restore damaged and repaired riparian areas.
- Establish locally native vegetation suitable for wetland and riparian areas along all flood damaged parts of Coobidge Creek.
- Establish locally native vegetation suitable for wetland and riparian areas along drainages and associated lowlands, wetlands and other waterlogged sites that flow into Coobidge Creek.

The vision for the managers of conservation lands, including Lakes Kubitch, Carbal and Gidong as nationally listed wetlands and adjacent Lake Gore as an internationally and nationally listed wetland, can be found in the Esperance and Recherche Parks and Reserves

Management Plan (DPAW 2016). The general vision for the Parks and Reserves is: The planning area will remain a place of high natural beauty and biodiversity where south-western and arid inter-zonal environments, island refugial habitats, internationally and nationally significant wetlands, and threatened and conservation significant flora, fauna and ecological communities will be conserved and enhanced. There will be an improved understanding of the values, threats and their impacts across the planning area. The planning area will remain a place of significant cultural value, requiring protection, appreciation and respect.

The planning area will continue to be a place where people can enjoy, learn and gain an appreciation of the natural, cultural, wilderness and recreation values, and participate in the protection and conservation of these values for present and future generations through cooperative management and community involvement.

Restoration of the natural elements as vegetation and channel dynamics of the Coobidge Creek system will enhance its ability to perform as a habitat, flood mitigation and water quality improvement measures, as well as amenity and land value improvements.

Southern Prospects values

The second objective of this catchment management plan is that all recommendations are consistent with Southern Prospects regional strategy and the goals of participating farmers.

[Southern Prospects 2019 – 2024](#) (South Coast NRM 2019) is the South Coast Regional Strategy for Natural Resource Management. It is a strategic plan that builds upon four earlier versions, the most recent being Southern Prospects 2011 – 2016, in setting priorities for action and identifying pathways for responding to more enduring long-term challenges. The strategy addresses natural resources across six themes: Regional Capacity, Land, Biodiversity, Water, Coastal and Marine, and Cultural Heritage.

The themes that relate directly to this Coobidge Creek Catchment Management Plan, as a response to the impacts of the 2017 flood, are Land, Biodiversity and Water.

Land Theme

The Land Theme Aspiration is Improved and protected land resources through sustainable land use, matched to land capability. It has six Outcomes, of which Outcome 3 relates specifically: Land degradation is reduced through effective on-ground works for soil health.

The relevant Key Action for Outcome 3 is Support on-ground activities to ameliorate identified soil threats. The soil health or condition indicators includes soil erosion by water and wind.

Biodiversity Theme

The Biodiversity Theme Aspiration is Natural ecosystems, habitats and landscapes support viable and strongly resilient populations of native species and communities. It has eight Outcomes, of which Outcome 2 Demonstrate improved biodiversity outcomes; Outcome 4 Threatened and significant species, communities and habitats are protected; and Outcome 5 The area of land restored or protected is increased, are directly relevant.

Water Theme

The Water Theme Aspiration is South Coast rivers, estuaries, wetlands and water resources are recognised as precious and are maintained, protected and/or restored with social cultural, economic and ecological values. It has six Outcomes, of which three are directly relevant: Outcome 3 The condition of impacted and degraded waterways is improved; Outcome 4 Low impacted and pristine waterways are protected; and Outcome 5 Ramsar Wetlands are protected.

Previous studies

Four previous studies of Coobidge Creek, undertaken following floods in 1989 and 2017, provide background and guidance for this 2022 catchment management plan.

GHD (1990)

Following a severe flooding in winter 1989, the then Department of Agriculture and the Esperance Land Conservation District Coobidge Creek Catchment Group commissioned a study of drainage and the development of a drainage plan for the Coobidge Creek Catchment. The study was undertaken by Gutteridge Haskins and Davey Pty Ltd (GHD) (GHD 1990).

The GHD study and catchment drainage plan was to address four main points:

1. A plan of proposed drainage lines
2. Use RORB or other appropriate model to determine the effect on flow volumes and peak flows of implementing drainage practices and erosion control works in the upper catchment.
3. Determine areas and volumes of the larger lakes, their potential for use as retention basins, and if used for this purpose, their effect on downstream peak flows.
4. Provide estimates of cross-sectional areas required for the main drainage channels for ten and twenty-year rainfall.

The recommendations of the study that relate to Coobidge Creek were:

1. The upper catchment of the Coobidge Creek catchment group area should be drained to the Lort River where possible.
2. Main creeks should not be straightened to remove meanders.
3. Main creeks should not be confined by levees to flow within the creek channel but allowed to overflow naturally onto the flood plain.
4. Existing creek lines should be fenced off and encourage to revegetate.
5. Natural swamps should not be drained but retained to provide flood storage to attenuate peak flows and therefore reduce water erosion.
6. The feasibility of providing some additional above ground flood storage at swamps should be investigated.
7. The feasibility of providing piped outflows from swamps to provide additional flood storage should be investigated.
8. Gullies formed by water erosion should be fenced off and revegetated to form stable waterways.
9. Discussions should be held with the Department of Conservation and Land Management (CALM) to investigate the possibility of improving drainage from

Coobidge Creek/Dalyup River and Coomalbidgup Creek through CALM reserves to Barker Inlet.

10. The extent and severity of water related land degradation problem within the Catchment Group area be monitored and recorded on an annual basis, so the cost of inundation, waterlogging, erosion and salinity can be estimated.

In hindsight, some of the recommendations would now be considered adverse to effective land and conservation management, including potential impacts on the wetland system of international importance into which Coobidge Creek flows.

Froend and van der Moezel (1990)

The 1989 flood also concerned the then Water Authority of WA and the Department of Conservation and Land Management for the longer-term damage to the Coobidge Creek catchment. As such they commissioned a study to classify the catchment wetlands and report on responses to prolonged flooding (Froend and van der Moezel 1990).

The Froend and van der Moezel (1990) study categorised the wetlands according to the Semeniuk wetland classification system, with water quality playing a defining role in the classification of the different wetlands.

The study found that large areas of the catchment had been cleared and that many wetlands have little or no surrounding native vegetation, or native vegetation damaged by stock, and that algal blooms were evident at several of these wetlands, indicating the importance of native vegetation and the removal of stock in preventing degradation. They also found that several wetlands had been rehabilitated and fenced by landowners.

The study found that only two areas of the catchment had wetlands of conservation value, being the playa lakes in the east and the coastal wetlands south of south Coast Highway. They found that the playa lakes were surrounded by large areas of diverse vegetation and the best example of remnant vegetation and fauna habitat in the upper reaches of the catchment. It also found that the coastal wetlands were an intricate system through extensive sandplain and coastal vegetation, much of which was flooded. The study concluded that flooding continued to occur and water from the catchment increases in salinity, then the coastal areas extending to Barker Inlet are at risk of being severely degraded.

Hopkinson (2001)

In 2001 respected south coast waterway authority Kevin Hopkinson completed the management study of the Lake Gore and Coobidge Creek system for Greenskills and then Water and Rivers Commission (Hopkinson 2001). The study was designed to focus on catchment areas and suites of wetlands identified as regionally significant by Ecologia (1999), which was part of the Water and Rivers Commission initiated survey and evaluation of the wetlands of the south coast region from Walpole to Esperance (Hopkinson 2001). The aim of Hopkinson (2001) was to assist the community to develop and implement wetland management plans that integrate into existing catchment activities for those outstanding wetlands identified by Ecologia (1999) (Hopkinson 2001).

Lake Gore and its associated wetlands complex and the Coobidge Creek catchment were included because (Hopkinson 2001):

1. They are locally outstanding and regionally, nationally and internationally significant;
2. They are threatened or at risk; and
3. The opportunity was available to work with the community and other agencies (the then Agriculture WA and CALM) to incorporate wetland management into farm and catchment planning activities.

The work of Hopkinson (2001) provides a foundation for this 2022 Coobidge Creek Catchment Management Plan, in developing management recommendations to protect the health of the catchment and its terminating wetlands from contemporary threats.

The Hopkinson (2001) management plan includes a table of recommended activities as an action plan. The recommendations of this current plan and their implementation continues the efforts of the solutions described by the Action Plan, building on this prior investment.

Table 1. Hopkinson (2001) Recommended Activities Action Plan

Loc No	Description	Works Required	Priority
1	Lower reach of creek that braids across broad floodplain. Most vegetation in A grade condition	Complete fencing to north of fringing vegetation surrounding lakes	High – to be completed during 2002
1434	Badly eroded section along west bank of creek from 1999/2000 floods	Area is fenced and requires riparian fringe planting	High – to be completed progressively from 2001 on
1435	West bank of creek unfenced and under pressure from cattle	Separate the floodplain area from other paddock with fencing along creek channel and manage as a separate land unit	High
1495	Broad flat area draining into wetland (above) needs shallow 'w' drains to enhance runoff, prevent waterlogging and direct fresh water into wetland	Survey area, construct 'w' drains into the wetland basin	Medium
1495	Broad flat area draining into wetland (above) needs shallow 'w' drains to enhance runoff, prevent waterlogging and direct fresh water into wetland	Survey area, construct 'w' drains into the wetland basin	Medium
1497	Western bank of creek is fenced and carefully managed as a floodplain paddock. Eastern side of channel needs similar management	Fence wetland flats on south eastern section to separate floodplain from other paddocks	Medium
1497	Wetland chain extending from large remnant vegetation block adjoining this location needs rehabilitation.	These wetlands have been recently fenced and are being gradually revegetated around the fringe to compliment the natural regeneration that is occurring	Medium-ongoing 2002
1497	Wetland fencing and revegetation may impact on groundwater levels as vegetation and regrowth becomes established	Drill a series of observation bores across the wetland landscape for regular monitoring by landholder.	Medium-to be completed 2002
1496	Creek channel more defined, 75% of channel fenced, including double fencing on northern third of channel	Complete creek fencing	High

25	Large waterlogged area becoming bare when dry, with scalding appearing	Fence and revegetate area to protect bare ground and utilise more water	Medium -Project to be undertaken during 2002
1821	Bare scalded ground at top of creek line	Fully enclose in fencing and revegetate	Medium

GHD (2021)

The February 2017 flood prompted South Coast NRM Inc to commission the Esperance Culvert Rehabilitation assessment (GHD 2021). The assessment investigated engineering and management options for Coobidge Creek immediately downstream of South Coast Highway culvert, where severe erosion had damaged the creek bed, which may lead to impacts on the Ramsar listed and otherwise important wetlands into which Coobidge Creek flows. The assessment report was also developed as a basis from which to apply for Natural Resource Management grants for further detailed studies and rehabilitation of the damaged creek, it recommended three management/rehabilitation options:

1. Installation of a flow diversion bund encouraging the creek to re-occupy the abandoned pre-flood channel. To be successful, this would require infilling of the post-flood channel, significant widening of the pre-flood channel and removal of riparian vegetation to prevent future avulsion.
2. Stabilisation of the post-flood avulsion channel. This would accommodate the majority of flood flows, but the natural adjustability of the channel would be compromised by the installation of the right bank protection and the naturally resistant bed materials. Flow velocities and erosivity are likely to increase, and increased erosion of downstream reaches is likely. Imported material is likely to be required to stabilise the right bank.
3. the creation of a broad, quasi-stable channel through the removal of some of the pre-flood riparian corridor and 'soft' engineered stabilisation of the avulsion channel. *This is GHD's preferred option as it would allow the natural character, morphology and geomorphic functioning of the creek to be re-established.* This option unusually recommends the removal of part of the mature pre-flood riparian corridor, in order to accommodate the full range of anticipated flood flows and to remove acute meander bends downstream of the resistant sediment bar. The removal of existing vegetation would be offset by the establishment of a full riparian corridor along both banks and in-channel vegetation. The channel would be designed to allow net throughput of sediment once fully established (i.e. no significant erosion or deposition within reach).

Further, it recommended that the short section of the creek just downstream of the culvert is modified by infilling the scour hole, cutting a notch in the resistant bar and stabilising the banks to limit widening. Bank protection and riprap inclusion were also included for the treatment of the culvert outflow.

GHD recommended option 3. However, this would require native vegetation clearing permission, and a social licence given the proximity to the highway and the view of the site afforded to the passing community. As such, Option 3 is considered to be unrealistic, and Option 2 a more widely acceptable and achievable solution (Department of Primary Industry and Regional Development).

Benefits and functions of vegetation

The problems faced by the Coobidge Creek catchment and other catchments in predominantly agricultural landscapes, relates to imbalances in landform surface dynamics involving the effects of water, chemicals and air. Nature's way of resolving the conflicts and opportunities between the forces of geology, climate, weather, rocks, soils, oxidation,

salinity, waterlogging, water and soil movement, wind and biotic forces is native plants and their natural landform-matched assemblages as vegetation.

The native vegetation of an old and isolated south west of Australia, where the last soil building processes occurred millions of years ago, and during those millions of years incessant sea breezes have brought salt inland, and made only reworked and nutrient impoverished soils, in a continuously drying climate, with oceans and deserts separating plants and animals from relatives, has caused a unique set of native plants and the vegetation units they form to evolve (Hopper 2009; McQuoid 2014).

Native vegetation provides a large range of benefits and services to manage the landscape in the face of range and enormity of natural forces, from water and wind erosion, profound soil variability, nutrient availability and scarcity, fresh and saline water, and drought, fire and flood impacts. At the same time, it provides habitat as food and shelter for a huge variety of animals, fungi (some which it has co-evolved to develop symbiotic relationships) and many other plants. Protection of existing native vegetation, restoration of degraded native vegetation and the revegetation of degraded lands with site suitable locally native vegetation will sustain the landscape and those organisms it shares that with, and mitigate the impacts of damaging natural forces.

Legal responsibilities

Clearing of native vegetation in Coobidge Creek south of South Coast Highway would require a permit to clear as it is either in or adjacent to an environmentally sensitive area (DWER 2022). Further, the area immediately downstream from the bridge on South Coast Highway has been the subject of a withdrawn clearing permit application (DWER 2022), and it is visible from south Coast Highway and therefore subject to public scrutiny.

Coobidge Creek is not a proclaimed waterway under the Waterways Act 1914 (DWER 2020; DPIRD Pers comm.), and is private property, as such, rechannelling or other works would not require approval.

Monitoring and evaluation

Monitoring is the regular gathering of information in a consistent manner. It may be to keep track of and observe the progress of a project or program. Environmental monitoring is a valuable tool to determine whether the condition of a resource is stable, improving or declining (South Coast NRM 2019).

Evaluation is the systematic review of a program, project, strategy or other activity to determine whether it is working as intended, what impacts it is producing, whether it is being implemented cost-effectively, and the reasons why it is producing the identified impacts. Evaluation involves collecting and analysing information to make judgements and recommendations for future action (South Coast NRM 2019).

Evaluation of restoration including revegetation activities is vital to assessing the environmental and investment values of the effort. Evaluation is guided by the monitoring of the activity, which in the case of Coobidge Creek would be for works recommended as implemented, including :

- Photo-point from a range of fixed points aimed at revegetation sites and places in wetlands and creek beds to assess change over time;
- Counting and recording of native plants over time from both revegetation activities and natural revegetation to assess growth, coverage and soil stabilisation;
- Bird observation and counts in selected habitats including bushland remnants waterways and wetlands to assess bird diversity and use;
- Coobidge Creek bed and sides from the South Coast Highway bridge;
- Observation of selected sand slugs in the creek bed to assess sediment movement and stabilisation trends over time; and,
- Water quality monitoring at key sites following DWER water monitoring guidelines.

Evaluation of the efforts of previous studies is important in supporting and designing the recommendations of this plan. This would develop an understanding of the uptake and benefits resulting from the work implemented and build upon the prior investment.

Characteristics of Coobidge Creek

Coobidge Creek Catchment has significant land, biodiversity and water values all worthy of protection and in some cases restoration.

- Land values are prime agricultural lands for cropping and grazing.
- Biodiversity values are remnant bushland habitats, aquatic habitats and organisms, wetlands including Ramsar listed wetlands, native animals and plants, and recreational nature and fisheries values.
- Waterways and wetlands as natural water and nutrient filters and depositories.
- Aesthetic values of the Coobidge Valley landscape as landforms, hills and valleys, creek and wetland basins, natural vegetation, water bodies and farm-scapes.

Coobidge Creek location, community and overview

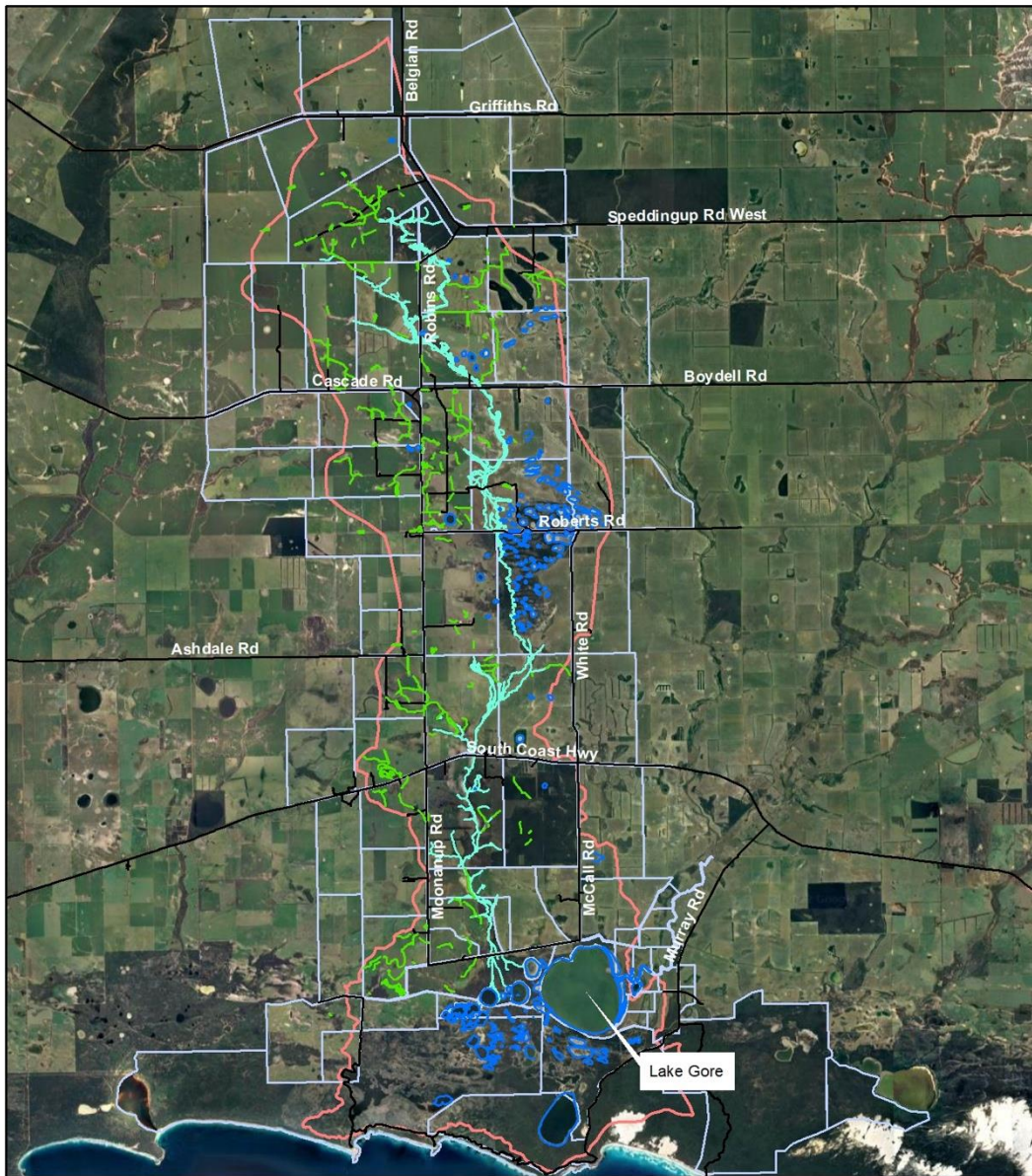
Coobidge Creek is located around 40 km west of Esperance (Figure 1), its catchment above its wetland endpoint covers approximately 20,700 ha. Coobidge Creek flows south through primarily private property and some nature reserve over a distance of around 30 km from headwaters some 25 km west of Speddingup, to drain into an unnamed swamp near Lake Kubitch, which along with the adjacent Lake Carbul and Lake Gidong and associated linking swamps, form part of the subcoastal Lake Gore wetland complex (Figure 2; Hopkinson 2001; DPAW 2016). Lake Gore is a Ramsar listed wetland, being of international importance for migrating wading birds (DPAW 2016).

The Coobidge Creek area's climate is Mediterranean with cool wet winters and warm to hot and dry summers. Annual rainfall at Esperance is around 620 mm, with summer rainfall typically infrequent, although it can be heavy as the February 2017 event exemplified, the result of thunderstorms and the passing of low-pressure systems carrying tropical moisture including the remnants of tropical cyclones (Hopkinson 2001).

The majority of Coobidge Creek and its fringing natural vegetation on private land is well protected through fencing by landowners, in many cases via access to publicly funded fencing programs. Some sections of Coobidge Creek and associated remnant vegetation in the catchment is not protected by fencing (Hopkinson 2001).

The majority of Coobidge Creek catchment is private land, which is used primarily for agriculture as cropping and livestock production. The community of the catchment is therefore almost wholly agricultural in character and enterprise. Cropping agriculture is the dominant land use, with winter growing season oilseed and cereal crops typically sown in late Autumn and harvested in late spring to early summer. Livestock production is principally sheep and cattle grazing on annual pastures (T Murray, R Marold, K Scott pers. comm.).

The catchment suffered impacts to land, creek line integrity, biodiversity and water quality due to a heavy rainfall event in February 2017 (K Fletcher South Coast NRM pers. comm.). This heavy rain caused sever erosion and sedimentation in parts of the catchment, which now require repair to limit further damage and loss of economic and natural values.



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Imagery data type: © Google 2022

Legend

- Lake
- Drainage
- Road
- Coobidge creek
- Property boundaries
- Catchment Boundary



0 1.5 3 6 9 12 Kilometers

1:210,000

Date: 18/08/2022

By Claudia Magana

Figure 2. Coobidge Creek Catchment and the Ramsar listed Lake Gore

Figure 2. Coobidge Creek Catchment and the Ramsar listed Lake Gore

Geology, landforms, soils and hydrology

The geology of Coobidge Creek is underlain by the igneous bedrock of the Paleoproterozoic Albany Fraser Oregon, which is close to its edge in the district with the older Archaean Yilgarn Craton. Sedimentary rocks overlay the igneous bedrock, and comprise Eocene deposited limestone and spongolite (DPAW 2016; Myers and Hocking 1998).

The geology and landforms of Coobidge Creek are expertly explained in ideal detail by Hopkinson in his Lake Gore Wetlands Management Plan (2001). The explanation includes the underlying geological reasons for the form and type of the Creek, its catchment and wetland features. This excellent explanation is reproduced here:

Antarctica began to break away from Australia 135 million years ago resulting in the sagging of the continental shelf area. Fluctuating sea levels over the following 60 million years resulted in the deposition of material that formed the Bremer Basin. This basin extends right along the South Coast and well offshore into the present sea bed.

The tertiary sediments that have since filled the Bremer basin region consist of sands overlying material known as the Plantagenet group. This group consists of material from two origins – the lower lying Werillup formation and the overlying Pallinup siltstone.

The Werillup formation consists of dark clays, coarse sands, siltstone, lignite (coal) and sandstones and has infilled low lying drainage depressions and channels in the underlying ancient bedrock.

The Pallinup siltstone was formed during a shallow marine environment and consists of siltstones, sandstones and spongolite.

The Pallinup siltstone sits higher in the landscape and may overly either the Werillup formation or lay directly over the basement bedrock

About 30 million years ago the Darling Plateau began to be uplifted, resulting in the Southern Coastline tilting towards the south and forming the extensive Ravensthorpe Ramp. The tilting of the ramp initiated the southward drainage that is seen in the near coastal region today. Eroded coastal sediments were transported inland to form sand sheets and dunes. Continued wind and wave action during the last geological period up to 2 million years ago has led to deposition of coastal sand dunes and development of the inland sandplain. (Keen 1992).

Deposits of river borne (alluvial) material at the lower reaches of old rivers such as the Coobidge has formed impermeable layers on the plains at the termination of the southward flowing rivers, where the coastal dunes have formed a barrier between the rivers and the sea. This has led to the creation of extensive areas of wetlands, including the chains of lakes found in the Gore, Mortijinup, and Warden systems (Ecologia 1999).

The chain of lakes in the mid Coobidge catchment have formed over a full tertiary profile, where Werillup sediments have filled an ancient drainage channel in the granite bedrock, and Pallinup siltstone has been deposited over this. Slumping of material in these sediments have led to the formation of the basins that created the chains of wetlands seen in the area today. Underground processes and the action of the wind have formed other basin wetlands in the inland sandplain region. Leaching of carbonates in Pallinup siltstones has caused collapsing of sediments and led to localised slumping. Wind blowing across the sandplain has scoured surface sand from these depressions and other flat lying terrain, enhancing the basins and exposing clays and forming claypans common to much of the sandplain area.

The hydrology of the majority of the Coobidge Creek catchment is determined by the landforms described above and the soils that overlie them as weathering and depositional products. The soils of the mid and upper catchment are dominated by the Esperance Land System. These soils are mostly duplex, as layers of sand over deeper layers of clay. The sand allows water infiltration, while the clay impedes infiltration, the sand horizon can fill quickly and lead to waterlogging (Hopkinson 2001; Simons 2000). Soil erosion and deposition downstream occurs when heavy rainfall causes significant runoff, including the February 2017 event.

Wetlands, waterways and conservation reserves

At the southern outflow of Coobidge Creek, Lakes Carbul, Kubitch and Gidong, and unnamed lakes to the south west are unvested unallocated Crown land mostly surrounded by private property, save for part of a shared boundary with Warrenup Lakes Nature Reserve to the south, Lake Gore is vested as Nature Reserve (DPAW 2016).

Kateup Creek in the headwaters of the Coobidge Creek system, flows through West Speddingup Nature Reserve (Reserve No. 36183), which covers 357.5 ha (DPAW 2016; Hopkinson 2001.)

The Esperance and Recherche Parks and Reserves Management Plan (DPAW 2016) recognises the wetland complex of the lower Coobidge Creek, associated swamps and wetlands, Lake Carbul, Lake Gidong and Lake Kubitch, as Nationally Important Wetlands and the Lakes additionally as Important Bird Areas (Figure 3). It proposes that Lakes Carbul, Kubitch and Gidong and the unnamed lakes be added to Lake Gore Nature Reserve, and that the greater reserve be added to the existing Lake Gore only Ramsar site. It states: *Reservation as an 'A' class nature reserve dates back to the CTRC (1974) 'greenbook' and EPA (1976) 'red book'. These lakes are part of the Lake Gore hydrological system and are included as part of the nationally important Lake Gore wetland system and have the potential to be added to the Ramsar site. The lakes are also where the hooded plover (Priority 4) has been sighted regularly in numbers of 20 or more at a time. The lakes form part of the South Coast Macro Corridor providing a link from Warrenup Lakes Nature Reserve to Lake Gore Nature Reserve. In addition, the threatened curlew sandpiper and four bird species listed as specially protected in Western Australia and protected under international agreements have been recorded here.*

The chain of saline lakes that form an isolated inland wetland complex alongside Coobidge Creek near the centre of the catchment are a significant ecological feature. These lakes are privately owned and cover an area of almost 1000 ha, this significant natural area of remnant native vegetation, wetlands and waterway, is fenced from stock and forms a key protective asset for both ecological and land values (Hopkinson 2001).

Coobidge Creek is an important ecological corridor between nature reserves near the top of the catchment, the wetlands at the centre of the catchment and the conservation reserves near and on the coast at the end of the drainage system.

Condition

The Coobidge Creek catchment area that drains into the wetland system covers approximately 20,700 ha, with around 5% of native vegetation remaining (Gee and Simons in Hopkinson 2001). The 1000 ha of protected private remnant vegetation, waterway and

wetland systems, the proposed wetland nature reserves at the end of the catchment, the West Speddingup Nature Reserve at the top of the catchment, and the fenced private remnants in the remainder of the catchment contribute to enhancing the overall condition of the catchment.

The condition of the Creek and the wetlands into which it drains and forms an ecological part of, is driven by the health of the protective ability of vegetation along the waterway and its tributaries and out across the catchment where it regulates water flow, water table balance, salinity and water logging, and wind erosion.

Hopkinson (2001) found that the main Coobidge Creek is largely protected, around 82%, by fencing of the creek's main channel and associated remnants. This protection includes the chain of wetlands near the centre of the catchment, which covers an area of around 1000 ha. The condition of the majority of the creek and tributary channels and associated remnants is mostly good, as observed during 2022. However, the section immediately below South Coast Highway bridge is severely eroded, having been impacted by the February 2017 flood, which can be observed from the bridge crossing and stands as a reminder of the damage that floods can cause and the need for catchment protection and restoration. The flood removed large amounts of sand, from the sandy landform on the west side, filled in the channel and deposited the sand a few kilometres downstream (K Scott pers comm.). The native vegetation is slowly returning to the creek side, although the sand landform remains damaged and the system here is in poor condition and requires significant restoration.

Threats to the condition of Coobidge Creek are primarily those that damage by movement the landforms, soils, sediments, and that damage native vegetation and its values as an energy filter, soil and water table stabiliser, water quality enhancer, and habitat shelter and food provider. The condition of the catchment is largely tied to the amount, arrangement, types and condition of its native vegetation, need/role for quality native vegetation

The types and distribution of native vegetation is a factor in condition and function as it relates to landscape position and landform type. Plants and the vegetation types they comprise, particularly those of in an old landscape like the south west of Australia, vary in their ability to withstand disturbance depending on the dynamic stability of the landform or landscape position they occupy. Those plants and vegetation types that naturally occur in watercourses and wetlands are able to withstand disturbance by soil or water movement and nutrient fluxes compared to those of more stable sand and gravel rises. This phenomenon has been the subject of recent recognition and research as Ocbil Theory (Hopper 2009; Hopper et al 2020), and the recognition of the disturbance tolerance and even preference attributes of watercourse and wetland vegetation is an important consideration for the conservation and restoration of these systems.

Vegetation and flora

Vegetation types of the catchment include the following types, as observed by the author during travels in the catchment:

- Tall woodlands dominated by Swamp yate (*Eucalyptus occidentalis*) trees, most often in watercourses and in fresher wetlands (swamps).
- Mallet woodlands of *Eucalyptus densa*, *E. platypus* and *E. dielsii* in small patches in the upper catchment.

- Mixed mallee and mallee woodlands of *Eucalyptus forrestiana*, *E. platyphloea*, *E. flocktoniae* and *E. kessellii* over mixed shrubland of *Melaleuca* spp., *Callitris* spp., and *Grevillea* spp., on calcareous plains of the upper catchment.
- Low woodlands dominated by Paperbark (*Melaleuca cuticularis*, *M. brevifolia*) over sedge *Gahnia trifida* in more saline wetlands and drainages.
- Mallee shrublands of mixed mallee including *Eucalyptus pleurocarpa*, *E. litorea*, *E. pluricaulis*, *E. phaenophylla* and *E. uncinata*.
- Tall Kwongkan dominated by *Banksia speciosa* on deep yellow sands.
- Mallee over kwongkan dominated by *Eucalyptus pleurocarpa*, *Banksia nutans*, *B. armata*, *B. cirsioides*, *B. repens* on duplex sandy clay over gravel.
- Kwongkan dominated by *Hakea cinerea*, *Lambertia inermis*, *Banksia pilostylis*, *B. pulchella*, *Melaleuca pulchella*, *Eucalyptus tetraptera* on slightly saline sandy clay.
- Wattle dominated shrublands of *Acacia cyclops*, *A. saligna*, *A. rostellifera* and *Eucalyptus angulosa* on coastal quaternary dunes and limestones.
- Shrubland and heath of *Calothamnus quadrifidus*, *Aster tetragonus*, *Spartochloa scirpoidea* on stony granite rises.
- Salt marshes of samphire *Tecticornia* spp., *Frankenia* sp., and saltbush *Atriplex* spp. on saline clay flats and in watercourses.

Fauna

Knowledge of the fauna of the catchment is dominated by studies and observations of waterbirds and waders in Lake Kubitch and adjacent lakes and wetlands at the bottom of the catchment. These lakes and wetlands are listed as of national importance to waterbirds and waders, and are recommended to be included in the Ramsar listing of Lake Gore in recognition of their importance (DPAW 2016; Hopkinson 2001).

Little is known of the fauna of the catchment away from the terminating lake and wetland system as no studies or observations are known to exist. Notwithstanding, the catchment does have a range of vegetation types, landforms and natural habitats, some of significant size and mostly on private land, which are of great value to native fauna, and for which further investigation is warranted. Observations in the catchment in May and June 2022 by the author include White-faced heron *Ardea novaehollandiae*, Mountain duck *Tadorna tadornoides*, Wood duck *Chenonetta jubata*, Grey teal *Anas gracilis*, Chestnut teal *Anas castanea*, Pacific black duck *Anas superciliosa*, Willie wagtail *Rhipidura leucophrys*, Grey fantail *Rhipidura fuliginosa*, Carnaby's black cockatoo (threatened) *Calyptorhynchus latirostris*, Mallee ringneck parrot *Barnardius zonarius*, Red-capped parrot *Platycercus spurius*, Magpie *Cracticus tibicen*, Magpie Lark *Grallina cyanoleuca*, New Holland honeyeater *Phylidonyris novaehollandiae*, Black-faced cuckoo shrike *Coracina novaehollandiae*. In addition, Chuditch *Dasyuris geoffroyi*, pigmy possum *Cercartetus concinnus* and Dunnart *Sminthopsis* sp. have been observed nearby (K Scott pers. comm.).

Fauna habitat stands to benefit from remnant vegetation protection and restoration works, which will enhance local habitats near works undertaken, as well as downstream and flow-on effects of erosion mitigation and water quality improvement, particularly in the habitat critical wetland system at the outflow that includes lakes Kubitch, Carbul and Gidong as part of the Ramsar listed Lake Gore system.

Aboriginal heritage

The Aboriginal heritage of Coobidge Creek is unknown. However, it is known and accepted that Noongar people lived along and used drainage systems as primary cultural places (D

Guilfoyle pers. comm.), and that Coobidge Creek and its terminating wetlands suite is likely to have been and remain significant. The adjacent Lort River (Benwenerup) drainage is part of a long-term plan by the Esperance Tjaltjraak Native Title Aboriginal Corporation's initiative to develop traditional owner management to public lands along the Benwenerup catchment from Peak Charles National Park to Stokes National Park on the coast. An investigation into the historic cultural use of Coobidge Creek is warranted, to add to the developing knowledge base of the Noongar history of the Esperance region.

Community concerns

The major community concerns for the majority of the catchment is the repair and mitigation of erosion caused by flood damage in February 2017, and the protection of farmland and natural lands from further damage by floods.

Surface water management, as it relates to the value of agricultural lands, is also an important consideration by farming landowners in the catchment.

The conservation of natural habitat values is important, particularly in the wetlands at the termination of the catchment in the context of these being nationally recognised bird habitats and recommended for inclusion in the Lake Gore international Ramsar listing. The impacts on these lakes and wetlands and their mitigation was the instigation of Hopkins (2001) and its investigation and recommendations for management actions. Notwithstanding, the habitats as wetlands and native vegetation in the natural lands of the entire catchment are of significance to the community, and their conservation and protection from flood and other impacts is recognised as a priority.

Community consultation – method and key themes

The Coobidge Creek catchment landowner community was contacted by letter (Appendix 1) and followed up by email during May 2022), with subsequent property visits in early June 2022. The letter and emails introduced and outlined the flood damage issue and the catchment plan objectives and development process, sought input to the development of mitigation measures, and invited participation in the planning process.

Other stakeholders from related State Government agencies were contacted by email, with follow-up interviews similar to landowners, where the project was introduced and outlined and input invited.

The objectives for the catchment management plan are:

1. A concise catchment management plan with maps, rudimentary farm designs, recommendations and future actions, for farmers to implement to mitigate erosion and sedimentation issues during short-lived high rainfall events.
2. *That the plan's recommendations* are consistent with Southern Prospects (biodiversity and soil health values) and goals of participating farmers.

A set of six questions were developed, and participating landowners and other stakeholders interviewed and questions discussed. The questions are:

1. What do you see as the main landscape, water management and environment/ catchment health issues needing attention in the catchment?
2. Where do you see these issues being, spatially – where in the catchment? Mark on maps provided.
3. How do you think the issues should be tackled/treated?
4. What activities do you already undertake on your property that you feel contribute to the health of the catchment?
5. What activities would you like to undertake on your property to support the health of the catchment?
6. What assistance or support would help you to carry out activities to improve the health of the catchment, which would be recommended in the catchment management plan?

The six questions relate to six themes, being:

7. The priority landscape, water and environmental health issues for attention.
8. Location of the priority issues in the landscape.
9. How to best approach or manage priority issues.
10. Initiatives and works already in place.
11. Initiatives and works to be scoped and implemented.
12. Assistance to scope and implement planned works.

The landowner and other stakeholder consultation responses according to theme were as follows:

Theme 1. Priority landscape, water and environmental health issues for attention

Stabilising and revegetating the watercourse and adjacent areas – which are anywhere where water will come off, where the volume and speed of flow is greatest.

Protecting vegetation beside Coobidge Creek and other watercourses.

More native vegetation in areas that are low value for agriculture, where its wet and in watercourses.

Coobidge Creek channel below the highway, needs reinstating and creek-side vegetation established.

Water management/flow from wet areas in paddocks to creek lines for discharge.

Salinity, waterlogging, sandy soil loss and sedimentation are problems; channels in creeks to improve flow.

Theme 2. Location of the issues in the landscape

Where the salt lake system is prominent at the centre of the catchment, and anywhere that sheds water. Low country that is not very productive.

Pasture paddocks where livestock are involved, cropping landholders not that keen on being close to the creek. Land values going up have pushed some to make the most of arable land, there's no incentive to put trees on valuable land.

In wet areas, alongside creek, in places not suitable for cropping or pasture.

Significant problem for Coobidge Creek is south of bridge on highway by the 2017 flood, where large amounts of sand were eroded and deposited downstream where the flow velocity dropped, it also filled in the river channel.

Floods will happen again. The creek upstream from the highway has its channel intact and all its riverside natural vegetation intact. This is missing from below the highway bridge and is an example to be replicated. Most yate trees planted below the bridge before the flood were lost in the flood, only some close to the bridge remain.

Waterlogging in paddocks in the catchment. Solved by the use of networks of shallow surface water management drains that take the water to creeks for discharge. Tree planting along major creek lines and areas unsuitable for cropping.

Most of the catchment is private property, therefore it's up to landowners to manage water and look after the creek and remnants.

Theme 3. How best to approach or manage priority issues

Get people to engage with the positives that come with from repairing the water damage and revegetation. Incentives that are larger and more honest – e.g. carbon as a durable and honest commodity in agriculture. Leadership by being involved in these sustainability solutions.

Cropping farmers are unlikely to fence. There would likely be more fencing take-up if programs were easily available to pay for fencing.

Vegetation establishment and fencing programs.

Reinstate the creek channel and creek and creek-side landform in Coobidge Creek below the highway. Revegetate and fence off the new creek side.

Create more shallow surface water drainages to mitigate waterlogged parts of paddocks, to the contour, directed into existing creek lines to use and carry water away. The shallow and low-profile surface drains do not erode and allow cropping and pasture to establish over, and do not require large machines nor hinder livestock or other farming operations.

Enhance creek channels in the vegetated tributaries of Coobidge Creek to carry water from surface drains from paddocks adjacent either side.

Establish more large dams, the order of 10,000 m³, to hold water drawn from surface water drainage system. Will augment existing large dams as large secure water supply.

Theme 4. Initiatives or works already in place

Fenced remnants and drainage lines, revegetated drainage lines. Developed some drains in the past. Water discharge now greater due to clearing is now drained by leaky pipes. Careful responses to land degradation a constant factor. Paperbark deaths in constantly wet inundated areas, and salinity has spread.

Lots of fencing historically. Drainage with slotted pipes to allow cropping over once damp places through subsoil drainage. Tree planting in the past, spotted gum and swamp yate. Best to leave remnants and the creek vegetation alone.

Existing network of shallow surface water drainages to mitigate waterlogged parts of paddocks, placed to contour, directed into existing creek lines and large dams to direct, use and store water. The shallow and low-profile surface drains do not erode and allow cropping and pasture to establish over, and do not require large machines nor hinder livestock or framing operations, they can also direct water into dam storages.

Tree plantings in the past alongside natural drainages and alongside paddocks. Tree plantings (planted in 2015) on Coobidge Creek south of highway washed away by February 2017 flood.

Theme 5. Initiatives and works to be scoped and implemented

Many properties, particularly in lower part of catchment have significant restoration and mitigation works in place.

Maintenance needed to sustain fencing of creek line remnants, including new fences to replace older failing fences.

Reinstate the creek channel and creek and creek-side landform in Coobidge Creek below the highway. Revegetate and fence off the new creek side to separate the paddock from the creek. This would reinstate a creek landform and natural vegetation like that which remains intact above the bridge on the highway, as the example to emulate or reform south of the highway to manage water flow.

Further shallow surface water drainages to mitigate waterlogged parts of paddocks, to the contour, directed into existing creek lines to use and carry water away. The shallow and low-profile surface drains do not erode and allow cropping and pasture to establish over, and do not require large machines nor hinder livestock or framing operations.

Enhance creek channels in the vegetated tributaries of Coobidge Creek to carry water from surface drains from paddocks adjacent either side.

Establish more large dams, the order of 10,000 m³, to hold water drawn from surface water drainage system. Will augment existing large dams as large secure water supply.

Fence unfenced remnants to protect them from stock damage.

Theme 6. Assistance to scope and implement planned works

Rate reduction or no rates on areas that make a larger or community contribution, such as coastal hills where sheep were run once upon a time.

Fencing materials and labour, so that all costs are covered.

Landowner and staff able and willing to undertake earthmoving works. Existing expertise in construction of shallow drainage system as a routine, a success for water management as part of cropping, pasture and stock management.

Assistance with fencing and tree provision would be welcome if it were available.

Additional Theme 7. Previous studies

GHD (1990) assessment

The GHD (1990) study and catchment drainage plan was to designed to address four main points:

1. A plan of proposed drainage lines
2. Use RORB or other appropriate model to determine the effect on flow volumes and peak flows of implementing drainage practices and erosion control works in the upper catchment.
3. Determine areas and volumes of the larger lakes, their potential for use as retention basins, and if used for this purpose, their effect on downstream peak flows.
4. Provide estimates of cross-sectional areas required for the main drainage channels for ten and twenty-year rainfall.

The recommendations of the study that relate to Coobidge Creek were:

1. The upper catchment of the Coobidge Creek catchment group area should be drained to the Lort River where possible.
2. Main creeks should not be straightened to remove meanders.
3. Main creeks should not be confined by levees to flow within the creek channel but allowed to overflow naturally onto the flood plain.
4. Existing creek lines should be fenced off and encourage to revegetate.
5. Natural swamps should not be drained but retained to provide flood storage to attenuate peak flows and therefore reduce water erosion.

6. The feasibility of providing some additional above ground flood storage at swamps should be investigated.
7. The feasibility of providing piped outflows from swamps to provide additional flood storage should be investigated.
8. Gullies formed by water erosion should be fenced off and revegetated to form stable waterways.
9. Discussions should be held with the Department of Conservation and Land Management (CALM) to investigate the possibility of improving drainage from Coobidge Creek/Dalyup River and Coomalbidgup Creek through CALM reserves to Barker Inlet.
10. The extent and severity of water related land degradation problem within the Catchment Group area be monitored and recorded on an annual basis, so the cost of inundation, waterlogging, erosion and salinity can be estimated.

Hopkinson report (2001) findings and recommendations

The Hopkinson (2001) study and its report included a set of recommended activities in a table as an action plan, as follows:

Loc No	Description	Works Required	Priority
1	Lower reach of creek that braids across broad floodplain. Most vegetation in A grade condition	Complete fencing to north of fringing vegetation surrounding lakes	High – to be completed during 2002
1434	Badly eroded section along west bank of creek from 1999/2000 floods	Area is fenced and requires riparian fringe planting	High – to be completed progressively from 2001 on
1435	West bank of creek unfenced and under pressure from cattle	Separate the floodplain area from other paddock with fencing along creek channel and manage as a separate land unit	High
1495	Broad flat area draining into wetland (above) needs shallow 'w' drains to enhance runoff, prevent waterlogging and direct fresh water into wetland	Survey area, construct 'w' drains into the wetland basin	Medium
1495	Broad flat area draining into wetland (above) needs shallow 'w' drains to enhance runoff, prevent waterlogging and direct fresh water into wetland	Survey area, construct 'w' drains into the wetland basin	Medium
1497	Western bank of creek is fenced and carefully managed as a floodplain paddock. Eastern side of channel needs similar management	Fence wetland flats on south eastern section to separate floodplain from other paddock	Medium
1497	Wetland chain extending from large remnant vegetation block adjoining this location needs rehabilitation.	These wetlands have been recently fenced and are being gradually revegetated around the fringe to compliment the natural regeneration that is occurring	Medium-ongoing 2002
1497	Wetland fencing and revegetation may impact on groundwater levels	Drill a series of observation bores across the wetland	Medium-to be completed 2002

	as vegetation and regrowth becomes established	landscape for regular monitoring by landholder.	
1496	Creek channel more defined, 75% of channel fenced, including double fencing on northern third of channel	Complete creek fencing	High
25	Large waterlogged area becoming bare when dry, with scalding appearing	Fence and revegetate area to protect bare ground and utilise more water	Medium -Project to be undertaken during 2002
1821	Bare scalded ground at top of creek line	Fully enclose in fencing and revegetate	Medium

The recommended activities action plan of Hopkinson (2001) has not been evaluated for implementation or to assess the results of any implementation.

GHD Report (2021) findings and recommendations

The GHD Report (2021) included three options for remediation of the Coobidge Creek channel and banks, and the restoration of the riparian zones below the culvert on South Coast Highway. The three recommendations /management options are:

1. Installation of a flow diversion bund encouraging the creek to re-occupy the abandoned pre-flood channel. To be successful, this would require infilling of the post-flood channel, significant widening of the pre-flood channel and removal of riparian vegetation to prevent future avulsion.
2. Stabilisation of the post-flood avulsion channel. This would accommodate the majority of flood flows, but the natural adjustability of the channel would be compromised by the installation of the right bank protection and the naturally resistant bed materials. Flow velocities and erosivity are likely to increase, and increased erosion of downstream reaches is likely. Imported material is likely to be required to stabilise the right bank.
3. The creation of a broad, quasi-stable channel through the removal of some of the pre-flood riparian corridor and 'soft' engineered stabilisation of the avulsion channel. This is GHD's preferred option as it would allow the natural character, morphology and geomorphic functioning of the creek to be re-established. This option unusually recommends the removal of part of the mature pre-flood riparian corridor, in order to accommodate the full range of anticipated flood flows and to remove acute meander bends downstream of the resistant sediment bar. The removal of existing vegetation would be offset by the establishment of a full riparian corridor along both banks and in-channel vegetation. The channel would be designed to allow net throughput of sediment once fully established (i.e. no significant erosion or deposition within reach).

GHD (2021) recommended that Option 3 was the most likely to successfully recover the creek and riparian vegetation, and that it should be undertaken with further environmental engineering and restoration design assessment and planning, and collaboration with the landowner and other expertise to guide implementation.

Management and restoration recommendations

Management and restoration (including revegetation) activities have been recommended since 1990. The recommendations provided here follow previous studies (Hopkinson 2001; GHD 1990, 2021) and are relatively simple and focused on issues that affect land, biodiversity and water sustainability across Australia. Effective financial and project management support, and collaboration will help implementation of recommendations.

In some cases, particularly relating to the GHD (1990) Study, more is now known about the sustainable management of the landscape for land/soil, biodiversity and water conservation. As such, some of the recommendations of the GHD (1990) report are no longer considered appropriate.

GHD (1990) recommendations

- Evaluate the implementation of the GHD (1990) report recommendations. In particular assess whether and how the four main points were addressed, and the implementation or otherwise of the ten recommendations of the study relating to Coobidge Creek.

Hopkinson (2001) recommendations

- Review and evaluate the implementation and results of the recommended management activities Action Plan table (Table 1, 2). Including assessment of fenced areas, recovery of fenced remnants, waterways and wetlands, and revegetation extent and success.

GHD (2021) recommendations

- Assess and evaluate the views of responsible regulating and managing Authorities (DWER, DPIRD, DBCA), and affected landholders on their consideration of the options and recommended option.

Theme 1. Priority landscape, water and environmental health issues for attention

- Coobidge Creek main drainage.
- Unfenced remnants on private land.
- Watercourses, wetlands, salt lakes, waterlogged land and otherwise unproductive land parcels.
- Ultimately the health of the subcoastal wetland system, including Lakes Kubitch, Carbul and Gidong into which Coobidge Creek flows, and the adjacent, associated and Ramsar listed Lake Gore.
- Implement the recommendations of the Esperance Coast National Parks and Reserves Management Plan (DPAW 2016) to include

Theme 2. Location of the issues in the landscape

- Coobidge Creek main drainage system (Figure 1).
- Unfenced remnants on private land.
- Watercourses, wetlands, salt lakes, waterlogged land and otherwise unproductive land parcels.
- The salt lake/playa wetlands in the upper catchment, as examples of saline wetlands with good remnant vegetation surrounds and relatively intact habitats.
- The subcoastal wetland system, including Lakes Carbul, Gidong and Kubitch, into which Coobidge Creek flows, and the adjacent, associated and Ramsar listed Lake Gore (Figure 3).

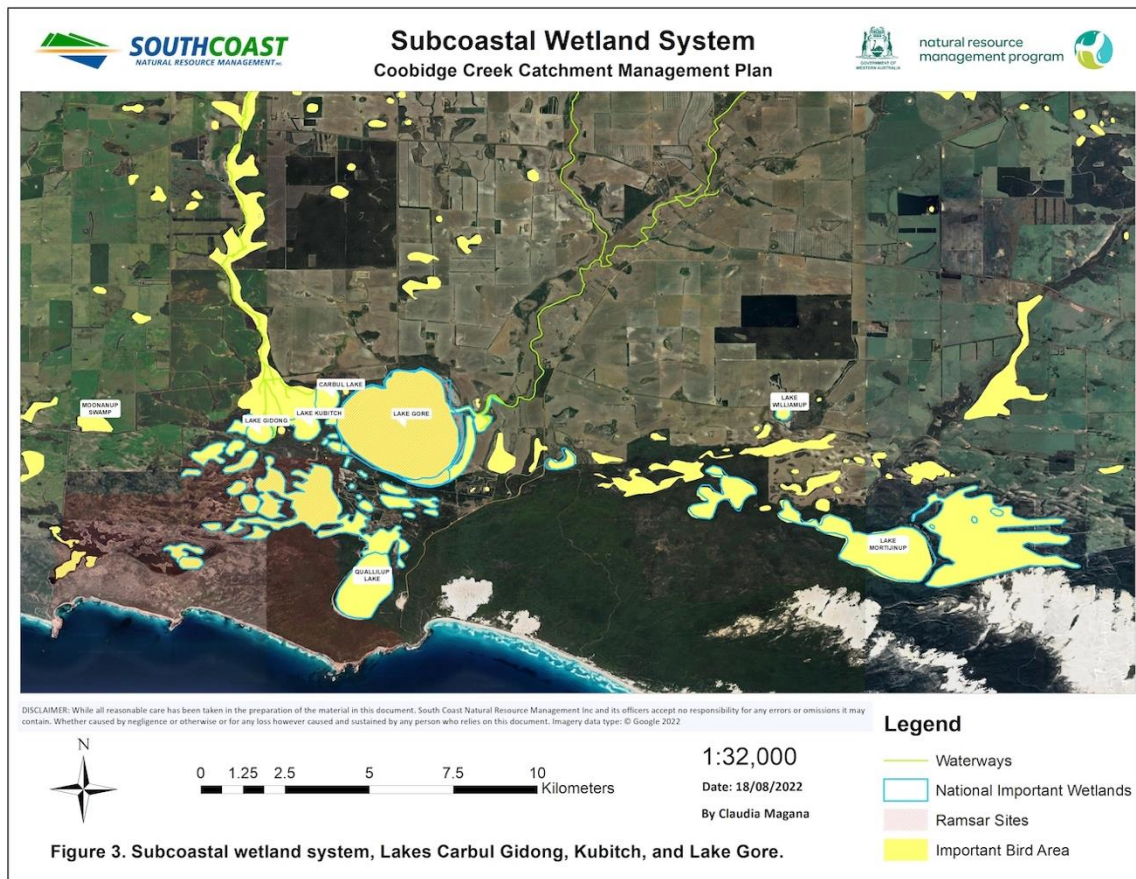


Figure 3. Subcoastal wetland system, Lakes Carbul, Gidong, Kubitch, and Lake Gore

Theme 3. How best to approach or manage priority issues

- Restore the main drainage of Coobidge Creek in a collaborative project with landowners. A combination of planning and design in line with the GHD (2021) report to include environmental engineering assessment, earthworks and native vegetation restoration.
- Fence all unfenced remnants as an overarching theme.
- Revegetate all watercourses and water and salt-affected and otherwise unproductive land as an overarching theme.
- Support landowners with easy to attain financial resources for Coobidge Creek restoration planning and design as a collaborative approach, and restoration, fencing and revegetation of priority places and throughout the catchment.
- Evaluation and monitoring of previous projects and their recommendations as a consideration and assessment of their prior investment.

Theme 4. Initiatives or works already in place

- The efforts, information and investment of the four previous studies.
- The considerable habitat values and conservation listings of the coastal and sub coastal wetland system, as Lakes Kubitch, Carbul, Gidong and the adjacent Gore.
- The Esperance Coast National Parks and Reserves Management Plan (DPAW 2016) of the Department of Parks and Wildlife.
- Most remnants including watercourses and wetlands throughout the catchment are already fenced (Hopkinson 2001). However, the most effective land, biodiversity and water conservation will occur when all remnants, watercourses, wetlands and low-value agricultural land is fenced and effectively revegetated.
- The February 2017 flood altered the Coobidge Creek channel below the bridge on South Coast Highway, it also removed some 17000 m² of sand from the paddock adjacent and placed it hundreds of metres downstream as a sand slug (GHD 2021; K Scott, G Burnett pers comm.). The landowner has offered to provide earthworks and restoration assistance for this damage section, including the repair of the channel, reforming of the creek sides and restoration of riparian zones.
- Shallow surface water drainage networks have been constructed across significant areas where waterlogging occurs in paddocks, with water drained into natural drainages in the Coobidge Creek system.

Theme 5. Initiatives and works to be scoped and implemented

- Review and evaluate implementation of GHD (1990), Hopkinson (2001) and GHD (2021), including the number and amount of recommended works completed and the success of mitigating impacts and the restoration of habitats resulting from the works. Noting that the GHD (2021) recommendation/s have yet to be implemented, and that there is not yet agreement on the recommended option between the landowner and regulators. See point 4 below.
- Liaison with DBCA on the implementation of the Esperance Coast National Parks and Reserves Management Plan (DPAW 2016), as it relates to Coobidge Creek catchment. Including the extension of the Ramsar listing to include Lakes Carbul, Gidong and Kubitch.
- Extend the Ecologically Sensitive Area (ESA), which currently encompasses the lower Coobidge Creek Catchment, to include the whole of Coobidge Creek Catchment. This will support the Ramsar listing extension of Lakes Carbul, Gidong and Kubitch (as above), and to support the availability of public and other resources to improve the conservation values of the catchment, including the implementation of this plan.
- Liaison between stakeholders involved with the Coobidge Creek erosion site south of the South Coast Highway Bridge, to meet, discuss, find agreement and collaborate on the implementation of the GHD 2021 report option/s, or other options as agreed. Liaison and discussions to be facilitated by an independent person. Stakeholders being landowners and managers, state agency staff (DPIRD, DWER and DBCA), South Coast NRM, GHD staff and others with expertise as appropriate.

- Identify remnant native vegetation yet to be fenced.
- Identify problem areas such as waterlogged sites, flood zones, saline areas and otherwise degraded areas, which are of low agricultural productivity, for restoration revegetation attention.
- Investigate the use of long-lived wattle and sheoak vegetation as nitrogen-fixing soil stabilisers in and along shallow surface water drainage lines. This system is predicted to use water, provide habitat and wind protection, and add nitrogen to support rather than impede adjacent crops and pastures. Suitable species include jam wattle *Acacia acuminata*, coast wattle *Acacia cyclops*, rock wattle *Acacia lasiocalyx*, rock sheoak *Allocasuarina hugeliana*, tamma *Allocasuarina campestris*, and swamp sheoak *Casuarina obesa*.

Theme 6. Assistance to scope and implement planned works

- Funding support for a focused project to evaluate the implementation of the GHD (1990) and Hopkinson (2001) studies. An evaluation project of previous investments may find improved uptake with catchment landowners. Use the information to identify specific gaps and further works needed.
- Develop a financially and practically attractive remnant fencing and revegetation works funding package specifically for Coobidge Creek landowners.
- Funding support for planning and design of earthworks and restoration works, and for restoration works including revegetation, for solutions agreed for mitigating the erosion damage to Coobidge Creek below the culvert on South Coast Highway, as part of implementing the GHD (2021) option/s.
- Funding for monitoring and evaluation of the health of the salt lake/playa system in the upper catchment, and the lower outflow wetland system of Lakes Kubitch, Carbul and Gidong.
- A finessed extension support program to encourage and incentivise landowners to be involved.

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Appendix 1. Landowner letter May 2022

Addressee
Esperance WA 6450

May 10 2020

Dear _____,

I write to introduce and outline the Coobidge Creek Catchment Management Plan project and its development process, and to ask for your expertise and input as catchment landholders to help improve the health of Coobidge Creek.

The Coobidge Creek catchment was heavily impacted by extreme flooding in early 2017, which caused damage to the river system landform, adjacent agricultural lands and fringing native vegetation.

The project aim is to design a long-term management plan to restore Coobidge Creek, which flows into the Lake Gore Ramsar wetlands complex west of Esperance.

The catchment management plan will define information relating to environmental engineering and riparian vegetation restoration actions required to restore Coobidge Creek and mitigate against further degradation to environmental values, water quality and agricultural lands.

The catchment management plan is designed to be used by you the catchment farmers, as a guide to conduct appropriate on-ground actions on the creek and surrounding catchment, with co-invested resources and to leverage potential future funding.

The catchment plan is an initiative of South Coast Natural Resource Management Inc, with a grant from the Australian Government's Regional Land Partnerships Program.

The objectives for the catchment management plan are:

3. A concise catchment management plan with maps, rudimentary farm designs, recommendations and future actions, for farmers to implement to mitigate erosion and sedimentation issues during short-lived high rainfall events.
4. That the plan's recommendations are consistent with Southern Prospects (biodiversity and soil health values) and goals of participating farmers.

If you would like to participate in the planning consultation process by providing your perspectives, expertise or other input to the development of the plan, you can register your interest by email to nathanm@westnet.com.au

Consultation would involve an initial phone discussion; either a written (dot points or simple responses ok) or discussed response to the six key questions that follow; and, if you wish, a visit to your property to view and discuss the plan and your particular circumstances and the issues requiring resolution.

I look forward to meeting and talking with you to develop the plan.

Sincerely,

Nathan McQuoid, Landscape Ecologist, project contractor.

Catchment Plan development questions to Landowners

1. What do you see as the main landscape, water management and environment/ catchment health issues needing attention in the catchment?

2. Where do you see these issues being, spatially – where in the catchment? Mark on maps provided.

3. How do you think the issues should be tackled/treated?

4. What activities do you already undertake on your property that you feel contribute to the health of the catchment?

5. What activities would you like to undertake on your property to support the health of the catchment?

6. What assistance or support would help you to carry out activities to improve the health of the catchment, which would be recommended in the catchment management plan?