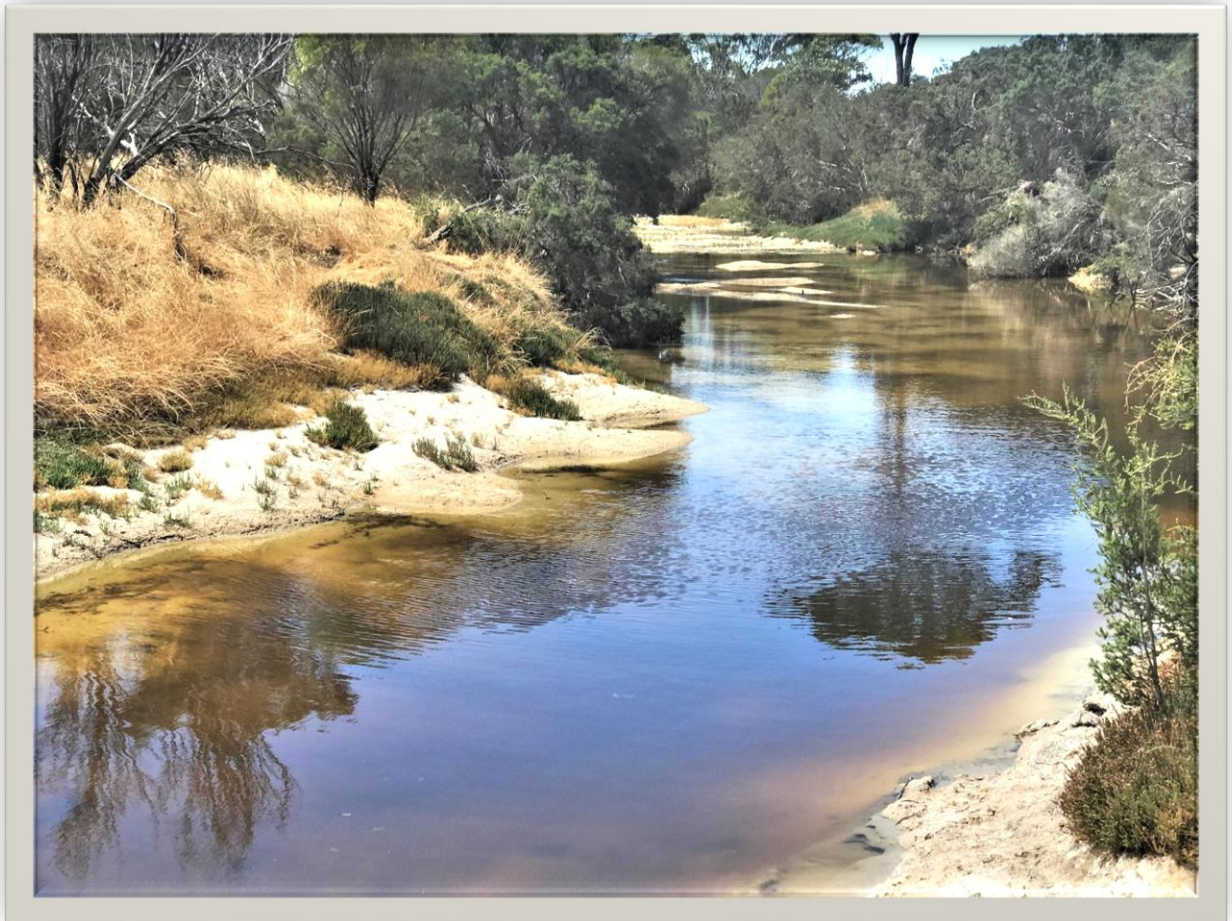


Warperup Creek Improvement Plan

Feasibility Study 2022

Supplement 1: Warperup Creek Landholder Survey



Prepared for North Stirlings Pallinup Natural Resources Inc
By Steve and Geraldine Janicke and Tegan Knowles, April 2022



natural resource
management program



This project was supported by funding from the Western Australian Government's State NRM Program.

Warperup Creek Improvement Plan Feasibility Study 2022

Supplement 1: Warperup Creek Landholder Survey

Prepared by Steve and Geraldine Janicke and Tegan Knowles
for North Stirlings Pallinup Natural Resources Inc
as part of their Waterways Restoration Project (CSGL19013).

Acknowledgements: The authors would like to thank all the landholders who participated in this survey.

This project was supported by funding from the Western Australian Government's State NRM Program.

Disclaimer: The authors have in good faith, made every effort to ensure the accuracy of the information presented and to acknowledge the sources, subject to the limitations of the methods used and take no responsibility for how this information is used subsequently by others, including implied notions and conclusions drawn. *Management implications* are not recommendations, but present options for consideration and discussion.

Cover graphics Warperup Creek upstream of the Hart Road crossing

All photographs are copyright to Steve and Geraldine Janicke unless otherwise acknowledged. They may be freely used by North Stirlings Pallinup Natural Resource Inc. provided the copyright owners are acknowledged.

OVERVIEW

This survey focused on the Warperup Creek catchment, but builds on the 2020 landholder survey, *'Your region, your input community survey report'*, commissioned by North Stirlings Pallinup Natural Resources (NSPNR).

The information from this survey will help determine the feasibility of developing a community-led Water Condition Improvement Plan (WCIP). A WCIP is a long-term, whole of catchment water management plan, principally developed by landholders with technical support from both local and external sources.

A WCIP is based on balancing the 'connectedness' of catchment waterways with the fragmented nature of land tenure. For this reason, landholder engagement and consensus are the most vital ingredients for achieving a successful plan for managing the waterways effectively over the next thirty plus years.

Funding: This project is funded by State NRM through the 2019 Community Stewardship Grants.

The survey goals were to:

- Gain information regarding the status of the waterways environment in the catchment which includes its extensive network of tributaries.
- Determine the requirements and limitations for achieving a significant improvement in the ecological values of the creek system.
- Determine community willingness to progress rehabilitation of Warperup Creek by adopting a 'whole of catchment' cooperative approach.

The survey was conducted over the phone by Tegan Knowles, Project Officer for NSPNR over March 2022. There were a total of 25 respondents to the survey.

Discussion

Warperup Catchment is 89500ha, (895 square kms) in area and includes the towns of Borden and Ongerup. There are five main sub-catchments, Upper Warperup, Ongerup, Peerup-Meenup, Peedilup and Coromup (which includes Alan and Long Creeks)

Box 1

NOTE: Land ownership changes from time to time and current (2022) land ownership data was not available to the authors. Hence the figures below will change slightly given updated data. Landowner data available to NSPNR indicated 41 landowners within the catchment however Cadastre databases indicate there were 65 landowners (excluding the townships). Some of these landowners have only a small part of their property within the catchment boundary. Others may have sold to landowners merging farms to increase their holdings. The area figures below come from the Cadastre database as available to the authors.

Warperup Creek Landholder Survey 2022

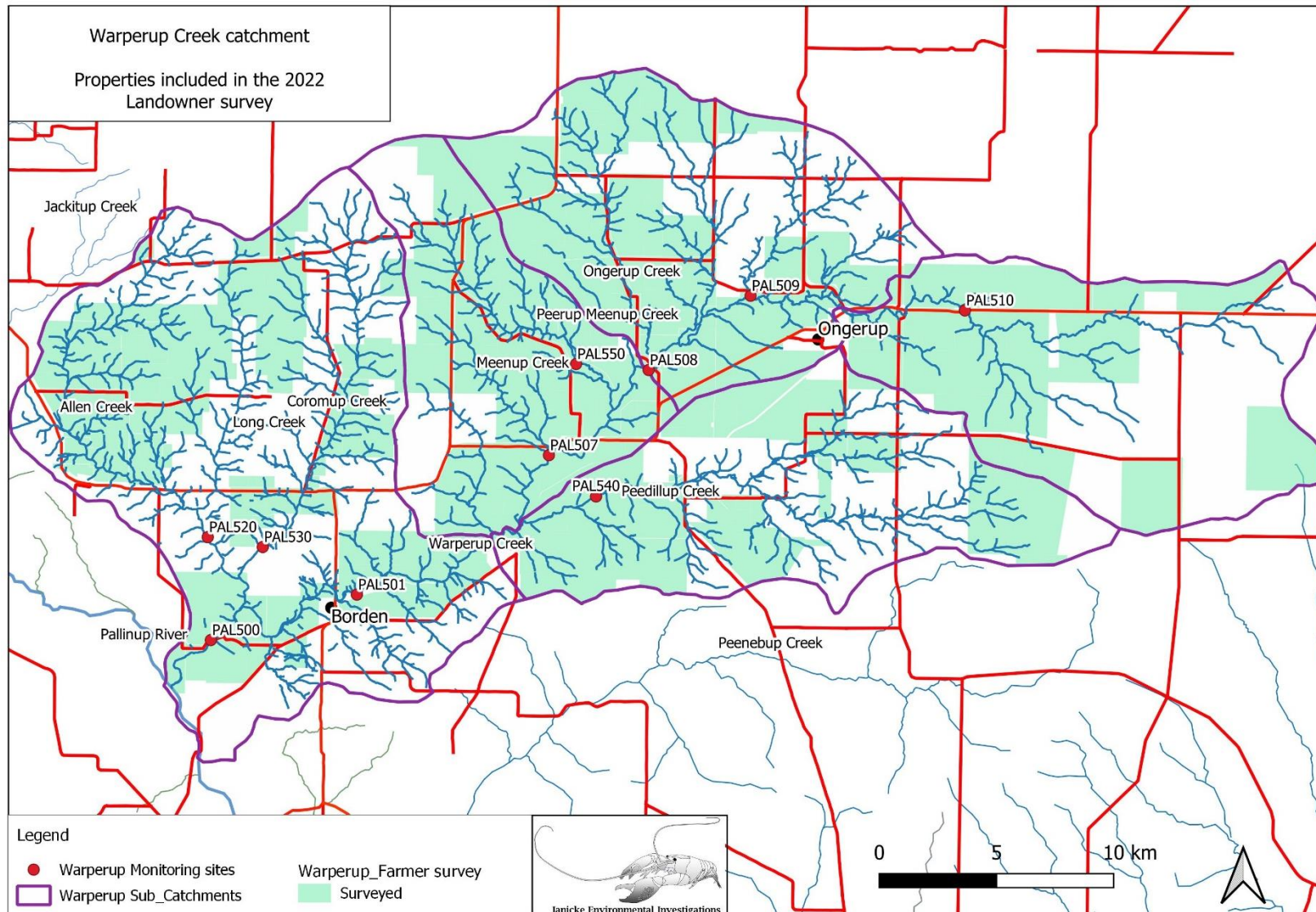


Figure 1: Warperup Creek catchment survey 2022. Please note comment in Box 1 above re land ownership changes.

Summary

There were limitations to the understanding of how the minor creeks and tributaries are part of the catchment for Warperup Creek. However, there was a general positive attitude towards waterways with an appreciation of their ambience and benefits to the farming enterprise despite problems of flooding, frost and other management issues.

Over 60% of respondents had done fencing and revegetation work during the past 30 years with the dominant reason being to protect the creek, bush and wildlife. Other works included drainage and planting perennials in an effort to mitigate salinity. Most felt that the works had been of benefit. Of the two respondent who felt the works had not been a benefit, one felt there was no real benefit from the planted saltbush and the other found flooding occurred despite drainage works.

Of the 25 landowners/managers surveyed, 80% indicated a willingness to participate in waterways management discussions. This represented at least 52% of the land area in the Warperup Creek catchment. One comment seems to sum up the general attitude: "Yes, I would be interested. I think each farm has its own issues that need to be addressed in isolation but to come together for the greater good...yeh I'd be interested to see where this goes."

Two important concerns were expressed:

- Landowners who do not live on the properties may have no connection to the land, and therefore would not care about the Warperup Creek.
- That participants would have to lead these discussions and present to others which some would not be keen on doing.

Survey Participation

Although only 38% of landowners in the catchment were surveyed, they represent 58% of the land area of Warperup Catchment. (See the map above and Figure 2 below).

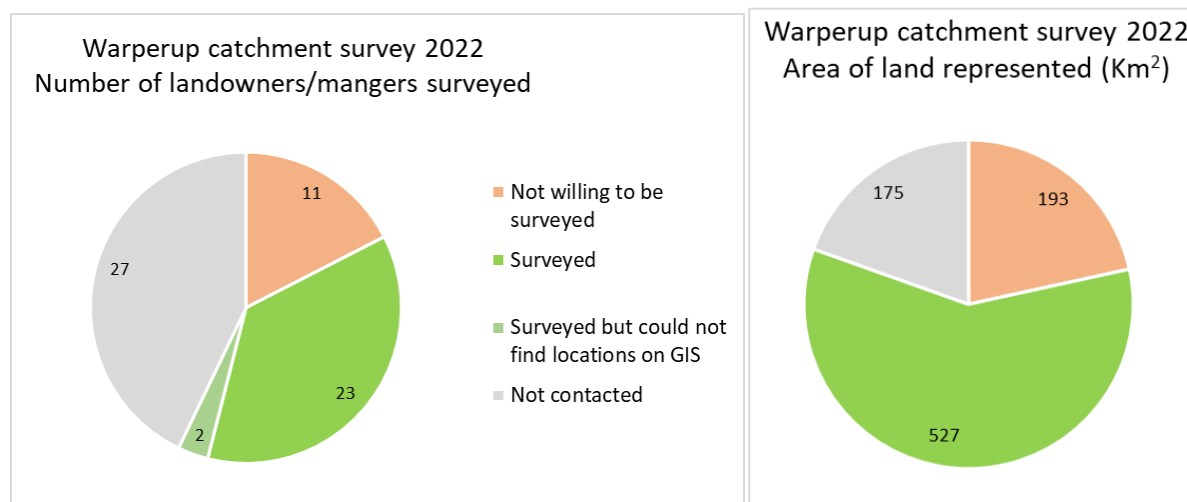


Figure 2: Numbers of landowners/managers surveyed, and the area of land represented by them.

Are the waterways valued?

The first set of questions were about how respondents view Warperup Creek and its tributaries within the properties they own and/or manage.

What is a creek?

The Warperup Creek waterways consist of small swales joining other swales until they become defined minor creek lines. These in turn join other minor creeks growing in size until they join the main Warperup Creek trunk. The larger creek lines are usually named (Coromup, Peerup, Meerup, Allan, Long etc.) however many have no names, and the minor defined creeks are rarely named. If a farming family give a minor creek a name, it usually indicates the creek has some value to them. Many people seem to not recognise that all the swales and minor creek lines are part of the Warperup Creek catchment and contribute to the condition of Pallinup River and Beaufort Inlet.

Only three respondents had names for creeks other than the main named tributaries. There seemed to be some misinterpretations of what waterways are part of the Warperup Creek catchment. One respondent who had one of the major tributaries flow through their property did not think that it was within the Warperup catchment.

Likes and dislikes

There were various reasons given to like and dislike their waterways, however it was encouraging that 28% of the respondents had no reason to dislike their waterways. Management issues, frost prone in the valley and problems with loosing fencing in floods contributed to dislikes, but for many, this did not take away their enjoyment of the ambience of the waterways.

Table 1: Summary of what respondents liked and disliked about having the creek/s flow through the properties they own and/or manage

Summarised likes	Number of respondents	Summarised dislikes	Number of respondents
Ambience	12	Flood problems	12
Drainage	8	No dislikes	7
Wildlife	4	Frost prone	5
Seasonal grazing/shelter	3	Weed issues	3
Recreation	3	Management issues	1
No answer	4	Loss of land	1

Note: Some respondents gave multiple answers.

Perceived changes to the waterway environment

New Landowners do not necessarily have historical knowledge or insight of the landscape processes or farming history of their property. Some landowners/managers indicated the length of their tenure on the property, which ranged from 3 to almost 50 years.

Many of the changes to the waterway environment were to do with past fencing and revegetation programs. There were more landowners who felt there had been no change compared with those who commented on some negative changes.

Of those who felt the waterway environment had not changed, several respondents had lived there for over 30 years. Their perception is supported in general by the study: *Middle Pallinup Floodway Condition Survey 2017*¹, which compared 155 photos taken systematically along 43 kilometers of the Pallinup in 2001 and again in 2017. What stood out was that the basic channel structure had remained much the same at the majority of sites over the 16 years period, in spite of various moderate to major floods.

Table 2: Summary of perceived changes to the waterway environment.

Summarised answers	Number of respondents
No change	10
Fenced and revegetated	10
Salt increase	3
Silted up	2
Degraded	1
Scouring	1
Weed increase	1
Yes (no reason given)	1

Note: Some respondents gave multiple answers.

Perceived needs for improvement

Those landowners who had already been fencing and revegetating the creek lines felt there was no further improvements necessary. Other landowners considered the complexity of salinity expression adjacent to the waterways and many were uncertain about what could be done while, yet others felt there was always the need to improve the environment. Several landowners made the distinction between what was needed and what they would like in terms of improvement.

The key message is uncertainty about what could be done and perhaps why. This indicates an opportunity to provide more information so landowners can make more informed decisions.

Table 3: Summary of responses to the question of whether the waterways need to be improved.

Summarised answers	Number of respondents
Yes	13
No	7
Unsure	5

Note: Many answers were followed by “maybe” and included some with provisos.

¹ Janicke, S. & Janicke, G. (2017). *Actions for the Pallinup: Middle Pallinup Floodway Condition Survey*. Report prepared for NSPNR Inc.

The benefits of waterways on the farm

Overall, respondents felt the waterways were a benefit to their farming enterprise and also commented on the personal benefits. Benefits to the farm enterprise included drainage, stock shelter and movement, and steeper gradient providing dam opportunities and less salt affected areas.

There were equally as many comments on the benefit of the waterways to personal health, through having pleasant or 'sacred' environments for the family to enjoy.

Table 4: Summary responses as to the whether waterways on the properties offer benefits with respect to the farming enterprises or family?

Summarised answers	Number of respondents
Benefits to the farm	12
Personal benefits	13
No benefits	5

Note: Some respondents gave multiple answers.

Soil salinity and acidity issues

Although many of the respondents indicated that they had soil salinity issues on their farm, some felt it was mostly confined along creek lines or in small patches.

Soil acidity seemed common to most respondents but was controlled by liming and implied a farming process cause, not an underlying geological cause. In WA, the two main causes of soil acidification are inefficient use of nitrogen and export of food and fibre from the farm². This question was asked to try to find out if there was a particular reason for slightly acid water in the upper Warperup Creek.

Table 5: Numbers of respondents with soil salinity issues impacting their farming enterprise.

Response	Soil salinity	Soil acidity
Yes	16	21
No	9	4

Environmental works

Environmental management works completed

Over two thirds of respondents had at some time done some fencing of remnant vegetation or the waterway. Some of this work was done over 30 years ago. Respondents who said they had not done any environmental works, indicated that since they had no stock, there was no need or that no works had been done in their time on the farm.

² Chris Gazey and Stephen Davies (2009) *Soil acidity A guide for WA farmers and consultants*. Bulletin 4784 First published in 2009 by The Department of Agriculture and Food, Western Australia

Table 6: Summarised answers to what environmental management works have been undertaken.

Summarised answers	Number of respondents
Fencing	18
Revegetation	11
Dryland Salinity perennials	4
No	3
Drainage	2
Stock management	1

Note: Some respondents gave multiple answers.

Main reasons for undertaking environmental management works

Over half of the reasons for undertaking environmental works were to protect the bush, creek or wildlife. The rest of the works were to benefit the farming enterprise.

Table 7: Summary of the main reasons they undertook environmental management works.

Summarised answers	Number of respondents
Protect bush/creek	12
Livestock management	6
Salinity mitigation	6
Drainage management	2
Farm economics	1
Wildlife corridors	1
Windbreaks	1

Note: Some respondents gave multiple answers.

Benefits of the works

Overall, it was considered that the works conducted were of benefit to the farm, except the drainage works on one farm that had not mitigated flooding of their property in last year's higher rainfall. Saltbushes planted in the past were of minimal benefit for grazing to another farmer. Other landholders appreciated that the trees were now mature, and the creek was now a great natural area providing personal enjoyment. Another comment was regarding fencing that had been washed away during floods.

Summarised answers	Yes, a Benefit	No, not a Benefit
Protect bush/creek	12	
Livestock management	6	
Salinity mitigation	4	1
Drainage management	1	1
Farm economics	1	
Wildlife corridors	1	
Windbreaks	1	
Totals Yes or No	26	2

Note: Some respondents gave multiple answers.

Looking Ahead

Participation in catchment management planning

Of the 25 landowners/managers surveyed, 80% indicated a willingness to participate in waterways management discussions. One comment seems to sum up the general attitude “Yes, I would be interested. I think each farm has its own issues that needs to be addressed in isolation but to come together for the greater good...yeh I’d be interested to see where this goes.”

Although it would seem that the smaller proportion (32%) of landowners in the catchment are willing to participate in the catchment management planning, they represent at least 52% of the land area.

Table 8: Responses to the question of participation in catchment management planning.

Summarised answers	Number of respondents
Yes	20
No	5

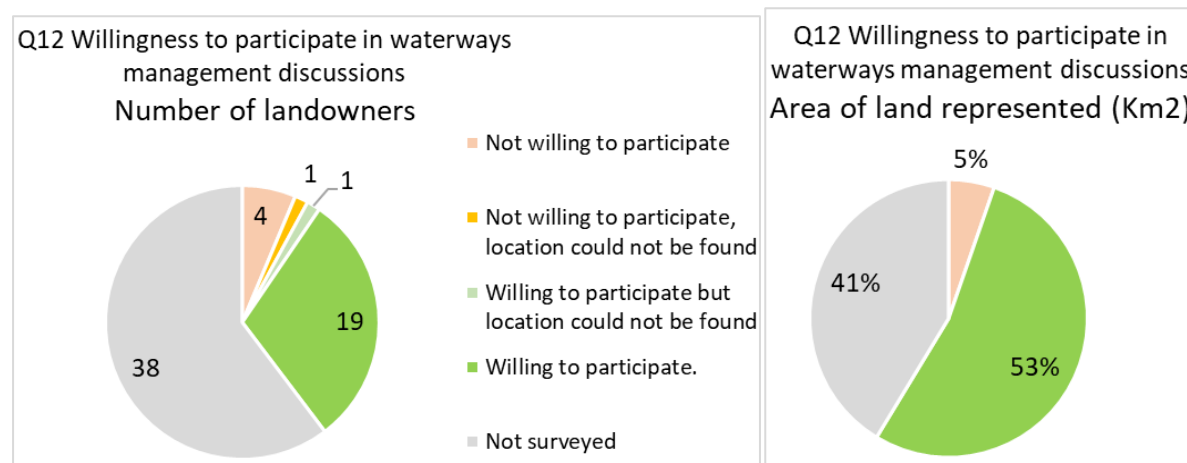


Figure 3: Numbers of landowners/managers willing to participate in waterways management discussions, and the area of land represented by them.

The number of landowners/managers willing to participate in catchment management discussions was broken down for each sub-catchment

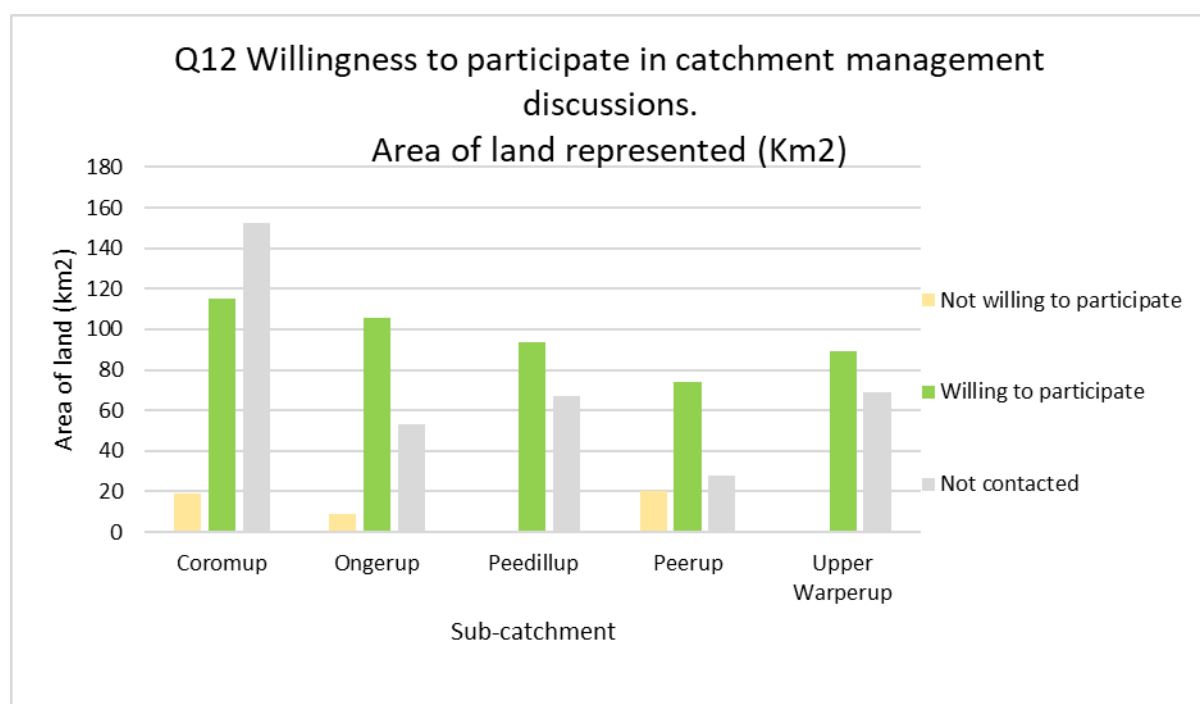
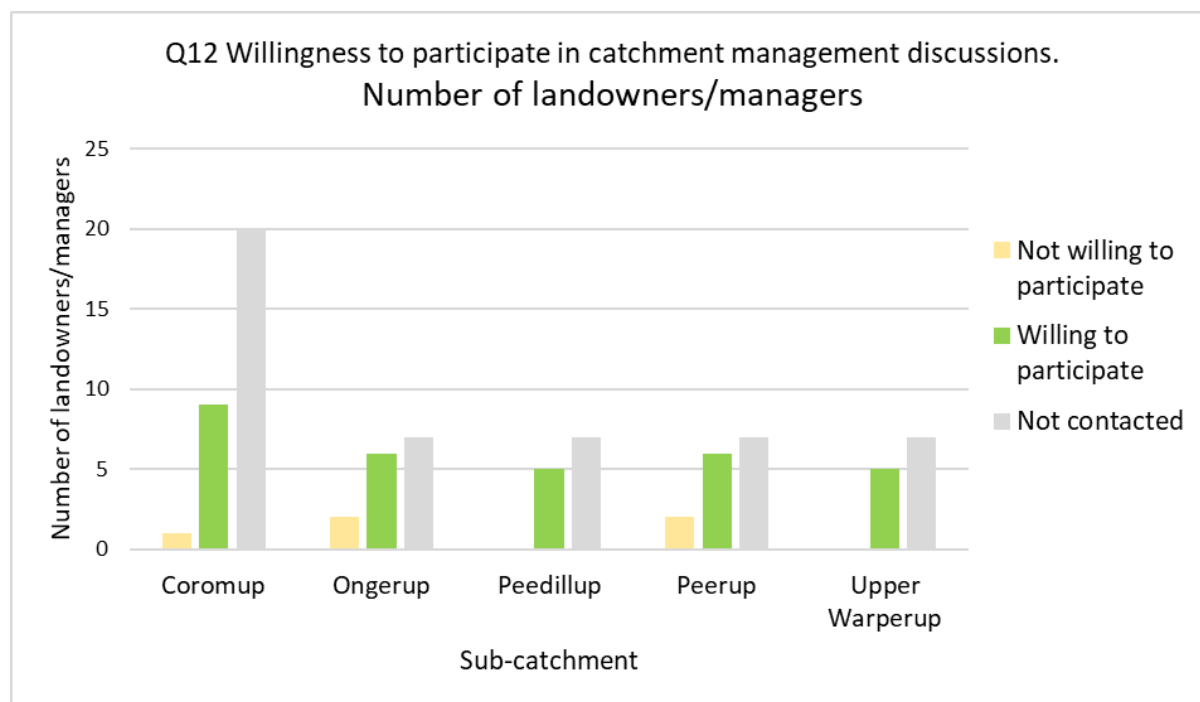


Figure 4: Sub-catchment separation for numbers of landowners/managers willing to participate in waterways management discussions, and the area of land represented by them.

Further environmental actions

The question, “Are there any other actions that could be undertaken on your farm which you consider would improve the health of Warperup Creek?” resulted in 64% responding “Yes” with a wide range of actions. More fencing and revegetation works were at top of the list.

Table 9: Summary of responses to the question of further actions.

Summarised answers	Number of respondents
Yes	16
No	9
Fencing	7
Revegetation	7
Drainage works	3
Salinity mitigation	2
Feral animal control	2
Unsure	2
Weed control	2
Perennial pastures	1
Contour earthworks	1
Study into Remnant vegetation values	1
Flood mitigation	1
Waterway Silt control	1

Note: Some respondents gave multiple answers.

Survey Answers

APPENDIX – SOME ANSWERS TO THE QUESTIONS ASKED

This set of questions are about how you view Warperup Creek and its tributaries within the properties you own and/or manage.

1. What name/s do you or your family call the creek/s other than Warperup Creek that flow through the properties you own and/or manage?

There were only a few responses with names of creeks besides Warperup Creek and the main tributaries.

2. What do you like and/or dislike about having the creek/s flow through the properties you own and/or manage?

Likes

Some answers to the question.

- The creek is really picturesque in some spots, you know, with trees that are thriving, it makes a really special spot.
- I like the fact that it does drain the water away from the farm.
- Looks good, provides a good slope and drainage.
- Pretty creek, nice environment.
- I love the habitat that they create.
- Watercourse takes the water away and avoids any pooling of surface water, it is pretty impressive when in full flow, also recreative wise, especially when the kids were younger.
- Nice environment, tree and wildlife species, it's also pretty.
- Breaks up the landscape – makes life interesting.
- I love the remnant bush and the natural areas that have regrown. They are lovely spots to relax or explore. The wildlife is very special also.
- Besides the good soil next to the creek, I guess it's just a nice natural area to have on the farm.
- I love the magnificent bushland that is associated with the creek, and everything that comes with it including the several wedge-tail eagle nests and the special orchid spots.
- It provides good shelter and fresh water for when we allow light grazing. Usually just grazing for fire reduction so they aren't causing too much damage which seems to work well. It's also just nice visually to have running water on the farm.
- As there is not much of a creek line running through our property, I don't really have any likes or dislikes.
- Nice creek, nice environment to have on your property.
- We really like having the creek flow through our property, the natural veg and the creek make it a nice environment to walk in.
- I like the birds etc that live there, it provides shelter when needed and drains the salt and water away.
- I really like the creek, it is pretty, and sounds nice when running. The creek also helps to drain the property.
- I like that it allows water to flow away in years of floods.
- The creek creates a nice habitat for birds etc.

Dislikes

Some answers to the question.

- Makes management difficult. The livestock fences always disappear when it floods.
- They take up space, so you effectively lose profitable land. Not too much else to dislike about them.
- I dislike the low-lying frost areas, and I dislike the foreign weeds that come down the creek.
- Occasionally flooding which makes it hard to get gear across it.
- Wash out of creek crossing when it rains a lot, like last winter.
- I love the habitat that they create, but I guess I then curse them when we have big rains, and they flood and wash the fences away.
- The frost that comes with it.
- It is a passageway for weeds, we lose fencing due to the close proximity to waterways, and irrespective of rainfall, the creek always runs salty.
- Flooding out on me and taking out all the fences.
- When there is lots of rain, and the floods cause damage to fences, via fallen trees flowing along the river and knocking fences.
- I guess I dislike it when we have lots of rain, resulting in flooding and I have to rebuild the crossing.
- It is a nuisance when it rains a lot. This past season was really wet so inaccessibility to parts of the properties was an issue.
- Frost follows it, the weeds (like Double G's) come down with it, and flooding can cause issues like fences washing away.
- Impassable when high water and fencing that gets washed away.

3. Do you have freshwater soaks or wetlands on the properties you own and/or manage?

Some answers to the question.

- Yes, the bore besides the creek isn't too salty, and the creek itself is sometimes not that salty.
- Yes, but I do not use them.
- No. There used to be here -when my father was young boy back in the 1920s there were many freshwater soaks, but unfortunately, they are all gone now.
- Yes, we have a few freshwater soaks.
- Yes, one freshwater soak in the SW part of the property.
- No. There used to be a soak, but it went salty. In the 1954 drought it was used for stock and went downhill from there.

4. How has the waterway environment changed since you have lived/farmed on the properties you own and/or manage?

Some landowners/mangers indicated the length of their tenure on the property which ranged from 3 to almost 50 years.

Some answers to the question.

- Since we have fenced the creek lines the vegetation has regenerated, which is good, however the salt level has risen.
- We have been farming since 1988 and haven't noticed any changes.
- Not changed. Been here 13 years.
- They were all cleared but now the creeks are fenced on these properties, so vegetation and animals are all back on the land which is nice.

- Trees have got older, and the understory has gotten less. I have been on the farm for 40 years.
- No changes, other than maybe the scouring of the waterway after big rains.
- We have been there 15 years and I have seen no significant changes; besides it being fenced off.
- Not much over the last 30 years.
- Well, the waterway has gone salty, although I think the condition has improved with the creek being fenced off and revegetated along the creek lines.
- The creek has silted up.
- I have been here since 1975, the fencing we put in has enabled trees and bush to grow. Another change I have witnessed is the increased salt scald on the land. The rapid rise of salinity problems was not visible before.
- The biggest change would be the fact that none of it was fenced 30 years ago. Since 1990 about 50% of the creek line has been fenced, with the majority of that fencing focusing on the main creeks.
- There has been lots of natural regrowth of bush and trees, now that the sheep are no longer here, and we don't farm close to the creeks anymore. The sheep were removed from the farm 25 years ago.
- I have been there for 9 years and haven't observed any changes.
- I think the waterway environment has improved during the time we have been here. We have worked hard to try and improve its health and it is paying off.
- I can't comment on the Warperup as we have only owned the property for 4 years. However, we have the Pallinup River and another creek on our main farm. In my lifetime they have silted up a bit more and there are more weeds. The major change has been that all of our properties have been fenced in the last 15 - 30 years and is much better vegetated.;
- In early to mid-1970's the creek was fenced off, and since then the bush has regenerated, so it has improved.
- In the 15 years I have been here I don't think it has changed.
- Fenced and the vegetation has come back strong and kept salt issues at bay by keeping the water table down. Since then, fencing has gone in, we haven't had salt issues.

5. Do you feel that the condition of the waterways needs to be improved?

Some answers to the question.

- Not really. It has been improving since it has been fenced, so it's looking good.
- Well, our farm is at the eastern end of the catchment, effectively where the creek starts. It is really complicated, the problem doesn't lie within the creek itself, its what's happening on the catchment around the creek that has an effect. Well, there is no one solution that works for all sites, all sites are different, the salts are brought to the surface, and there's dykes, and you can cut drains but that's still only transporting the salts into the creek faster. It does get really tricky. On a 70-hectare patch of salt affected land, we did some deep ripping to 600-700 deep, top-dressed wheatgrass, barley and salt bush, and within 12 months we had full coverage. We now use that land for grazing, although with all the rain last year the sheep were getting bogged!
- Yes, can always have more fencing off of remnant vegetation, and revegetation works.
- They are fine as is.
- Looks fine as is to me, especially on our properties. On a larger scale, I guess really damaged, washed-out areas could be improved.
- Yes, always needs improvement, and I think the chemical residue washing into the water ways is not helping
- I guess so, it just really needs to be fenced off

- Maybe, but I am not really sure if there is anything you can do to improve it.
- Yes, maybe more vegetation, and controlling of the grasses. Interestingly after the flood events from 4 -5 years ago, many new trees have emerged and are growing successfully.
- No, not really sure there's anything you could do, but I guess if there's anything that could be done it would be nice to see it done.
- Not need to, but it would be nice to give it a go. I would like to see these creeks to be treated with respect rather than like a drain or a rubbish dump.
- Yes, continually, keep planting and keep fencing.
- Yes, the draining of the catchment could be improved to decrease flooding on the property.
- I am not sure what could be done to get it back to its natural state, I think that we have gone past that stage unfortunately. It would be nice if it were possible though.
- Yes, there are big salt issues that need improving.
- I guess so, although, it doesn't need to improve but it would be good to know it wasn't declining.
- Not a lot that can be done where it is on our property, the damage has been done with the silting. It is better with more vegetation now. There are other farmers that could fence it out so their stock only occasionally graze.
- Well, I don't think so, I don't think they are going backwards.

This next set of questions are about the impact of waterways on your farming enterprise.

6. Do the waterways on the properties you own and/or manage offer benefits with respect to your farming enterprises and family? If yes, what sort of benefits?

Some answers to the question.

- Not really to us personally, but it the drainage aspect does benefit the farming enterprise.
- I guess they offer the benefit of moving stock along there.
- For the farm it provides good drainage of water, and good shelter for sheep. We personally benefit by having the nice creek environment nearby.
- Yep, heaps, with the catchments we have created plenty of dams.
- No benefits to farming enterprise but nice to have on the farm.
- No benefits to the farming enterprise as it's really only a pain to cross it if it floods. But the habitat that they create is a nice environment for the family to visit.
- Yes, along with drainage, it also offers land to be lightly grazed at times.
- Yes, to both as already mentioned. For the farm, the creek and the resulting gradient in the land means we do not have any salt-affected areas on our farm.
- Yes, to both, the family have a very sacred place along the creek that we gather for special occasions. The farm benefits from the water in the creek to supply water the vegetation and sometimes supply water to sheep.
- It is a benefit to myself and my family personally as it provides a natural garden and brings joy.
- Not really any benefits farming wise. But the creek offers personal benefits to the family.
- No, not to the farming, but to myself, yes. I personally greatly benefit by being immersed in these natural environments.
- Yes, good shelter, especially for lambing.
- No benefits to the farm, you sort of just accept that its part of the landscape and work around it. It does benefit the family being a nice bit of remnant veg.
- Yes, the waterways and its associated vegetation reduces erosion via shelter belts.

- They offer somewhere to see a variety of birds, roos etc. We do have echidnas in some areas. They are somewhere different in the landscape than our cleared land
- No not farming-wise, but lifestyle wise yes, the creek is aesthetically pleasing.
- Yes, the drainage aspect stops water logging of soil. Our farm is just cropping – no stock.
- Yes, for the farming side of things, it provides drainage, somewhere for the water to go in comparison to flat land. And yes, to family in that they are a nice environment to have near home.
- Farm: Like I mentioned the grazing benefits in drought years. Family (when prompted): Yeah, I guess when it floods, we like taking the kids down there.

7. Do you have soil salinity issues which impact your farming enterprise?

Some answers to the question.

- Yes, in certain areas, the main area affected by salinity surrounds the waterway.
- Yes, but only a very small amount.
- No, well there is one little patch where the creek forks, but it is not really significant.
- Yes, although it is not a significant problem, yet.
- Yes, but it is confined along these creek lines.
- Yes, although I feel like we are improving.

8. Do you have soil acidity issues that impact your farming enterprise?

Some answers to the question.

- Yes, although this is addressed with lime. Soil pH is around the high 4s into the 5s so not too bad and is under control with the liming program.
- Not a massive concern with our liming programs.
- Yes slightly, but I guess it is only increasing.
- Yes, although it would be district represented, and is not an issue that we can't stay on top of.
- Yes, we can still grow crops, but the acidity does impact the yields, and we use lime extensively.
- Yes, broadscale issue.
- Yes, although it is getting addressed with the addition of lime. If we didn't apply lime, we'd have problems with soil acidity.
- Yes, we add lime to help, but not too much of it, trying to find the balance between the benefits of the lime and the dollar cost of it.

9. Have you completed any environmental management works along waterways on the properties you own and/or manage? If yes, what so sort of works?

Some answers to the question.

- Fencing and drainage works
- No, there's no stock at that farm so no need.
- Yes, 8 years ago we got some funding and were able to fence of the start of the creek, approximately 3-4km worth. With that same funding we planted a few hectares of revegetation.
- No. (Interviewer: prompt whether any fencing has been done?) Yes, the creeks have all been fenced.
- Fencing and revegetation.
- Fencing of the creek line about 14 years ago. I have also maintained the fencing off a roughly 100 acres patch of remnant bushland. Revegetation works, every year I purchase 2000 trees and put them in the ground. We really need more plants in and stop the clearing of any more bush/trees.
- We haven't (over the last 3 years) but fencing along the creek was put up maybe 20 years ago. And the last owner did do a lot of revegetation works.
- Fencing, but then they just wash away. We haven't really done any planting along the creek but when we see a new tree seedling pop up, we make the effort to fence around it to give it the best chance.
- Fencing and planting – in the last 30 plus years
- Fencing and revegetation on all the farms at some point.
- Fencing mainly. There has been past planting along the creek lines, but not much in the past 10 years.
- Yes, lots of revegetation, and removing the sheep has made a huge difference.
- Drainage to confine flooding.
- Not really, in the northern end there were some saltbushes planted, but that was before my time.
- No. We have no stock, so haven't had to fence, and we have not revegetated any areas.
- Yes, we have had success in planting out a saltbush feedlot on otherwise 'useless' land. We have also revegetated and fenced off parts of the waterway.
- Creek was fenced in 1970s
- Not myself, like I said this is only my third year. There has definitely been some fencing along parts of the creek line in the past.
- Yes, planted trees, wheat grass (that's arable) and salt bush in some of the salty areas.

10. What were the main reasons that you undertook environmental management works?

Some answers to the question of reason for environmental works.

- Fencing - keep livestock out. Drainage - stop the spread of salt.
- To protect remnant bush and create shelter and protection for stock.
- Keep stock out of the creeks. Help protect the creek system.
- To create windbreaks, the winds here come in April May and are something terrible and whip up a whole lot of soil, so these creeks and trees help break up that wind. We also obviously do the work to protect remnant bush and improve the environment by planting trees.
- Partially for environmental reasons and partially to exclude stock and things like that.
- For the health of the creek and to keep the farm from falling apart.
- Would have been done to conserve the bush on the creek.
- In the belief that we could slow down salinity issues. Also, to provide wildlife corridors.

- I think the fencing started to help with a salinity issue, but it turned quickly to just protecting the creek vegetation and the biodiversity.
- Environmental values, I, as did my father, worked hard to restore, and improve these natural environments because they are so special to us. They are very important natural areas.
- To improve accessibility.
- They are salt affected soils, so best to have something on the soil rather than leaving bare.
- Make more money by improving the salinity issue and help the waterway environment.
- To encourage the trees to grow.
- Mainly to get something growing on that land and get the water table down.

11. Have the works been a benefit to you?

Overall, it was considered that the works conducted were of benefit to the farm, except the drainage works on one farm did not mitigate flooding of their property in last year's higher rainfall and saltbushes planted in the past were of minimal benefit for grazing to another farmer.

Some answers to the question of whether the works were of benefit or not.

- No, during the wet season we had last year, the properties still got flooded (after drainage works).
- No, not really, sort of open to grazing, but I'd say not much benefit, (after saltbushes planted some time back).
- Yes, for sure, everyone needs to be doing their bit.
- Yes, many of those seedlings are now mature trees.
- Yes, in stabilising the creek line and allowing strategic grazing.
- Yes, although the fencing occasionally gets washed away if it's really wet.
- Yes, definitely, the creek is now a great natural area.
- Not to the farming side of things, but yes, they benefit me spiritually and enable me to personally enjoy these natural areas.

APPENDIX LOOKING AHEAD

12. Would you be open, to discuss waterways management with other landowners regarding management of the whole Warperup Creek catchment and work to formulating a long-term rehabilitation plan?

Some answers to the question of catchment management participation.

- Yes, I would be interested. I think each farm has its own issues that needs to be addressed in isolation but to come together for the greater good...yeh I'd be interested to see where this goes.
- Yes, although like I mentioned my part is pretty negligible with most of our property in different catchments.
- Yes, if there was anything I could offer.
- Yes, everyone would say yes to this wouldn't they?
- No. (It's a pity, I didn't explain the reasoning behind the question, but the respondent shared his thoughts that this type of thing would be a waste of time, as his neighbours do not live on the properties may have no connection to the land, and therefore would not care about the Warperup Creek).
- Yes, always open for a chat.
- Yes, I would be happy to be part of the discussion. (The respondent was concerned that he would have to lead these discussions and present to others which he

wasn't too keen on, but when I explained that it would be landholders meeting up on the same level to discuss the Warperup Creek he said he would be happy to be involved).

13. Are there any other actions that could be undertaken on your farm which you consider would improve the health of Warperup Creek?

Some answers to the question other actions that could be undertaken.

- Only thing that I think would help is to deep rip it and plant a mix of salt bush, wheatgrass, and trees. I would do it in this area, but with some parts of the ground being so hard, I need more heavy-duty machinery.
- Fencing and revegetation.
- Continued planting and fencing the creek off. Some earthworks around the contours of the creek would not go astray.
- Not really, just the fencing, I guess.
- Not really, possibly planting, but then you have the same issue of the plants washing away with the big rains. I am not sure how far up from the creek bank that you would have to plant to stop it from washing away.
- Maybe a perennial pasture.
- Completely finish the fencing of the creek. Parts of it are fenced but not all of it.
- Control of Salinity encroachment, and possibly more local studies into why the issue is getting worse as I believe the salt is coming down from the hills and slopes, rather than coming up with the rising water table. On our property it seems this is the case anyway.
- Control of foxes and cats.
- More fencing of remnant vegetation.
- More study into ways to make this important remnant vegetation an asset on farmland rather than diminishing the property value.
- Possibly Weed control.
- Not off the top of my head. I am sure there would be, but I just don't know them. I'll just also mention that we are right on top of the catchment. No water from other farms, flow into ours, so I am guessing maybe there are more issues downstream than where we are.
- "I'm not really sure. I guess maybe more fencing and planting, although it's just not really feasible. You can spend lots of money on fencing to have it washed away when the rains come. We did put in a heap of fencing and it only lasted 2 years before washing away. You would have to fence above the high tide/flood mark and it's not feasible to fence off that much land.
- Weeds are increasingly becoming an issue with lots of Soursob and other weeds that seem to pop up and take over. I am not sure if we'd ever be able to get rid of the Soursob now, it's just too widespread. We had a weed last year called Thorn apple. That was a nasty one.
- Silt is also a major problem on our farm.
- I'm not really sure, but I think there would be lots you could do, but I just don't know, it's tricky.
- Not really, maybe just some drainage at the northern end of the property.
- Probably rabbit control.
- Yep always - more revegetation and better fencing. I am also about to try out cutting drains to help direct water which should improve the health of the creek.
- Yes, more trees along the creek line.
- Not really, apart from some drainage works.