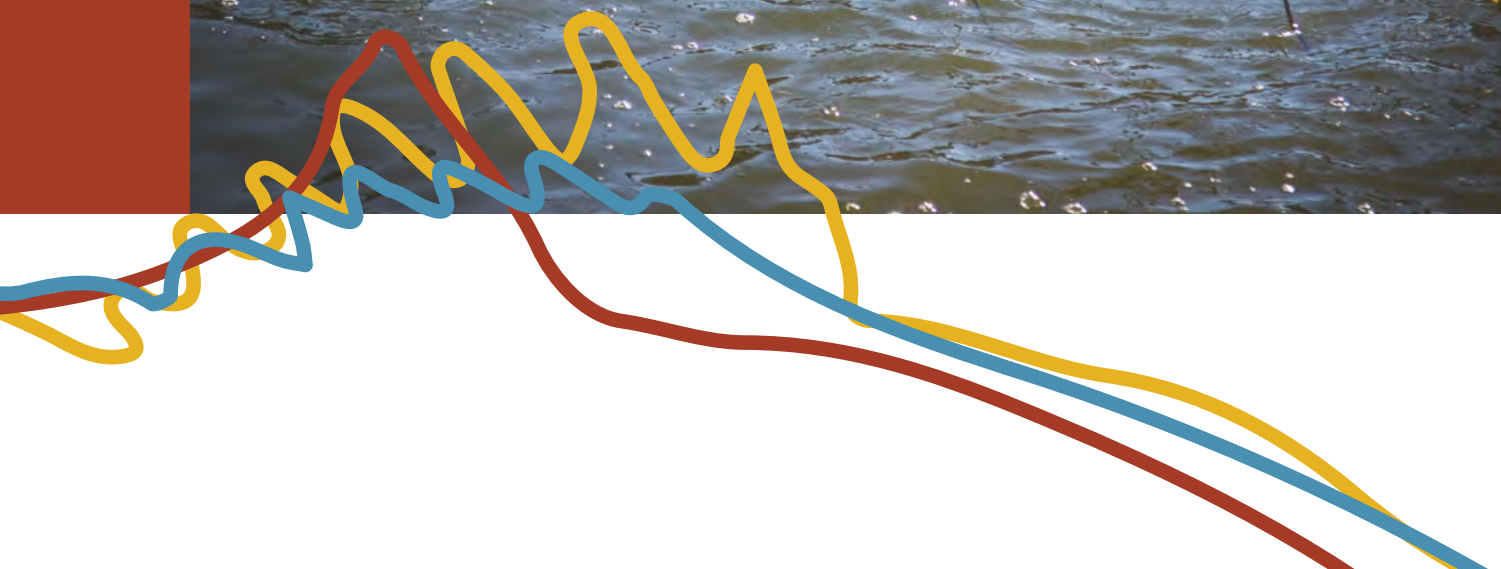


NATIONAL CARP CONTROL PLAN

Carp questionnaire survey and community mapping tool



This suite of documents contains those listed below.

NCCP TECHNICAL PAPERS

1. Carp biocontrol background
2. Epidemiology and release strategies
3. Carp biocontrol and water quality
4. Carp virus species specificity
5. Potential socio-economic impacts of carp biocontrol
6. NCCP implementation
7. NCCP engagement report
8. NCCP Murray and Murrumbidgee case study
9. NCCP Lachlan case study

NCCP RESEARCH (peer reviewed)

Will carp virus biocontrol be effective?

1. 2016-153: Preparing for Cyprinid herpesvirus 3: A carp biomass estimate for eastern Australia
2. 2018-120: Population dynamics and carp biomass estimates for Australia
3. 2017-148: Exploring genetic biocontrol options that could work synergistically with the carp virus
4. 2016-170: Development of hydrological, ecological and epidemiological modelling
5. 2017-135: Essential studies on Cyprinid herpesvirus 3 (CyHV-3) prior to release of the virus in Australian waters
6. 2020-104: Evaluating the role of direct fish-to-fish contact on horizontal transmission of koi herpesvirus
7. 2019-163 Understanding the genetics and genomics of carp strains and susceptibility to CyHV-3
8. 2017-094: Review of carp control via commercial exploitation

What are the carp virus biocontrol risks and how can they be managed?

9. 2017-055 and 2017-056: Water-quality risk assessment of carp biocontrol for Australian waterways
10. 2016-183: Cyprinid herpesvirus 3 and its relevance to humans
11. 2017-127: Defining best practice for viral susceptibility testing of non-target species to Cyprinid herpesvirus 3
12. 2019-176: Determination of the susceptibility of Silver Perch, Murray Cod and Rainbow Trout to infection with CyHV-3
13. 2016-152 and 2018-189: The socio-economic impact assessment and stakeholder engagement
Appendix 1: Getting the National Carp Control Plan right: Ensuring the plan addresses community and stakeholder needs, interests and concerns
Appendix 2: Findings of community attitude surveys
Appendix 3: Socio-economic impact assessment – commercial carp fishers
Appendix 4: Socio-economic impact assessment – tourism sector
Appendix 5: Stakeholder interviews
Appendix 6: Socio-economic impact assessment – native fish breeders and growers
Appendix 7: Socio-economic impact assessment – recreational fishing sector
Appendix 8: Socio-economic impact assessment – koi hobbyists and businesses
Appendix 9: Engaging with the NCCP: Summary of a stakeholder workshop
14. 2017-237: Risks, costs and water industry response
15. 2017-054: Social, economic and ecological risk assessment for use of Cyprinid herpesvirus 3 (CyHV-3) for carp biocontrol in Australia
Volume 1: Review of the literature, outbreak scenarios, exposure pathways and case studies
Volume 2: Assessment of risks to Matters of National Environmental Significance
Volume 3: Assessment of social risks
16. 2016-158: Development of strategies to optimise release and clean-up strategies
17. 2016-180: Assessment of options for utilisation of virus-infected carp
18. 2017-104: The likely medium- to long-term ecological outcomes of major carp population reductions
19. 2016-132: Expected benefits and costs associated with carp control in the Murray-Darling Basin

NCCP PLANNING INVESTIGATIONS

1. 2018-112: Carp questionnaire survey and community mapping tool
2. 2018-190: Biosecurity strategy for the koi (*Cyprinus carpio*) industry
3. 2017-222: Engineering options for the NCCP
4. NCCP Lachlan case study (in house) (refer to Technical Paper 9)
5. 2018-209: Various NCCP operations case studies for the Murray and Murrumbidgee river systems (refer to Technical Paper 8)



FRDC

FISHERIES RESEARCH &
DEVELOPMENT CORPORATION

FINAL REPORT

Carp questionnaire survey and mapping tool: CarpMap

**Empowering the community to be part of the national solution to
Carp through the National Carp Control Program**

Centre for Invasive Species Solutions and

Peter West - NSW Department of Primary Industries

10 May 2019

FRDC Project No 2018/112

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Carp Questionnaire Survey and community mapping tool – CarpMap – Empowering the community to be part of the national solution to Carp through the National Carp Control Program

FRDC Project No 2018/112

2019

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Executive Summary

This project was undertaken during 2018-19 by the Centre for Invasive Species Solutions and NSW Department of Primary Industries, in consultation with FRDC and research staff from the CSIRO.

The project arose out of the need to better understand carp aggregation behaviour to inform the NCCP epidemiology modelling. Detailed population data is required to inform a strategic release plan for the carp biocontrol, and to identify possible consequences of the release.

The primary objective of this project was to design and deliver a national carp questionnaire survey (via a new carp community portal) for FRDC and CSIRO to consult community users to gather information about historical carp aggregations within inland waterways, and to supply survey and questionnaire results to FRDC.

The project undertook the following:

1. Developed a dedicated and purpose-built mapping, monitoring and recording system (using mobile platforms) for carp aggregations, and monitoring the consequences of carp control.
2. Utilised existing FeralScan www.feralscan.org.au technology to support a dedicated National Carp survey and mapping tool.
3. Deployed a Carp Questionnaire Survey designed by FRDC and CSIRO as a citizen science survey of members of the community (including key waterway users)
4. Provided NCCP and CSIRO project partners with access to all Carp Questionnaire Survey data from the community about historical carp aggregations.

This main output of the project is a new community mapping website named CarpMap (available at www.carpmap.org.au) (built on the existing FeralScan community platform www.feralscan.org.au) in September 2018, for deploying the Questionnaire Survey to waterway users. This was designed to potentially accommodate for future collection and mapping of carp data and for community engagement. This provided the platform for deploying the national Carp Questionnaire Survey, capturing participant statistics, and housing survey responses in associated databases.

The CarpMap website and survey provided an effective means of capturing community information about historical carp aggregations, and also enabled community participants to provide historical photographic evidence of carp aggregations in waterways.

The survey was completed by 568 participants over 6 months, after 637 initially registered to participate. All survey data were supplied to CSIRO and FRDC as requested for assessing progress and promotion of the survey, and for subsequent detailed analysis by CSIRO.

This project has demonstrated the capacity of online survey tools to support community-based reporting of carp aggregations in inland waterways. If carp biocontrol become a reality in Australia, the CarpMap website and survey tool could easily be re-deployed to encourage community-based reporting of carp mass fish-kill events. This could enhance the real-time collection of carp biocontrol results from community groups and waterway stakeholders.

The CarpMap website is available for use beyond the current project, and could be promoted further as a means of gathering further community information about carp behaviour in inland waterways.

Keywords

CarpMap, www.carpmap.org.au, national carp survey.

Introduction and background

This project arose out of the need to better understand carp aggregation behaviour to inform the NCCP epidemiology modelling. A trial survey was completed for the Lachlan catchment in conjunction with CSIRO. This trial provided the basis for this project.

The National Carp Control Plan (NCCP) was established to explore the possible release of the carp virus, Cyprinid herpesvirus 3. The NCCP is a \$15 million program under the Fisheries Research and Development Corporation (FRDC), delivered on behalf of the Australian Government. The objectives of the NCCP include using the best available science to develop a smart, safe, effective and integrated approach to controlling carp impacts, by working together and incorporating feedback from the Australian community.

One of the potential tools for controlling carp impacts is a biocontrol agent (ie, Cyprinid herpesvirus 3). If approved for use as a biocontrol for carp in Australia's waterways, detailed information will be required to plan the release of the virus, and to mitigate any adverse impacts. More specifically, detailed population data will be required (initially in 2018, and for several years) to inform a strategic release plan for the carp biocontrol, and to identify possible consequences of the release. This project will address these needs by developing and delivering web mapping technology for community users across the Murray-Darling Basin (utilizing established NCCP & FRDC networks, community groups, and stakeholder organisations).

This project involved 3 stages

Stage 1 - Develop and deploy a national Carp Questionnaire Survey via a carp community portal to gather information from the community about historical carp aggregations.

Stage 2 - Develop a CarpMap website and mapping tool (desktop and optimised for mobile devices) for people to record carp aggregations once the Questionnaire survey is no longer required. This item will proceed if the CarpMap website becomes redundant.

Stage 3 - Develop an operational tool (phone app) for community members to report observations of carp control outcomes from the field (funded separately in 2019/20 - and contingent on carp biocontrol approvals). Note, this item was not funded in the current project.

This will centralize historical and current carp population and behaviour data together for researchers and operational agencies.

Objectives

This project included 9 specific objectives:

1. Develop a dedicated and purpose-built mapping, monitoring and recording system (using mobile website platforms) for carp aggregations, and monitoring the consequences of carp control.
2. Utilise the existing FeralFishScan www.feralfishscan.org.au technology, and the FeralScan web platform (and associated services), to provide the base technology for a dedicated national carp survey, and carp mapping tool.

3. Develop and deploy a Carp Questionnaire Survey (survey designed by FRDC/CSIRO) as a citizen science survey to enable members of the community (including key waterway users) to record historical carp aggregations or concentrations.
4. Develop a dedicated database for Carp Questionnaire Survey responses, integrated within the FeralScan database, and displays relevant results on a carp activity map via the carp website.
5. Provide NCCP stakeholders with access to Carp Questionnaire Survey and Mapping tool, data recorded by community and waterway user groups.
6. Supply a real-time monitoring dashboard of carp data for stakeholders to examine trends in carp information (including charts and tables) recorded into a community mapping tool.
7. Establish database of public participants involved in carp monitoring for future FRDC community programs and communications.
8. Develop notifications for Project team members to be alerted to addition of new data in the carp mapping program, and provide editing tools to enable attributes of the data to be amended by project staff if required, such as Project Scientists. Note: this will be via email notifications.
9. Provide image gallery of carp aggregation images from the community (geotagged to records), and displayed for project team members only in an internal Gallery.

Milestones of project

31-8-2018	Contracts signed Project commencement and website design specifications set Website software development commenced Development of carp questionnaire survey and website
29-09-2018	Draft website and questionnaire submitted for approval
05-10-2018	User acceptance testing (UAT) completed and go live of survey website, subject to approvals
31-01-2019	Finalised questionnaire survey and website provided for community usage Website completion by software developers Website rollout Provision of data to FRDC and relevant stakeholders/steering committee
01-04-2019	Agreed questionnaire and survey provided indefinitely, subject to approvals
20-04-2019	Final reporting on project

Method

This project included 6 distinct development and implementation components, as follows:

Item 1. Project commencement and website design specifications. This involved consultation with FRDC about immediate and medium-term data gathering requirements. This included development of design specification, and seeking of quotes from technical service providers.

Item 2. Development of Carp community Questionnaire Survey to gather information from the community about historical carp aggregations in local waterways.

Item 3. Development of a carp mapping portal to deploy the Questionnaire Survey, and an engagement website (utilising the existing FeralScan system architecture) and road-test through NCCP and FRDC. This used existing platform technology but was a distinct stand-alone carp website with appropriate NCCP branding, style design, and carried key messages consistent with NCCP website content. This was accessible from the NCCP website <http://www.carp.gov.au/> and allowed seamless transition from the NCCP website to the carp mapping tool.

Item 4. Questionnaire survey, website and mapping tool rollout and promotion:

A) The Questionnaire survey was deployed from new carp web site and landing page. This included some instructions for users to help people to participate, and an email address authentication tool to maximise the reliability of user supplied survey results.

B) Website – The website was a stand-alone service, and was linked to from existing NCCP/FRDC websites, plus CISS communications tools (eg. newsletters).

C) The proposed app will be considered for future field-based recording of carp data. Note, this item was not funded in the current project or contract.

Item 5. Provision of data to FRDC and relevant stakeholders, including statistical analysts and project scientists. This occurred throughout all stages of the project, and included a full export and supply of all data at project completion to ensure FRDC/NCCP and project partners had ready access to all datasets.

Item 6. Provision of dashboard monitoring data to project partners.

Data collection fields

The project data collection fields were defined by CSIRO and NCCP staff, and detailed in the Technical Specifications document. They included:

- User details (registered or non-registered user specifications)
- User/contributor information (name, email address, mobile phone number)
- Carp Aggregation datasets
- Year, month
- Closest township (for location validation purposes)

- Location of carp aggregation
- Waterway type
- Waterway condition, eg in flood, high flow, normal flow, low flow, drying, etc
- Duration of carp spawning event
- Number of carp seen during aggregation event, eg <10, 11-100, 101-1000, >1000
- Carp aggregation reasons (spawning, migration, etc)
- Comments/Notes
- Photo upload (with terms and conditions)
- Following the deployment of the Questionnaire survey and mapping portal, additional data fields will be added to enable the carp mapping program to record
- Location of carp control (including biocontrol)
- Observations of the consequences of carp control (such as mass fish kill events) These will be tied to a series of custom-designed Alert Notifications to enable operational agencies to receive notifications about incidents and respond accordingly.

Functionality

The CarpMap resource was purpose-built to incorporate the following functionality:

1. Offline/online usability for mapping carp and habitat parameters regardless of network coverage
2. Submission and retrieval of data when internet connection is re-established
3. Easy method of recording carp activity and submission of detailed field data
4. Photo capturing tools, GPS geo-location services and navigation assistance
5. Real-time tracking for navigation, and real-time display of carp data
6. Synchronisation of web and application data into one database
7. Web-data sharing of all carp data with FRDC and NCCP stakeholders in an agreed format for analysis
8. Dashboard of live records collected by community users and stakeholders, summarised into tables and charts for easy interpretation
9. Heat map of carp aggregation hotspots, including aggregations and/or die-off events.

Note: Items 8 and 9 were not undertaken during the project because it was decided that the continuous delivery of survey data to FRDC and CSIRO project staff was adequate, especially given initially low levels of public response. Item 9 would be far more relevant for post carp virus release scenarios.

Outputs & Outcomes

This project aimed to deliver

1. New National Carp Questionnaire Survey tool for community user groups.
2. New community mapping website (built on the architecture provided by the existing FeralScan community platform) in September 2018, for deploying the Questionnaire Survey and for future collection and mapping of carp data from the field, communication of carp information to community and industry stakeholders, and for community engagement to promote participation in ongoing carp surveillance.

3. New Dashboard (for internal stakeholders) for collating, charting and summarizing data collected within the carp survey and mapping activities. This will provide NCCP project partners and stakeholders with the capacity to examine, analysis and interpret data recorded by community, and see trends in data throughout the Program, such as numbers of new carp breeding aggregation recorded by community participants in various regions of the MDB.

4. Instructions to support people to participate in the survey and mapping activities. This will be accessible for mobile web users.

5. New domain for the NCCP community carp mapping platform, namely www.carpmap.org.au for the interactive National Carp Mapping resource.

6. New Alert notifications for carp data from community participants, such as notifications to local and regional stakeholders about carp data and photos recorded by community participants.

The proposed software would be purpose-built to provide users with an online Survey Questionnaire and mapping program, plus offline capable Mobile App for recording carp activity (funded separately, and contingent on carp biocontrol approval).

Extension

This project did not include any specific marketing of the Carp mapping program by CISS other than by using existing CISS and FeralScan communications and promotion tools to encourage an existing network of FeralScan users Australia-wide and CISS partners to participate in the new carp surveying and mapping program.

There is no formal consultation with this project. Some stakeholders were involved in user acceptance testing. The survey was seeking responses from many citizens. Feedback to survey participants was provided.

Project team member activity

Project software development and deployment was coordinated by:

Mr Peter West - National Coordinator of FeralScan via www.feralscan.org.au since 2011. Senior Research Officer at NSW Department of Primary Industries and Project Leader for the Centre for Invasive Species Solutions.

This project was implemented with support from CSIRO and FRDC, as below:

- Questionnaire Survey design will be supplied from Dr Peter Durr, CSIRO
- Consultation of stakeholders, user-groups and key organisations Dr Jamie Allnutt, National Carp Control Plan, Project Manager FRDC.

Data type and management

Data was collected in real time through the survey questionnaire and stored within a database associated with the FeralScan platform. This data was automatically sent to CSIRO research partners

at regular intervals throughout the project. The data will remain on the FeralScan database consistent with CSIRO ethics approvals. All survey data will be retained by the CSIRO.

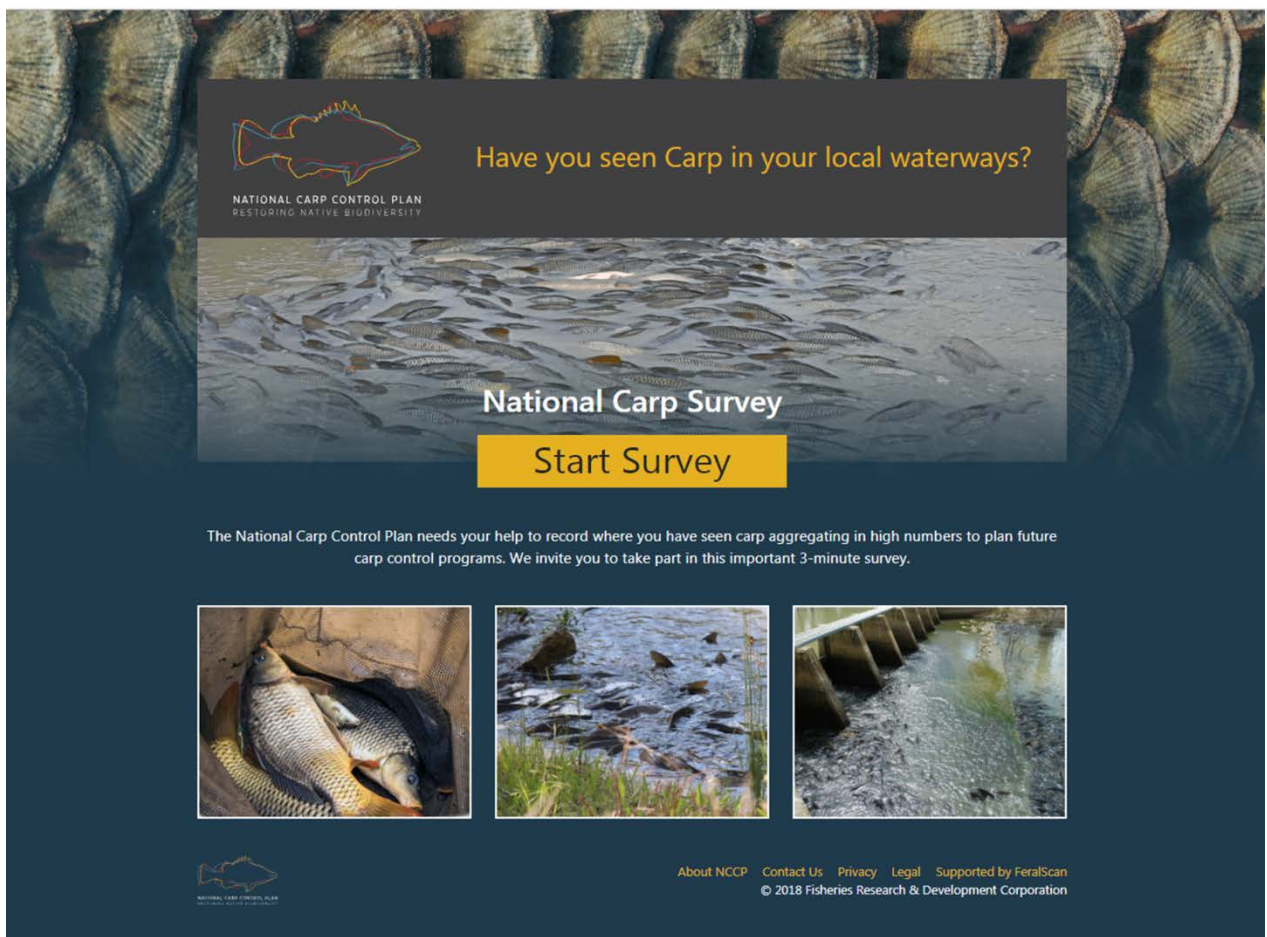
Results

All survey project data from the Questionnaire Survey were supplied to Dr Peter Durr (CSIRO) and Jamie Allnutt (FRDC) for analysis and reporting.

A total of 568 members of the public completed the CarpMap survey during the project term.

This project provided 7 main outputs, which included:

1. New community mapping website (built on the architecture provided by the existing FeralScan community platform) in September 2018, for deploying the Questionnaire Survey and for future collection and mapping of carp data from the field, communication of carp information to community and industry stakeholders, and for community engagement to promote participation in ongoing carp surveillance.



Have you seen Carp in your local waterways?

NATIONAL CARP CONTROL PLAN
RESTORING NATIVE BIODIVERSITY

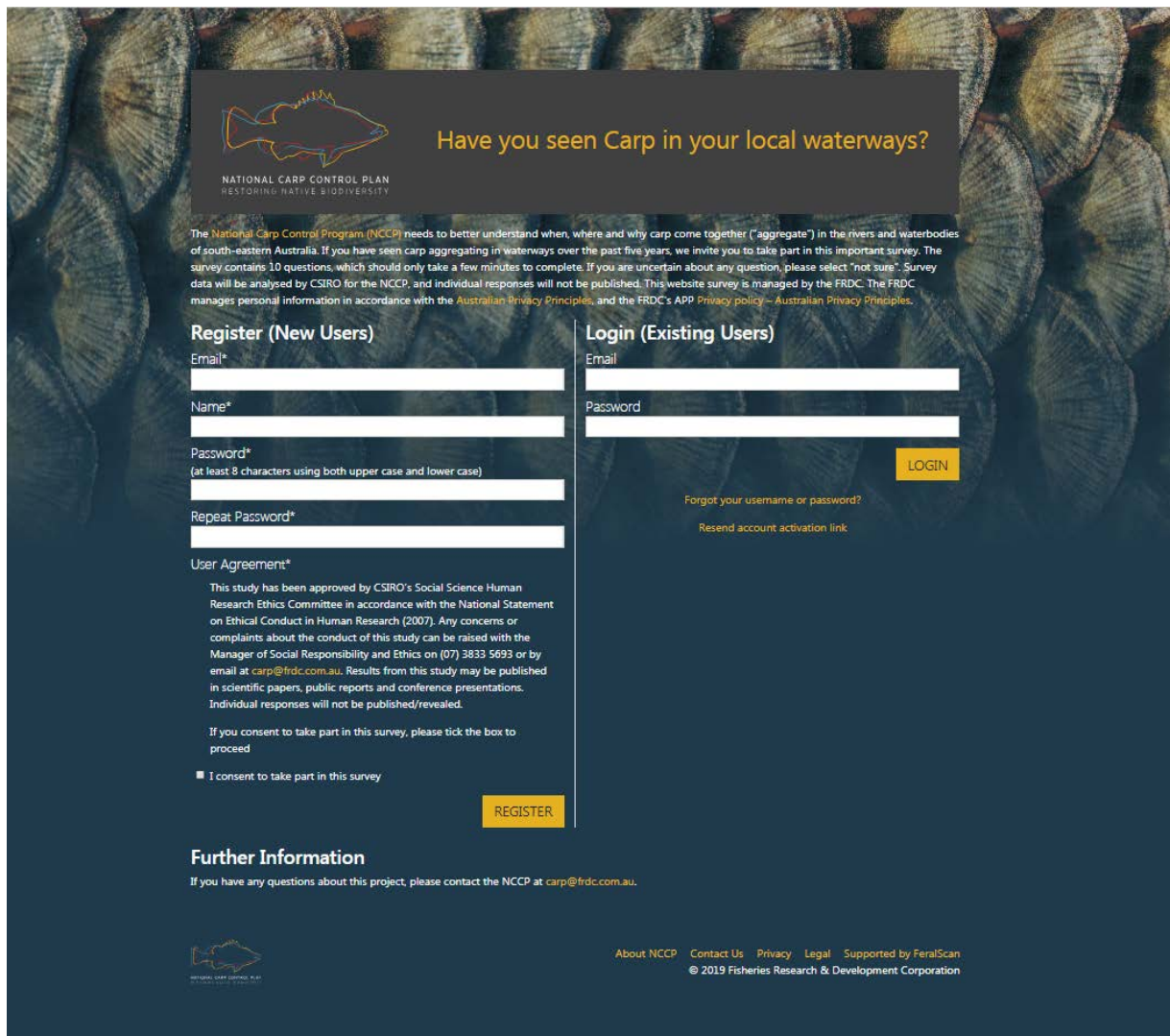
National Carp Survey

Start Survey

The National Carp Control Plan needs your help to record where you have seen carp aggregating in high numbers to plan future carp control programs. We invite you to take part in this important 3-minute survey.

[About NCCP](#) [Contact Us](#) [Privacy](#) [Legal](#) [Supported by FeralScan](#)
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2. New Survey platform that can be maintained into the future and adapted as required for post-virus release needs.



3. New National Carp Questionnaire Survey tool for community user groups through a new website www.carpmap.org.au

Click the map to mark the location of the aggregation event



Where on the waterway did the event occur?

- Below a weir (or other barrier)
- Above a weir (or other barrier)
- Mid-river (i.e. away from a weir or barrier)
- In an irrigation channel
- In a permanent wetland or billabong
- In a lake
- In a temporary (ephemeral) wetland
- In a farm dam or urban pond
- Other:

What was the condition of the waterway during this event?

- In flood
- High flow
- Normal flow
- Low flow
- Drying out
- Other:

What is your best guess for how long the event lasted for (in days)?

What is your best guess of the number of carp within this aggregation or concentration event?

- Less than 30
- 30 to 100
- 100 to 1,000
- More than 1,000
- I'm not sure

Why do you think this event occurred?

- Carp were spawning or getting ready to spawn
- A fish-passage barrier impeded carp migration
- Carp were trying to move to warmer water
- Carp were trying to avoid poor-quality water
- Carp were aggregating to feed
- In response to flow of water
- Carp were concentrated due to the waterway drying
- I'm not sure

If you have any other observations about this event, please note them here

If you have photos of the event, please upload them here (max 2)



Drop files here, or click to select files to upload.

Is there another aggregation event you have observed in the past 5 years that you would like to describe?

- Yes
- No

SUBMIT



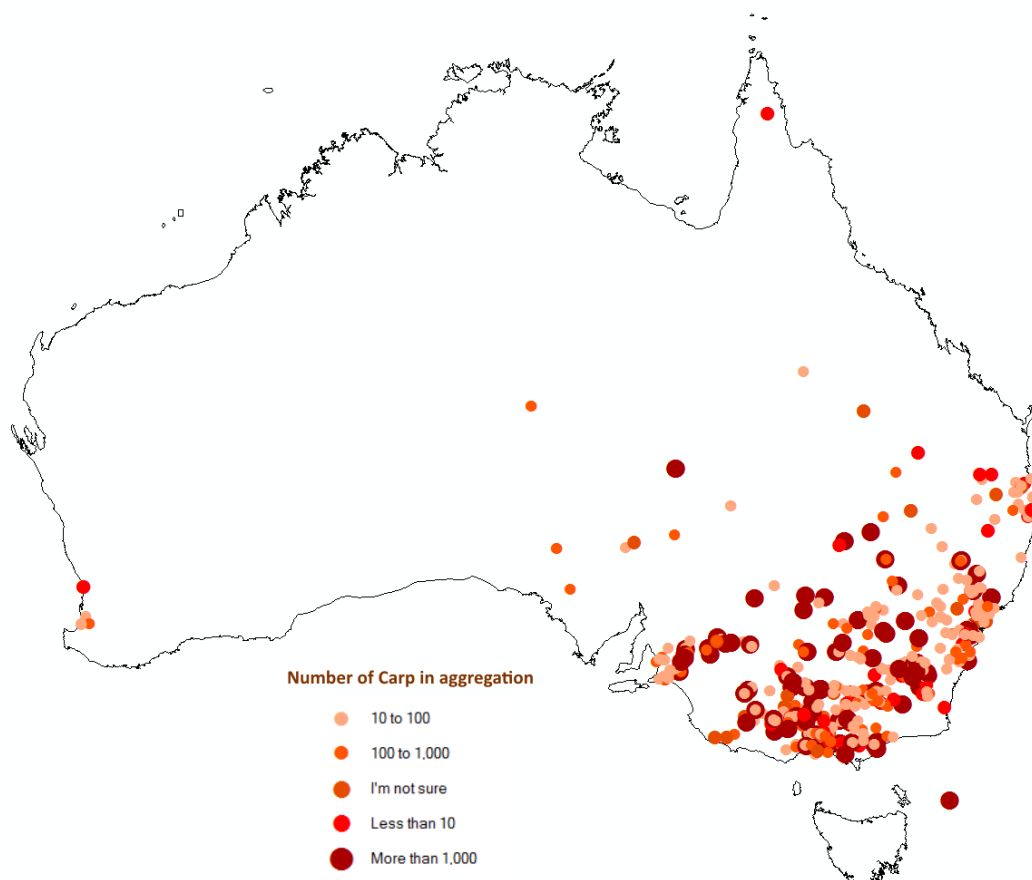
4. Instructions to support people to participate in the survey and mapping activities. This will be accessible for mobile web users. These were stated on the website as:

The **National Carp Control Program (NCCP)** needs to better understand when, where and why carp come together ("aggregate") in the rivers and waterbodies of south-eastern Australia. If you have seen carp aggregating in waterways over the past five years, we invite you to take part in this important survey. The survey contains 10 questions, which should only take a few minutes to complete. If you are uncertain about any question, please select "not sure". Survey data will be analysed by CSIRO for the NCCP, and individual responses will not be published. This website survey is managed by the FRDC. The FRDC manages personal information in accordance with the **Australian Privacy Principles**, and the FRDC's APP Privacy policy – **Australian Privacy Principles**.

5. New domain for the NCCP community carp mapping platform, providing an interactive National Carp Mapping and survey resource that can be used into the future for carp surveys.

The survey was completed by 568 participants, with many reporting seeing aggregations involving over 100 carp. Figure 1 below reveals that some survey participants reported carp aggregations incorrectly at the time of completing the survey – with some survey results appearing at locations outside the range of carp in Australia.

Figure 1. Map displaying location of 568 surveys, and number of carp observed in completed surveys by the respondent.



6. Survey participants database – containing contact information for 637 survey participants. Please note, not all survey participants proceeded to complete the survey after initially registering.

7. Questionnaire survey data and results for 568 completed surveys during the project term from members of the public.

Summary of project data supplied to FRDC at project completion

1. Export of all questionnaire survey results supplied April 2019
2. List of survey participant contact details
3. Image gallery of carp map images supplied during the survey

This project did not proceed with the following items.

- Dashboard of live records collected by community users and stakeholders, summarised into tables and charts. This item was not undertaken during the project because it was decided that the continuous delivery of survey data to FRDC and CSIRO project staff was adequate, especially given the low levels of public responses to the survey
- Heat map of carp aggregation hotspots, including aggregations and/or die-off events. Spatial data from the survey was continuously supplied to the FRDC and CSIRO project members for analysis and examination during the project, and a heat map was deemed unnecessary. Given low levels of public participation, it was also determined that a heat map might be misleading. The heat map would be far more relevant for post carp virus release scenarios, where spatial display of mass fish kill event localities would provide real-time reporting to FRDC and stakeholders.
- New Alert notifications for carp data from community participants, such as notifications to local and regional stakeholders about carp data and photos recorded by community participants. This was developed for the Project Coordinator to monitor survey participation, but was not produced for local or regional stakeholders, as this was not determined to be necessary at informing local communities or stakeholder groups about survey participation. This would be far more applicable to post-virus release scenarios whereby notification of local stakeholders and community representatives may support timely local management responses.

Conclusion and recommendations

The objectives of this project were to design and deliver a website survey and questionnaire tool for FRDC and CSIRO to consult community users regarding carp aggregations in inland waterways. The survey was completed by 568 participants, after 637 initially registered to participate. All data were supplied to CSIRO and FRDC as requested for detailed analyses.

Some survey results were entered for locations that are outside the known range of carp in Australia, possibly as a result of participants mapping their own location, not the location of the carp aggregation event.

This project has demonstrated the capacity of online survey tools to support community-based reporting of carp aggregations in inland waterways. If carp biocontrol become a reality in Australia, the CarpMap website and survey tool could easily be re-deployed to encourage community-based reporting of carp mass fish-kill events. This could enhance the real-time collection of carp biocontrol results from community groups and waterway stakeholders.

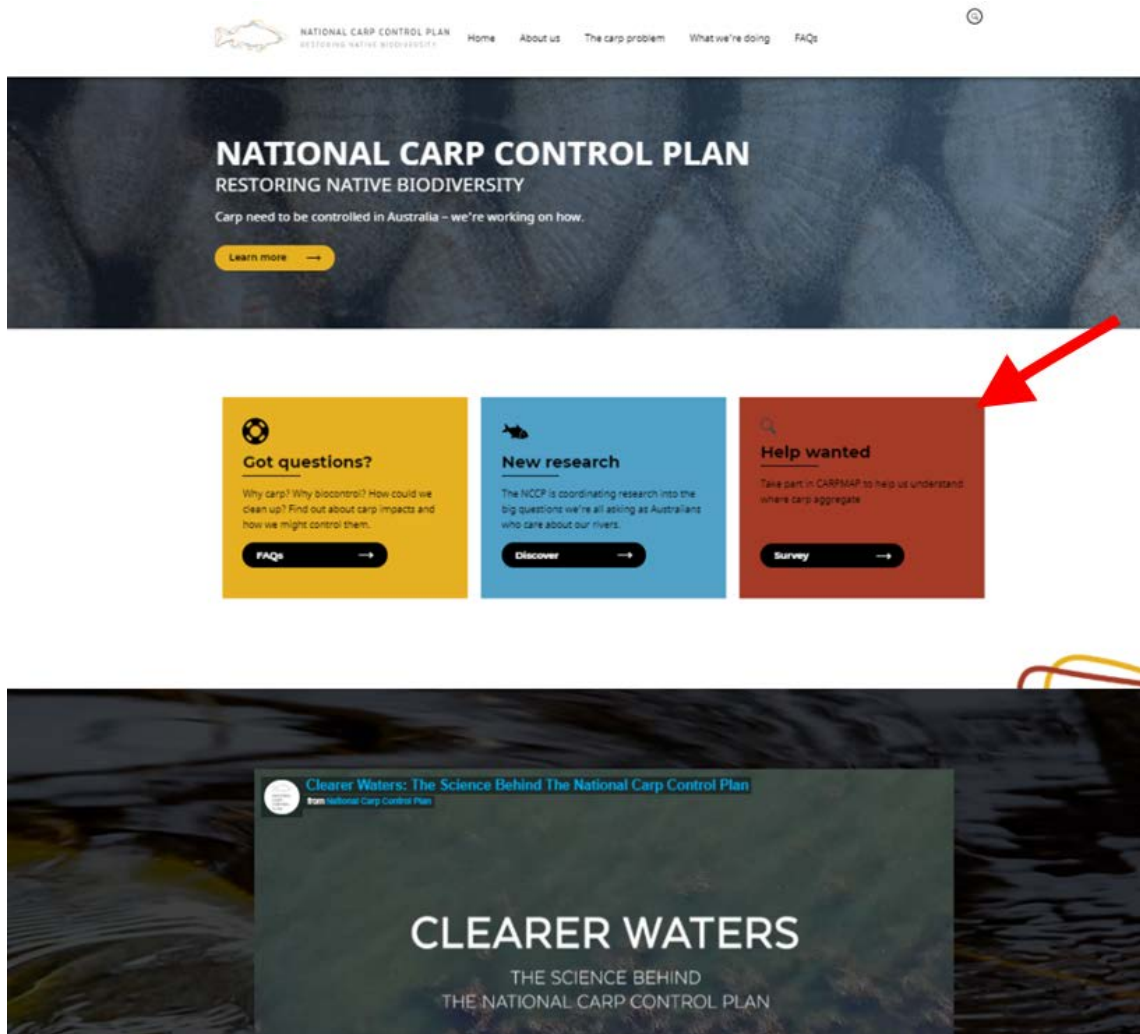
Extension and Adoption

The CarpMap survey was primarily promoted through the FRDC communication channels, including media, newsletters, website cross-promotion, etc. The Centre for Invasive Species Solutions supported FRDC to promote community awareness of the survey using public newsletters, the PestSmart website, and through the existing FeralScan website.

The CarpMap website is available to be used beyond the term of the current project, and could be promoted further as a means of gathering further community information about carp behaviour in inland waterways prior to, and after future carp biocontrol.

Project coverage

Promotion of the CarpMap questionnaire and survey was primarily coordinated by FRDC through existing organisation avenues and networks. For example, the survey was promoted via the NCCP website - <http://www.carp.gov.au/>



Project materials developed

This project developed the CarpMap website, containing the questionnaire survey platform.

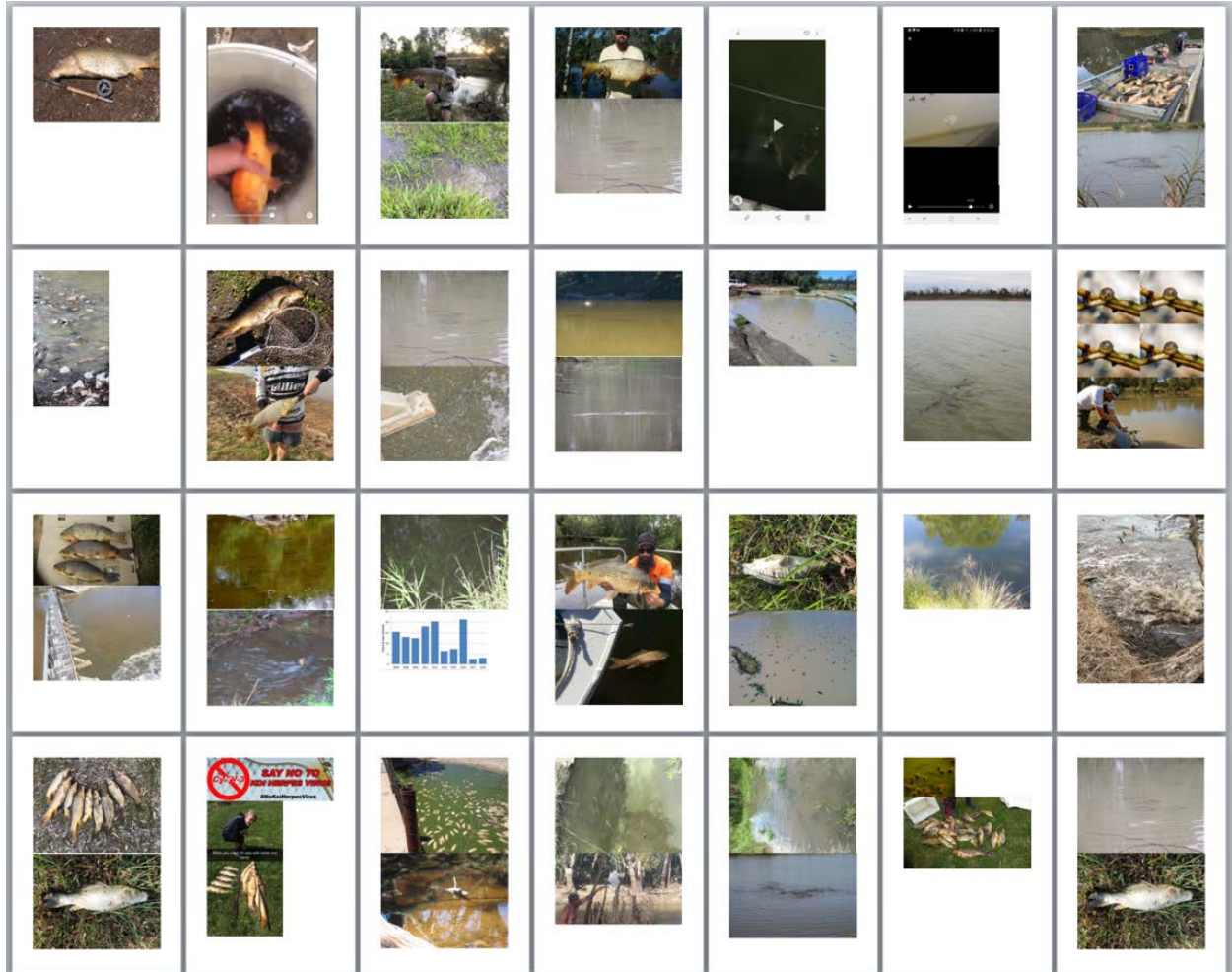
The website is <https://carpmap.org.au>

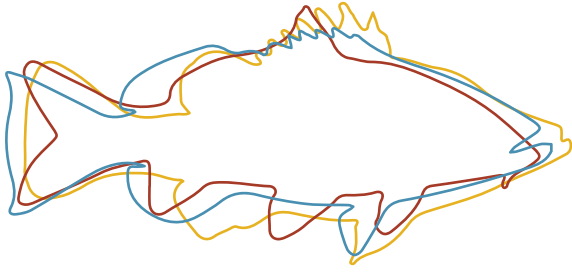
Supporting this website is a content management system and carp survey database, housed in NSW and administrated by the Centre for Invasive Species Solutions.

The CarpMap website can potentially be utilised beyond the project term during the remainder of the CISS collaboration (until mid-2022).

Appendices

Appendix 1. Questionnaire survey images supplied by respondents.





NATIONAL CARP CONTROL PLAN

The National Carp Control Plan is managed by the
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