

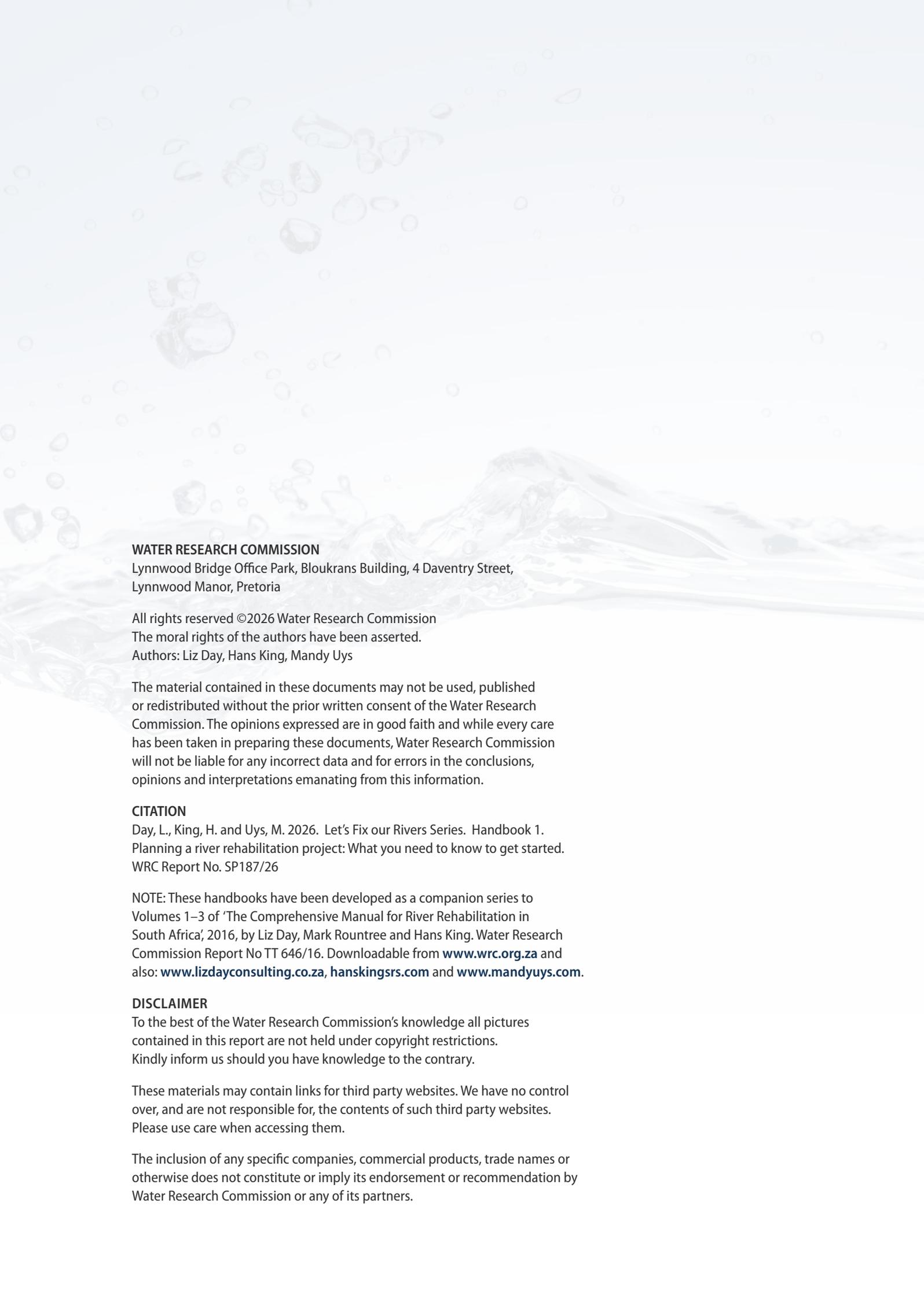
# LET'S FIX OUR RIVERS!

A COMPANION SERIES TO THE WRC COMPREHENSIVE  
MANUAL FOR RIVER REHABILITATION IN SOUTH AFRICA



## PLANNING A RIVER REHABILITATION PROJECT: What you need to know to get started

Liz Day • Hans King • Mandy Uys

A background image of water splashing, with numerous bubbles and droplets of varying sizes scattered across the upper and middle portions of the page. The water appears to be moving from the right side towards the left, creating a sense of dynamic motion.

## **WATER RESEARCH COMMISSION**

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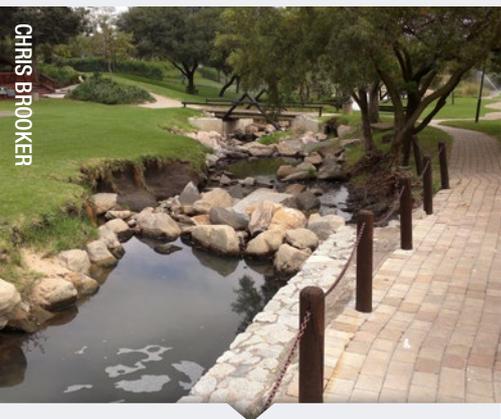


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You are probably only reading this handbook because you are a citizen, or citizen scientist, concerned about some aspect of a river or rivers that you know or are involved with. Perhaps the river is showing obvious signs of damage/degradation, such as erosion and bank collapse, which threaten property and infrastructure. Perhaps the river has changed subtly over the years, and you or your community realise that it no longer provides the same amenity or biodiversity services it once did. Perhaps it has become polluted and is a risk to human health, livestock or natural ecosystems. It might also be affecting downstream systems such as lakes or wetlands. This series has been written for communities, citizen scientists, farmers and others who need guidance on how to get started with river rehabilitation.



CHRIS BROOKER

River bed and bank erosion through a small housing development in Gauteng. Fast-flowing stormwater flows from upstream developments made the river banks erode and deepened the bed (i.e. it incised). Erosion threatened adjacent roads, bridges and amenity areas and resulted in significant deterioration of riverine habitat quality, prompting rehabilitation interventions

# WHEN AND WHY TO REHABILITATE RIVERS (OR SECTIONS OF A RIVER)

This handbook is intended to guide you in thinking through various rehabilitation possibilities and approaches as you embark on the journey towards fixing your river.

The material draws on rehabilitation principles and practices that have been developed by practitioners around the world, and which provide structured approaches to assist in practical planning and implementation of river rehabilitation projects.

## What's in a name? Rehabilitation, restoration or remediation ...

These three terms are all used to describe activities undertaken to improve or enhance river ecosystems in some way. Internationally, the term restoration is increasingly used as an umbrella term to cover all efforts aimed at assisting the recovery of ecosystems that have been damaged, degraded or destroyed, where the ultimate aim is to achieve substantial ecosystem recovery. That is, to bring the ecosystem back to, or close to, its natural (or "reference") condition.

In South Africa, our National Water Act does not speak about restoration, but refers to both 'rehabilitation' and the need to 'remedy' various impacts affecting watercourses. For this reason, the terms 'rehabilitation' and 'restoration' are used interchangeably in this handbook, but the latter is used most frequently as a general term for improving some aspects of river ecosystems. The terminology recognises that the 'substantial restoration' of a river back to its natural condition is usually an unrealistic goal for our degraded systems. However, it is important that at least some ecological improvement in river condition should be aimed for, and that rivers in a near-natural condition should be actively protected.

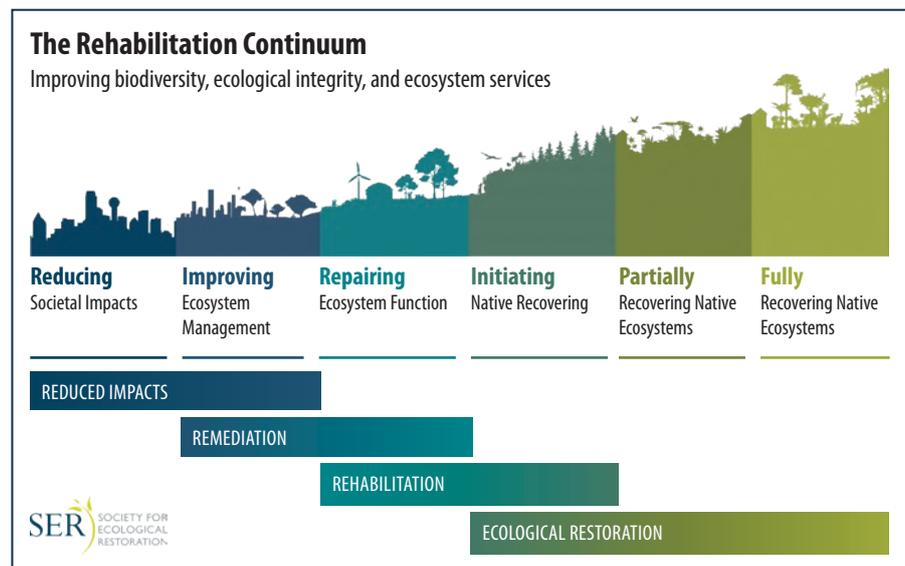


Figure after Gann et al. (2019)

# RIVER REHABILITATION IS A PROCESS



Planning and implementing river rehabilitation projects can be costly and time-consuming. These projects can also sometimes affect a number of users and other stakeholders, as well as important and/or sensitive natural ecosystems. It is thus important that rehabilitation projects are carried out in a structured way that allows stakeholders to:

- Understand the risks and costs involved in rehabilitating – and the risks and costs of doing nothing;
- Be informed by appropriately experienced professional advisors; and
- Engage in planning and implementation activities, so that those involved ‘learn through doing’ and can adapt the project design and implementation methodology accordingly.

River rehabilitation projects need to be seen as processes that must be considered carefully at each of their stages, and be informed by science, new as well as tried and tested technology, community values, and conservation and/or biodiversity priorities. They need to respond to the changing global climate and other conditions that require resilient river ecosystems. At the same time, they can present opportunities to respond to important social issues such as unemployment and land reform.

New information / data or changing circumstances should also inform what is being planned and implemented, so that the best decisions based on the best available knowledge and understanding can be made at all times. At the same time, it is important to keep the end goal in focus, so that the project’s original objectives don’t get lost along the way.

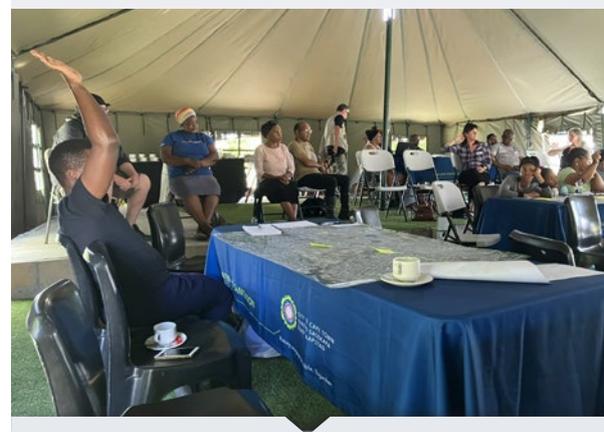
This handbook provides guidance around the kinds of processes that should be engaged with in planning and doing river rehabilitation projects. It is also important that the rehabilitation objectives are not seen as end-states – rivers are dynamic ecosystems that require ongoing attention in a world where many of the natural ecosystem elements have been permanently changed. Ecological maintenance is a critically important part of river rehabilitation projects.



Poorly designed roadworks upstream resulted in concentrated flows through this watercourse, precipitating erosion / channel incision. This situation requires urgent intervention to prevent worsening erosion



Eroding river rehabilitated with gabion weirs – but sedimentation upstream requires ongoing maintenance (removal)



Stakeholder engagement in rehabilitation planning brings new insights and information



SEE **HANDBOOK 6** AND **HANDBOOK 3** FOR WAYS TO MAINTAIN RIVER SYSTEMS AND MIMIC NATURAL DISTURBANCE.



# PRINCIPLES OF RIVER REHABILITATION

River rehabilitation interventions may be driven by passion or need (for example, a strong desire to fix a damaged river, or the need to address an issue that is threatening lands, livelihoods, infrastructure or important ecosystem services).

Whatever the reason for embarking on a rehabilitation project, there are eight principles that are useful starting points and which should help interested parties to move from an initial concern or vision to on-the-ground strategies and interventions. These principles were put forward by the international Society for Ecological Restoration (SER) and have been expanded on here in a South African context.



Inappropriate road drainage triggered severe erosion that dried out a spring in this wetland, depriving landowners of their only water source. Urgent intervention was clearly required



**IMPORTANT NOTE:** River rehabilitation projects that apply these principles are more likely to succeed and to make a measurable difference at a catchment scale. They may also be more successful in attracting funding from global donors, as they speak to international rehabilitation goals. However, many river rehabilitation projects are aimed at achieving less ambitious but still worthy objectives that might ultimately find broader traction if carried out at scale by multiple implementing agents.



## PRINCIPLE 1

### ENGAGE WITH STAKEHOLDERS

Engaging with local communities and individuals who may have local, current or historical knowledge of the river system in question can provide vital context and background that might otherwise be missed. Successful long-term rehabilitation projects are usually those that draw in local communities to champion the project and who will see it through in its maintenance phases. It is critically important to have community/stakeholder/landowner buy-in to river rehabilitation projects from the start. The degree to which these groups feel included and engaged in the project often determines how well it is sustained and taken forward in the long term. Stakeholders should be drawn into the visioning and design of a rehabilitation intervention from its earliest phases.



## PRINCIPLE 2

### PROJECTS SHOULD DRAW ON MULTI-DISCIPLINARY EXPERTISE

River restoration is often done in response to changes in the drivers of river condition – water flows; water quality; sediment loads **SEE HANDBOOK 2**. These may result in complex ecosystem responses (e.g. changes in vegetation patterns). Rehabilitation projects are enriched and strengthened by input from a range of specialists in different disciplines and by people with a history of local knowledge and experience. It is essential to include specialist input into rehabilitation projects.





### PRINCIPLE 3

#### PROJECTS SHOULD BE INFORMED BY AN UNDERSTANDING OF NATURAL PRE-IMPACT CONDITIONS

Many rivers or wetlands have been permanently changed from their natural or 'reference' conditions, and true restoration back to natural is often not a possibility. It is however important to know how and why these systems have changed, and what might assist or limit rehabilitation efforts now.



Near-reference valley bottom wetland with limited invasion by alien plant species



The same valley bottom wetland, but alien-invaded, with the flood flow-path choked by dense alien trees, resulting in scour of the natural wetland, loss of peat soils and an unstable sand and rocky base



### PRINCIPLE 4

#### PROJECTS SHOULD SUPPORT NATURAL ECOSYSTEM RECOVERY PROCESSES

Rehabilitation design and implementation should try to kick-start natural ecosystem processes that will strengthen rehabilitation going forwards. Examples include bringing in indigenous plants with fruit or seeds that birds will distribute further along the river corridor, or clearing alien trees from sand bars that can then be remobilized by floods.



### PRINCIPLE 5

#### PROJECTS SHOULD SET CLEAR GOALS AND MEASURABLE OBJECTIVES

Setting clear, attainable and measurable rehabilitation goals is important and must be informed by all of the above principles. Goals should include the desired outcomes against which progress can be measured. Developing an understanding of the present (pre-rehabilitation) state of the river in terms of its habitats, water quality, and animal and plant communities, structure and interactions, is one of the early tasks in a rehabilitation project. Usually a desktop study or a river survey by specialists is needed here. The present state informs what kind of ecosystem changes may be realistically possible in the short-, medium- and long-term, and this enables one to set objectives. An estimation of the financial costs of the rehabilitation measures (**versus the often immense cost of doing nothing**) is also essential, along with an understanding of who should and will bear these costs.



### PRINCIPLE 6

#### PROJECTS SHOULD SEEK THE MAXIMUM FEASIBLE ECOSYSTEM RECOVERY

The realistic scale and scope of rehabilitation projects are affected by historical changes, current threats outside of the control of the project, funding, land ownership, legal requirements, and community and political buy-in (because river rehabilitation is not often a priority for political parties and their municipalities). Despite these challenges, projects should still aim for maximum ecosystem recovery, and with a long-term view, should consider the possibilities for increasing the effort or reach of the project through future funding or partnerships.



### PRINCIPLE 7

#### PROJECTS SHOULD IDEALLY GAIN CUMULATIVE VALUE WHEN APPLIED AT LARGER SCALES

Many river rehabilitation projects affect only short sections of a river, flowing through a particular erf or site. Ideally however they should complement other initiatives / rehabilitation work in the river or catchment to achieve more measurable improvement in ecosystem function.



### PRINCIPLE 8

#### PROJECTS SHOULD CONTRIBUTE TO OTHER STRATEGIES AS PART OF A SUITE OF ACTIVITIES

The outcomes of river rehabilitation projects can be complemented by other actions not aimed at improving ecosystems. Examples include stormwater attenuation and treatment, and climate change resilience interventions (e.g. improving infiltration and reducing runoff).

These 8 principles are incorporated into the following guidelines for river rehabilitation planning.



**REMEMBER:**

All river rehabilitation projects are different, because rivers are different; they are affected by different issues in different reaches; and the budgets, objectives and time-frames of people and organisations undertaking rehabilitation are also different. So although this handbook outlines principles and steps to guide you along this journey, there can be no 'one size fits' all approach to rehabilitation projects. The steps provided here are a guideline and a different sequence of steps may fit your needs or budget better.

**FOR MORE DETAILS ON THESE STEPS AND PHASES:**

Consult the WRC River Rehabilitation Manual, Volume 1, Chapter 6.



Sometimes, it is difficult to know where even to start with rehabilitation. Following a structured process can help

# REHABILITATION PLANNING AND IMPLEMENTATION: WHERE TO START?

Starting a river rehabilitation project can be daunting. The eight principles already presented should help to guide your thinking – but actually getting going is more difficult. The next few pages of this handbook aim to guide you through the various stages of a river rehabilitation project, what to expect, and what kind of professional input you may need. Note that these projects might focus on short sections (or reaches) of a river only, but if they are implemented iteratively across multiple sites, over time they should have measurable catchment-scale impacts.

The River Rehabilitation Manual on which these handbooks are based presents a 12-step River Rehabilitation process, originally developed for use in Australian river rehabilitation programme.

Essentially, the 12 steps can be broken down into four basic phases:

- **PHASE 1:** Seeing (establishing a vision and deciding what needs to be done)
- **PHASE 2:** Planning (designing and developing a plan)
- **PHASE 3:** Doing (implementing the plan)
- **PHASE 4:** Checking and moving forward (monitoring, review and ongoing maintenance).

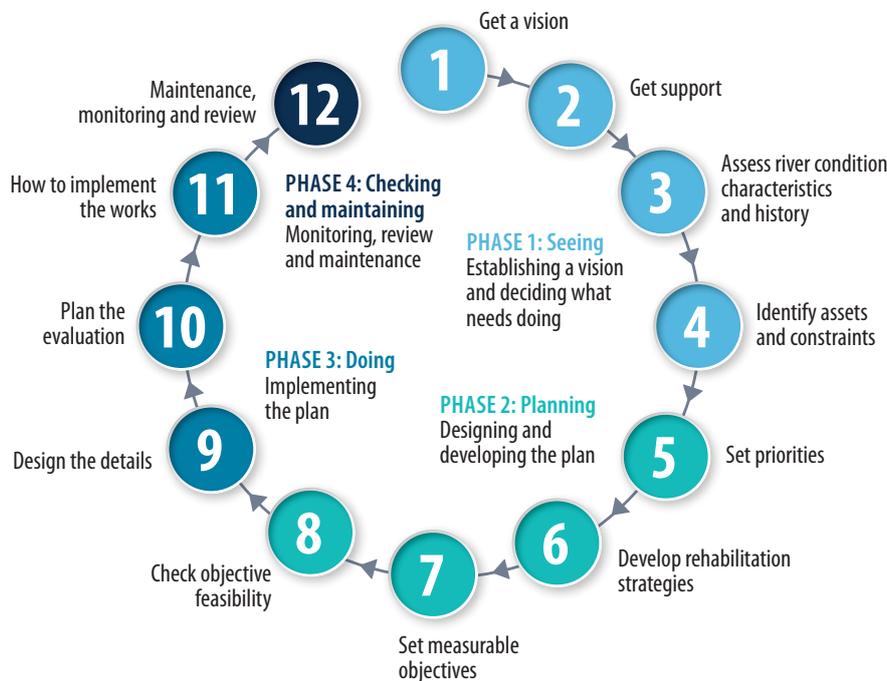


Figure adapted from the Australian Manual for Stream Rehabilitation

As the project progresses and new information and insights are gained, each of these phases may require check-backs and perhaps a re-look at the relevance of the original vision; adjusting of objectives and priorities; and/or re-design of the proposed interventions and how to measure and monitor their progress.

# PHASE 1: ESTABLISHING A VISION AND DECIDING WHAT NEEDS DOING

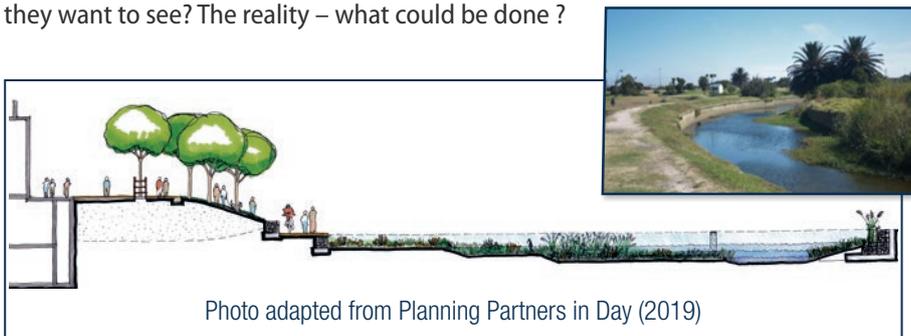


## STEP 1 Establish your goals/vision

This important phase determines the direction of the entire river rehabilitation project. It needs to be realistic, focused and informed by science as well as by the needs and wants of the stakeholders, authorities, and the rehabilitation team.

Sometimes there may be conflicts between ecological and social, aesthetic and amenity objectives, or alternative proposals for the space required to achieve meaningful rehabilitation. These issues all need to be addressed and agreed on during this phase, to develop a common vision.

To start with, gather interested stakeholders and start talking about the river, the big vision, and then what the project objectives should be. What is a manageable scale and scope, and what needs to be done to take the project further? What do they want to see? The reality – what could be done ?



**REMEMBER:** Your vision and objectives might well change over time, as new information becomes available. It is important to keep stakeholders engaged and informed throughout the rehabilitation process.

## STEP 2 Share the vision and get support

Once there is an initial vision for the river, it needs to be communicated to a wider grouping of stakeholders. It is important that authorities are brought on board early in project planning, so that they are part of the process. Useful pointers at this step include making sure that project planning remains flexible and being able to respond to new information or ideas. You should also be thinking about what new information or data you need to inform project planning and design.



**IMPORTANT NOTE:** If your project is small-scale and involves only a river reach on your own land, you won't need to engage with so many stakeholders, other than authorities and possibly your upstream and downstream neighbours. Just ensure through specialist liaison that you won't impact negatively on erosion, flooding or sedimentation of the river up- or downstream, and that your activities are legal.

### WHO SHOULD BE BROUGHT INTO THESE EARLY CONVERSATIONS?

Important stakeholders would include:

- Municipal officials (from environmental, stormwater management, town planning and parks and amenity portfolios (which differ between municipalities);
- Other authorities (e.g. DWS, DFFE, Agriculture);
- Water User Association representatives (in agricultural areas);
- Local communities;
- Catchment forum representatives
- River "Friends" groups and other NGOs with environmental or green space mandates or interests;
- Aquatic ecologists, botanists and engineers with specialist knowledge of river rehabilitation;
- Local residents with long-term knowledge of and interest in the river system;
- Land-owners – including up- and downstream landowners that might be affected by the project or might wish to scale it out into their own properties;
- People with an understanding of the legal processes that might be required for rehabilitation – Environmental Assessment Practitioners for example;
- Businesses / industry / agriculture that might benefit economically (e.g. through global export markets) from a contribution to improving environmental sustainability and might therefore benefit from a contribution to rehabilitation implementation.



River rehabilitation projects can be complex. They may involve interventions that impact on river hydraulics (i.e. the depth, velocity, and direction of flow); sediment deposition; river width and depth; faunal connectivity (does the system allow animals of all sizes to move along the river bed, banks and riparian areas and so complete their life cycles peaceably?); and riverine vegetation including river corridors and buffer areas. Some interventions (such as establishing plants on river banks or removing alien vegetation – **see Handbooks 6 and 9**) can have other unintended impacts, such as promoting flooding or erosion elsewhere. Given this, rehabilitation projects must also allow for input from a range of disciplines, as well as local communities and people with intimate knowledge of the site and its condition over a long period of time. This is covered in Steps 3 and 4.



## PHASE 1 CONTINUED: GATHERING INFORMATION

### STEP 3 Assess and understand the condition of the river and its characteristics and history and how it has been altered from its natural state

This step is where you need to assess the present-day condition of the river. This generally relies on the application of accepted assessment methodologies as well as inputs from those who know the system well. If there are river specialists on the team, they may apply a standard method such as EcoClassification to assess the present-day condition of the river system. **SEE HANDBOOK 2**

Many rehabilitation projects fail because of incomplete or inadequate understanding of riverine processes and how and why they have been altered in the system or at the site in question. Long-term flooding and other disturbance patterns, critical for river ecosystem maintenance, are also often poorly understood. An inter-disciplinary team with some specialist input is important at this stage of rehabilitation planning, and social, economic and political considerations should also be represented.

### Assembling the team

The following kinds of specialists would typically be needed to inform a river rehabilitation project and provide input into what the natural condition of the site or river would have been:

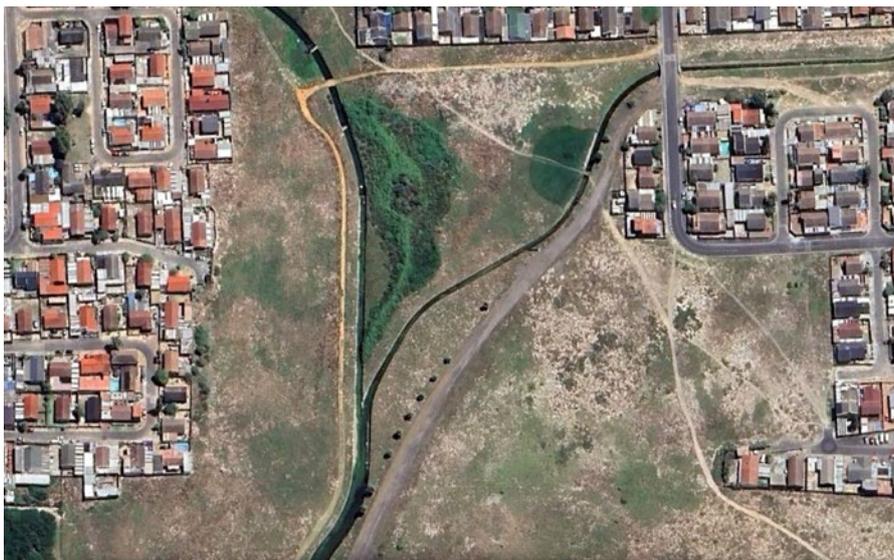
- River ecologist, who should also assess water quality and instream habitat;
- Faunal specialist(s) to assess aquatic invertebrates, frogs, fish, birds and other potentially affected or target fauna;
- Botanist;
- Landscape architect;
- Engineer with experience in river rehabilitation;
- Hydrologist;
- Land surveyor to provide a topographical survey;
- Project manager, to keep the process on track.



**IMPORTANT NOTE:** In some cases, the planned rehabilitation interventions may be relatively simple and may not require all of these complex studies. In all cases though, it is important to step back and question whether any of the interventions planned might trigger unintended negative impacts that would need to be considered, or requirements for legal authorisation. Some of the studies (e.g. specialist Environmental Impact Assessments needed for development and sometimes rehabilitation authorisations) have specific specialist reporting requirements, and timeframes that might delay project implementation if not known up-front.

## STEP 4 Identifying assets and constraints

Information gathered in Step 3 allows the team to identify qualities in the river that should be retained and/or strengthened, and to allow current and potential problems or risks to be identified. These could range from the risk of erosion if alien or other vegetation were to be removed or banks are disturbed, to risks of creating divisions in local communities through particular interventions, to financial risks, and risks in terms of safety and security (e.g. some communities feel unsafe if rivers are densely vegetated with tall trees and reeds, as these may support criminal elements).



Local community engagement in this catchment showed that key priorities were around safety and security. Once paths and lighting had been implemented, the community supported more substantial river rehabilitation initiatives. Phase 1 (shown above and below) allowed for low flows to be diverted from the canal into a rehabilitated wetland. Phase 2 will see removal of the canal wall and creation of a much larger wetland.



Rehabilitation in areas with high levels of solid waste dumping can be challenging



Runoff from informal settlements and poorly managed industry can pose significant constraints to rehabilitation potential



Canals with relatively unimpacted water quality and open space can present excellent rehabilitation opportunities



## PHASE 2: DESIGNING AND DEVELOPING THE PLAN



### REMEMBER:

River rehabilitation takes time, especially when the desired outcome is a biotic response to physical habitat changes (e.g. improving instream habitat quality with the objective of attracting birds and other wildlife may take time, as it will require initial establishment of habitat for aquatic invertebrates, fish, plants and other building blocks for a more complex ecosystem).



GAL BRISTOW

Heron feeding

### STEP 5 Setting priorities

This phase is where the team decides on which activities or stretches of river should be prioritised for rehabilitation efforts. Sometimes the extent and scale of works is constrained by land ownership or access. Important considerations in setting priorities are:

- Budget;
- Capacity of the team to implement the plan;
- Maintenance requirements (it is useless to spend large sums of money and effort on rehabilitation if there is no capacity for management afterwards. Alien clearing is a good example of this);
- The impacts of upstream landuse – what threats or constraints do these impose on meeting rehabilitation objectives (e.g. impacts on water quality or runoff);
- Possibilities for project phasing, with later works piggy-backing on earlier efforts.

It is also important to start by prioritising measures aimed at preventing degradation, or addressing minor impacts, before they get out of hand and require major interventions. Successfully implementing less ambitious rehabilitation projects can also create momentum for funding and implementing larger interventions. Identifying “low hanging fruits” in rehabilitation planning is a useful strategy.

This leads to Step 6.

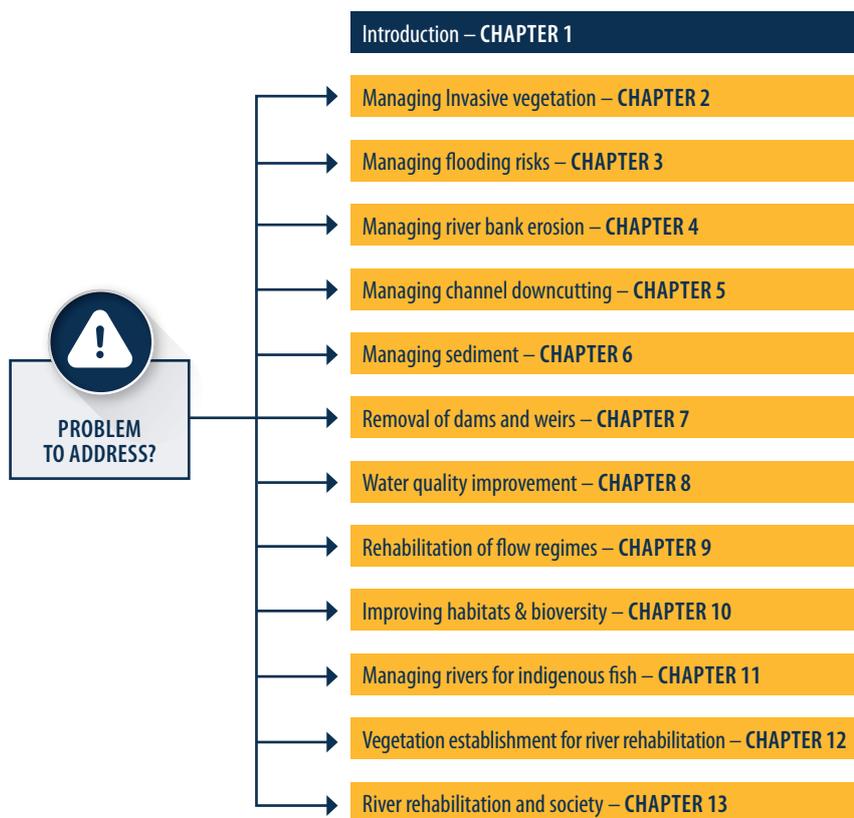
### STEP 6 Develop rehabilitation strategies

This should be the exciting part of the rehabilitation project. Use the insights gained in the previous steps to decide how to address the problems that have been identified and to reach the defined objectives. A useful start would be drawing up a list of options. Annotate the list with potential threats or knock-on effects for each intervention – this helps to ensure that the plan remains true to its over-arching objectives as it evolves.



This river was diverted out of its natural course as a result of sedimentation from erosion in unmanaged forestry areas upstream

ACCESS MORE DETAILED INFORMATION ON RIVER REHABILITATION SOLUTIONS IN THE FOLLOWING CHAPTERS OF VOLUME 2:



Volume 2 of the WRC River Rehabilitation Manual provides detailed information around various options to address key problems in South African rivers, as shown in the graphic to the left. These are condensed in Handbooks 3–9 of this series.



This weir was designed to direct main flows into the Palmiet wetland on the left hand side of the photo while allowing maintenance flows into the eroded artificial channel on the right



Planting areas designed into rehabilitated river channel to improve habitat diversity



Communicating with stakeholders needs to be ongoing in project planning as well as project roll-out/implementation

**STEP 7** Set measurable objectives

Specifying exactly what the project is trying to achieve is important. These objectives should be listed, and ideally linked to some kind of outcome, against which project success can be measured. Examples include: ‘Instream habitat should be diverse and support macroinvertebrate communities likely to attract fish and riverine fauna. River banks should be stable and well vegetated and include nesting areas for pied kingfishers’. Realistic time-frames for improvement should also be estimated. Having good baseline information about current river condition and characteristics (Step 3) is essential for Step 7!

**STEP 8** Check project feasibility

Are your objectives feasible? This step entails considering project costs, timeframes, requirements for authorisation, and the direct and indirect effects of the proposed rehabilitation activities. You might find you need more detailed design information to inform costing, or to explore donor funding options as well.



## PHASE 3: DOING (IMPLEMENTING THE PLAN)



### IMPORTANT NOTE:

Some design details may change in this phase – make sure you check that your design objectives are not compromised by such changes.

### STEP 9 Design the details

This critical step is where you move into detailed design. You may need to bring engineers, landscape architects, landscapers and ecologists onto the project team. Important aspects to consider are:

- Project urgency – is the river degrading (e.g. eroding) at a rate that will make interventions more costly if they are not undertaken immediately? Consulting with DWS and DFFE officials is necessary in such cases.
- Project timing – river works should not normally be carried out in the wet season (when high flows or floods are likely). Other issues may also affect timing, such as nesting or breeding seasons for important fauna.
- The availability of labour, building material or machinery for undertaking the works.

Time required to source and grow up appropriate plants for bank stabilisation

- Approval processes;
- Tenders and budgets for larger rehabilitation projects.

### STEP 10 Plan the evaluation

All rehabilitation projects should be evaluated against their objectives. This allows project success to be measured, even if only qualitatively. It also allows learning from mistakes, and ideally should contribute to wider learning that can be taken forward into other projects. For bigger projects, setting up a Reference Group or other body with oversight of the project's key objectives can be a useful way of ensuring that objectives are met. This can be especially important when external funders are involved or invited.



Propagating indigenous plants for river rehabilitation projects takes time



Rehabilitation objectives are to prevent further erosion; allow road access; and re-establish vegetated habitat



Rehabilitation activities need to be timed to avoid nesting and breeding seasons where possible

## STEP 11 Implement the works

This should be the highlight of the project but its success will reflect on the attention to detail and good planning in the previous phases. Effective, responsive project management is required during implementation. It is also important that the design remains adaptive through the implementation phase – some aspects may prove problematic in reality and these might require design or process changes. Unexpected events such as floods, fires, or strikes, outside of the control of the project might also need to be considered and worked through at the time. At all times, the project objectives should be remembered and should be noted in records, particularly when making changes to the plan during implementation and during auditing of project outcomes.

Sometimes big interventions can look frightening, particularly if large machinery is needed on site. These steps are needed to achieve the desired final outcome.



Rehabilitation is urgently required to address flood damage – but channel incision and soil loss mean that damage is permanent



Breaking ground in a canal rehabilitation project



Eroded gully through watercourse needs urgent intervention to prevent further loss of soil and drainage of wetlands



Gabion weirs used to stabilise headcut (above)



Major excavation works during rehabilitation



## PHASE 4: MOVING FORWARD

### STEP 12 Maintenance, monitoring and reporting

Rehabilitation does not end with the implementation stage. Most rivers need ongoing management, or they may degrade, undoing all your efforts. Attention to maintenance of alien clearing is particularly important, as alien vegetation often thrives in newly disturbed, shaped river banks. Also, many of our rivers are in such altered environments that they lack the natural disturbance regime needed to keep them dynamic and functional. Management activities might need to mimic the effects of large herbivores, fires, and medium floods in clearing vegetation and opening up waterways, in order to maintain ecosystem functions (see **Handbook 3 for details**). Rehabilitation planning must be sure to budget for long-term maintenance or to find local communities, citizen scientists or user-groups with an interest in taking on maintenance activities.

Monitoring is also essential, to track the improvements to the river system. Citizen science monitoring tools like Mini-SASS are in common use **SEE HANDBOOK 3**. Monitoring also allows other problems to be identified and addressed before they grow into major issues. Monitoring should be designed around tracking both general ecosystem condition and specifically tracking the measurable objectives identified in Step 7. It is critical in informing best practice and learning.



Gulley erosion which occurs soon after rehabilitation implementation can be addressed if observed during monitoring

## Rehabilitation and the law

Don't forget about the costs or timelines needed for running any required Environmental Impact Assessment (EIA) processes, or registering water uses with the Department of Water and Sanitation (DWS). Many river rehabilitation projects need some kind of authorisation if you are affecting the river bed, banks or floodlines – even in a positive, restorative manner! It is well worth consulting an experienced environmental assessment practitioner to find out what authorisations are needed and which processes to follow. Local DWS or Environmental Affairs officials may also be able to assist. Try to get their input in writing, so you have a record of their engagement.

### REHABILITATION REALITIES – RIVER REHABILITATION IN URBAN ENVIRONMENTS

Finding opportunities for river rehabilitation in urban areas can be particularly challenging, because:

- There are often multiple landowners within a catchment/along a particular watercourse;
- It is difficult to address or control catchment-scale impacts that affect river ecosystems;
- There are many different (and often competing) demands on rivers and riverine corridors;
- Legislative issues are often complex (more town planning and municipal policies than in other areas of work);
- Securing municipal funding is challenging because rivers are not usually political priorities;
- Rivers are often more impacted in urban areas, and many of these impacts are permanent – so substantial rehabilitation is seldom a realistic objective for rivers in urban areas.

Despite and perhaps because of these challenges, urban river rehabilitation projects are critically important, from both ecological and societal perspectives, with rivers sometimes representing the only potential green corridors and natural environments through otherwise ecologically sterile spaces.



Urban rivers present opportunities to improve open spaces and provide riverine corridors

The National Water Act (NWA) Section 21 lists the following 'water uses' which require general or full authorisation:

- Taking water from a water resource;
- Storing water;
- Impeding or diverting the flow of water in a watercourse;
- Engaging in a stream flow reduction activity contemplated in National Water Act (NWA) Section 36 (e.g. afforestation);
- Engaging in a controlled activity identified as such in NWA Section 37 or 38 (e.g. irrigation with waste water or water containing waste);
- Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
- Disposing of waste in a manner which may detrimentally impact on a water resource;
- Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
- Altering the bed, banks, course or characteristics of a watercourse;
- Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people;
- Using water for recreational purposes.



## REFERENCES

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Gann, G.D., McDonald, T., Walder, B., Aronson, J., Nelson, C..R., Jonson, J., Hallett, J.G., Eisenberg, C., Guariguata, M.R., Liu, J., Hua, F., Echeverria, C., Gonzales, E.K., Shaw, N., Decler, K., Dixon, K.W. 2019. International principles and standards for the practice of ecological restoration. Second edition. *Restoration Ecology* (S1–S46). Society for Ecological Restoration. Open access <https://www.ser.org/page/SERStandards>.

Koehn, J., Brierley, G., Cant, B. and Lucas, A. 2001. River Restoration Framework. Land and Water Australia. Occasional paper.

Rutherford, I., Jerie, K. and Marsh, N. 2000. A rehabilitation manual for Australian streams. Canberra: Land and Water Resources Research and Development Corporation.

## FURTHER READING AND RESOURCES

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Australian manual for stream rehabilitation (as referenced above)

Australian (Victoria State) river rehabilitation fact sheet series (River Landscapes Fact Sheet 9)

How to Save a River: A handbook for citizen action. By David M. Bolling. Island Press.

Manual of River Restoration Techniques (British). <https://www.therrc.co.uk>.

Restoring Rivers (American).

<https://www.americanrivers.org>.

## ACRONYMS AND ABBREVIATIONS

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<b>DWS</b>	Department of Water and Sanitation
<b>DFFE</b>	Department of Forestry, Fisheries and the Environment
<b>EIA</b>	Environmental Impact Assessment
<b>SER</b>	Society for Ecological Restoration

## LINKS TO THE RIVER REHABILITATION MANUAL

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- **VOLUME 1:**
  - **Chapter 4:** What is rehabilitation?
  - **Chapter 5:** Assessing the site
  - **Chapter 6:** Planning a rehabilitation activity
  - **Chapter 7:** Options for rehabilitation
  - **Appendix 1:** Legislative requirements for river rehabilitation in South Africa
- **VOLUME 3:** Rehabilitation case studies

## LINKS TO THIS SERIES

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- **HANDBOOKS 3–9** for ideas on how to address issues
- **HANDBOOK 1** for a discussion on how to assess your river and understand its drivers and cause of the problem

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HANDBOOK

**01**

Planning a river rehabilitation project:  
What you need to know to get started

HANDBOOK

**02**

Understanding South African Rivers

HANDBOOK

**03**

Rewilding rivers: the role of  
habitat, plants and animals in  
river rehabilitation

HANDBOOK

**04**

Dealing with river erosion in  
South Africa

HANDBOOK

**05**

Responding to sediment problems  
in South African rivers

HANDBOOK

**06**

Addressing changes in river channel,  
floodplain and wetland form

HANDBOOK

**07**

Responding to changes in water  
quality and flow in urban, farming  
and rural environments

HANDBOOK

**08**

Infrastructure in and near rivers  
(fences, pipelines, bridges, culverts  
and other crossings)

HANDBOOK

**09**

River rehabilitation case studies