National standards for the practice of ecological restoration in Australia

A brief overview

From the weekend volunteer to the professional contractor, people throughout Australia are working on the land and in the water to repair damaged ecosystems.

The Standards bring together a growing body of knowledge that will assist everyone involved in ecological restoration to strive for the best possible outcomes for their projects.

What is ecological restoration?

The Society for Ecological Restoration Australasia (SERA) supports the practice of ecological restoration as a means of sustaining the diversity of life on Earth and establishing a healthy relationship between people and the natural world.

There are few areas on Earth that have not been touched by the actions of humans. More than 50% of the Earth's land surface is dominated by human uses, with a further 25% showing a clear human footprint. We have cleared forests for towns and agriculture, converted native grasslands to introduced pasture, dammed rivers and fished the depths of the ocean. Even those places where few people tread are threatened by our actions: remote alpine and wet forests are now regularly devastated by human-made fires intensified by a changing climate.

Ecological restoration assists the recovery of an ecosystem that has been degraded, damaged or destroyed. It is a rapidly expanding practice undertaken by landholders, community groups, non-government organisations, private industry and public land managers, and encompasses the planning, implementation, monitoring and on-going management of a restoration project.

Through the work of ecological restoration, restoration practitioners seek to guide the recovery of damaged ecosystems. Their knowledge of local, relatively intact ecosystems—the species they contain, the interactions between species, and the relationships between species and their environment—informs the process.

The activities undertaken by restoration practitioners are continuously informed by the outcomes they seek to achieve. The process of ecological restoration is one of adaption and refinement, guided by the characteristics of the site and its relationship with the landscape and its climate.


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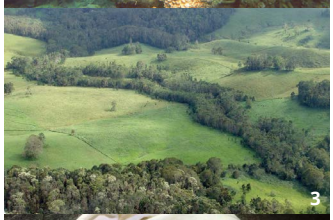
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Why do we need national standards?

SERA developed the National Standards for the Practice of Ecological Restoration in Australia (the Standards) to assist Australian restoration practitioners attain the best outcomes they can for their ecological restoration projects.

Restoration practitioners can use the Standards to improve the success of their restoration projects, make the best use of resources (including public funds) and improve their knowledge and skills. The Standards outline the steps required to plan, implement and monitor a restoration project.

Ecological restoration is guided by a set of six key principles applicable to all restoration projects—large or small, terrestrial or aquatic. They are equally applicable in the planning and implementation of a community-led bushland regeneration project as they are to the mandatory restoration of a mine site after closure.

The Standards clarify the minimum performance levels and outcomes required for a project to be classified as ecological restoration. The generic nature of the Standards means that they can be used in conjunction with other, more specific guidelines relating to a particular aspect of an ecosystem, funding purpose or a restoration activity.

6 key principles of ecological restoration practice

1 An appropriate reference ecosystem is used to set recovery targets and assess the success of an ecological restoration project

Achieving the highest possible outcome for a project requires having a clear vision of what that outcome will be. Which species will we restore to the site, and how will they be distributed? What conditions are necessary to encourage other species to return to the site by themselves? What types of disturbances are necessary, or to be avoided, so that plants and animals regenerate and reproduce at the site?

Restoration practitioners use a reference ecosystem as a model to guide the recovery of the degraded site. The Standards explain how to identify a reference ecosystem and how to use six key attributes of the reference ecosystem to set recovery goals, e.g., about which species to recover, their habitats and interactions.

The choice of a reference ecosystem is most-often informed by the ecosystem that exists or existed at the degraded site, although in cases of permanent environmental change (such as sea level rise) other local native ecosystems better adapted to the conditions now on the site may need to inform the reference ecosystem. Whether similar to the pre-existing ecosystem or not, the restored ecosystem must be self-sustaining and able to adapt to changing environmental conditions, both now and into the future.

Uncertainty about future climates presents restoration planners with perhaps their greatest challenge, particularly in fragmented ecosystems where natural migration potential is limited. The Standards provide information to help restoration planners identify whether reference ecosystems for particular sites may need to be adapted in anticipation of changing climates, as well as to gain information about how to build adaptability into the recovering ecosystems themselves.

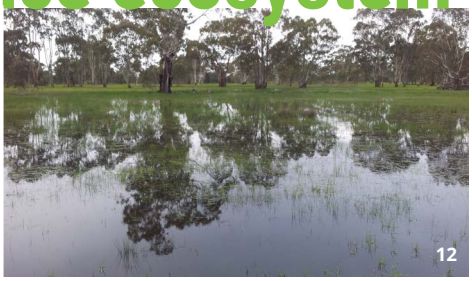
Six key attributes of a reference ecosystem

Physical conditions

The suitability of soils, water, landforms and other physical properties.

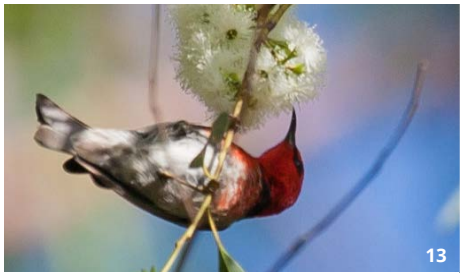
Species composition

The array and relative proportion of organisms (e.g. plants and animals).



Community structure

The physical organisation of living and non-living elements (e.g. layers and food webs).



Ecosystem function

The roles and processes arising from interactions among living and non-living elements.

External exchanges

The two-way flows between sites and their surrounding environments.

Absence of threats

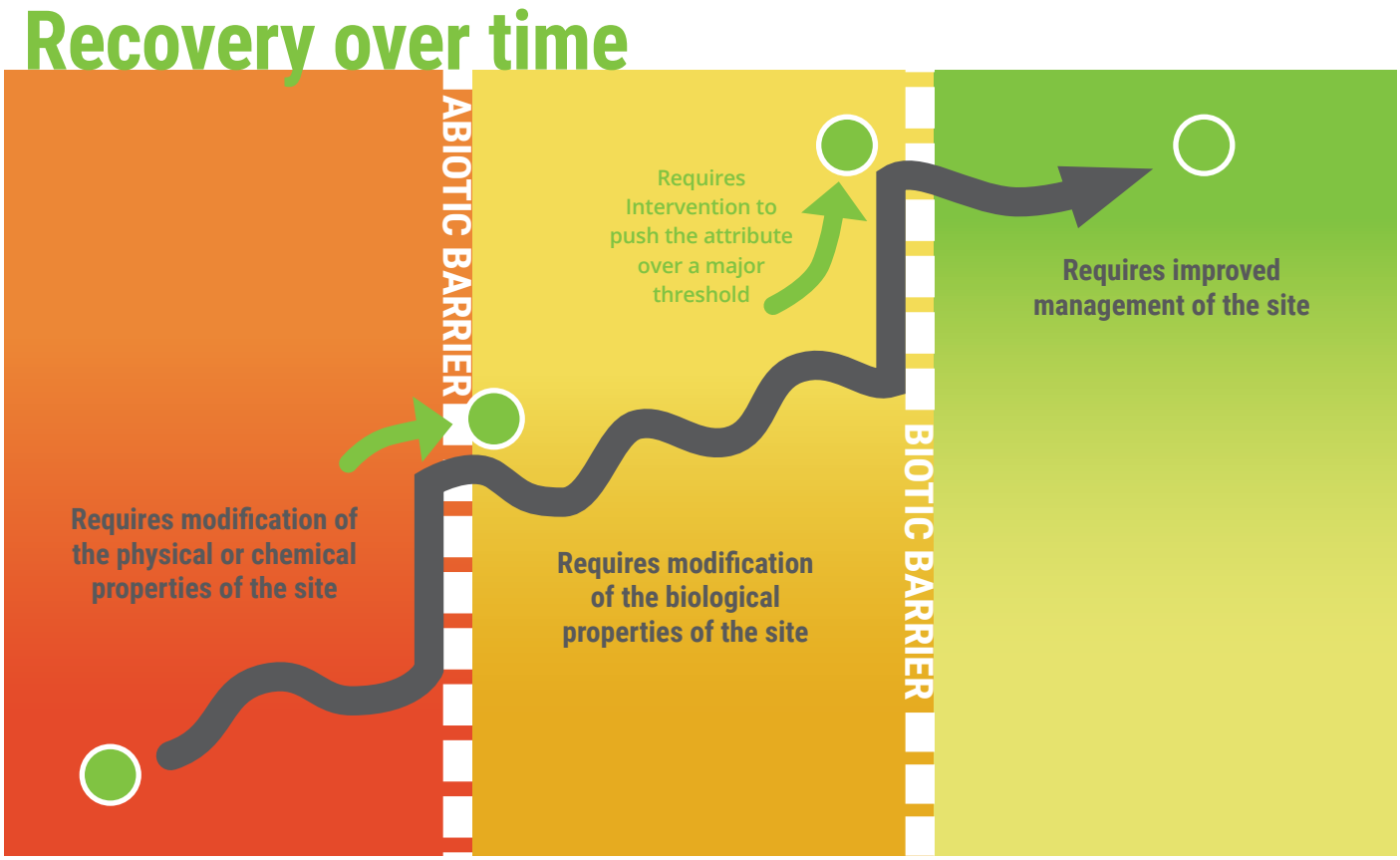
Degree any factors impacting the health of the ecosystem are managed.

2 The techniques used at a site will be determined by the level of degradation and any ability of the ecosystem to recover naturally

Once restoration targets have been set, practitioners choose the techniques they will use to initiate the recovery of the ecosystem. Understanding the processes that degraded the ecosystem (as well as understanding its current 'resilience' level) is essential to selecting appropriate techniques.

Ecologists use the term 'resilience' to describe an ecosystem's capacity to bounce back after stress or disturbance. All ecosystems and the species they comprise have at least some adapted ability to recover from disturbance, as long as the characteristics of the disturbance—its type, severity and frequency—do not exceed the bounds of the natural disturbances they evolved with.

The Standards explain how knowledge of an ecosystem's ability to recover from different types of disturbance will guide practitioners in the types of techniques that they use to restore a site. More time-intensive or resource-intensive interventions may be required to assist recovery where severe or frequent disturbance has eroded the ecosystem's resilience.



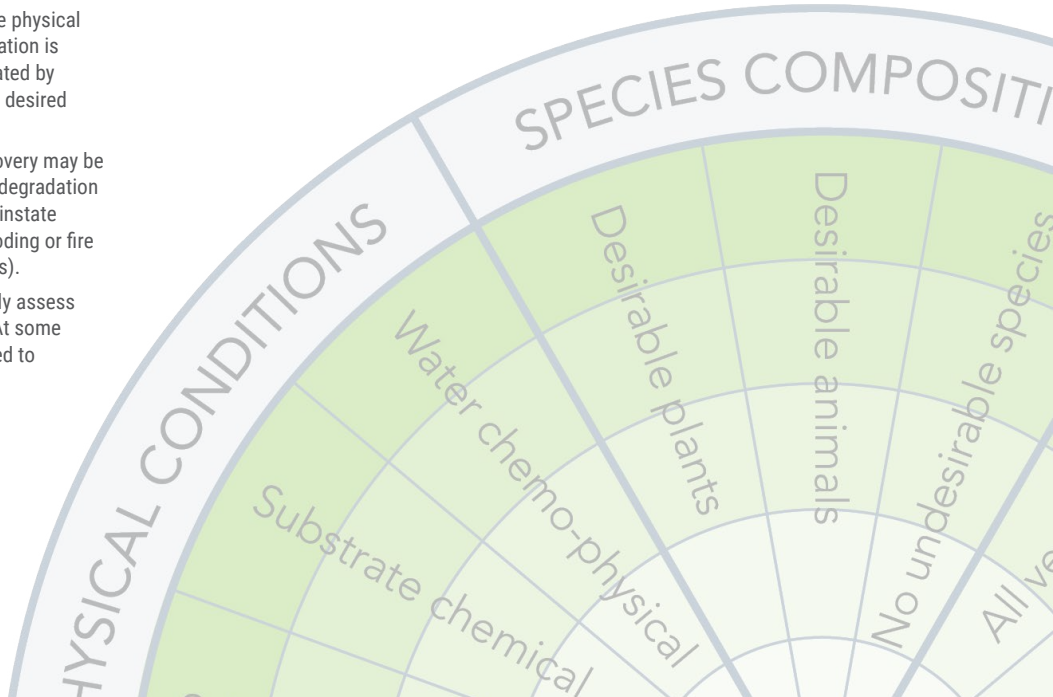
The course of recovery doesn't always run smoothly. Restoration interventions are often needed to 'push' an ecosystem towards a higher level of recovery.

In a severely degraded sites (orange panel) intensive physical interventions may be needed. In sites where degradation is more moderate (yellow panel), recovery can be initiated by intermediate-level interventions such as introducing desired species and removing undesired species.

In sites where degradation is low (green panel), recovery may be achieved through activities that prevent any further degradation of the site (e.g. fencing to keep out stock) or that reinstate important ecosystem functions (e.g. reinstating flooding or fire regimes to encourage the return of desirable species).

Restoration planners and practitioners must carefully assess what is required before implementing a treatment. At some sites, physical interventions may be all that is needed to encourage plant and animal recolonisation.

Based on Figure 1 in the Standards.



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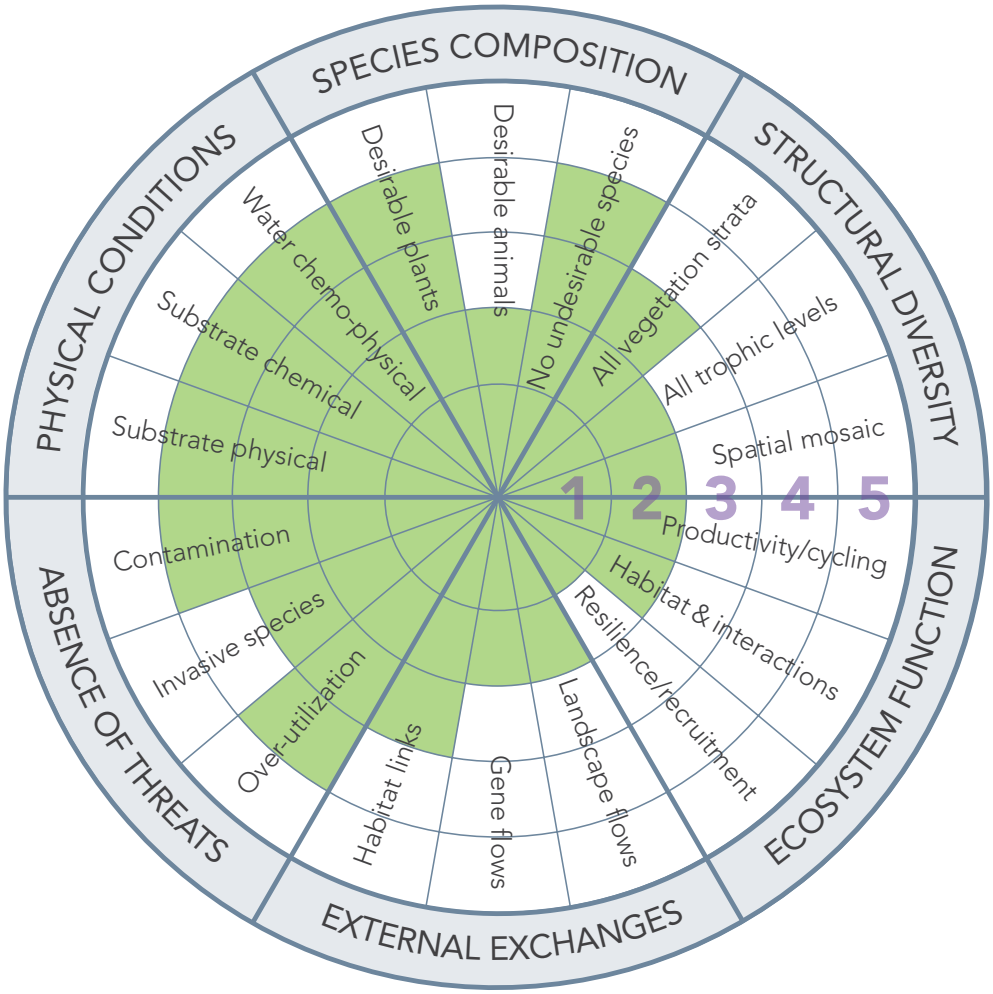
Ecosystem recovery must be assessed against clear goals and objectives, using measurable indicators



The success of ecosystem recovery increases when restoration planners and practitioners set clear goals and objectives relating to the composition, structure and function of the ecosystem at the beginning of an ecological restoration project. Setting goals and objectives that can be measured using specific indicators will allow practitioners to monitor the progress of the ecosystem's recovery over time and modify any restoration activities that are not working.

The Standards outline how to use the six ecosystem attributes of the recovery ecosystem to set specific and measurable goals and objectives.

For example:

Physical conditions Are the physical and chemical characteristics of the soil able to support desirable terrestrial species? Can stream characteristics and water chemistry support desirable aquatic species? Does an appropriate area of various landforms exist?

Species composition Are desirable plant and animal species present in appropriate numbers, and undesirable species, such as invasive plants and animals, absent?

Community structure In terrestrial ecosystems, are the appropriate layers of vegetation present? In marine ecosystems, is there an appropriate structure for a coral reef or the layers of seaweed on a rocky reef? Are species in all steps of the food chain present? Is each species distributed correctly across the site?

Ecosystem function Is there appropriate cycling of water, nutrients and energy within the site? Is there habitat for desirable species? Are pollinators, seed dispersers and decomposers present in sufficient numbers? Is there evidence of successful breeding of animal species and regeneration of plant species, including recovery after disturbance?

External exchanges Are there appropriate flows of water, nutrients and energy from the surrounding landscape into and out of the site? Is there movement of organisms into and out of the site? Is there exchange of genetic material, through pollen and seed dispersal in plants and movement of animals via habitat links?

Absence of threats Is the site unaffected by threats such as pollution, invasive plants and animals, feral predators, or overuse of resources (e.g. overfishing in marine areas)?

4 Ecological restoration should aim for full recovery, insofar as possible

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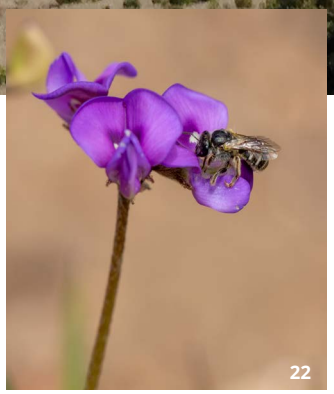

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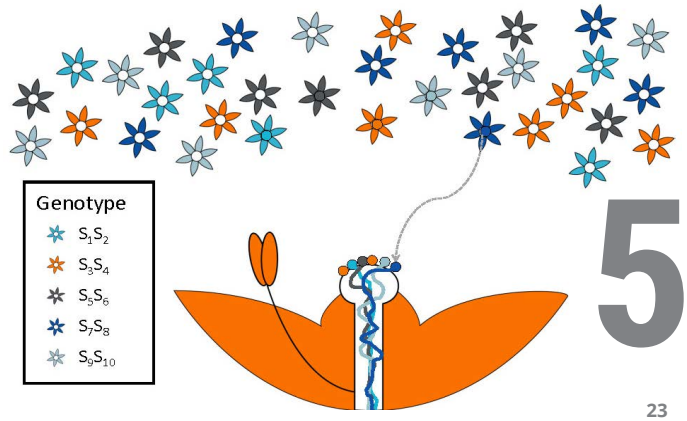
The ethic of ecological restoration is one of conservation, renewal and repair. The intent is to achieve the highest and best level of recovery possible in each case.

The recovery of an ecosystem to the desired level may take a long time and require significant social and financial investment. Research partnerships between scientists and practitioners may be required to better understand how to efficiently overcome some of the physical (e.g., soil, water, nutrients) and biological barriers impeding ecosystem recovery.

The Standards outline a five-star system that practitioners can use to evaluate the progress of recovery at the restoration site, as compared with the reference ecosystem. They can then plot these scores onto the recovery wheel to visualise the current level of recovery of each attribute at the site. The recovery wheel also provides a useful tool to communicate the success or failure of restoration activities with stakeholders.

Projects that do not meet the criteria for ecological restoration but still enhance environmental function or lead to improved management within the broader landscape can be highly beneficial and complementary to ecological restoration. For example, sustainable farming can 'restoratively' improve soil health and water quality in rivers and the ocean, while also providing habitat stepping stones for native fauna. Efforts by urban dwellers to reduce carbon emissions and deal with waste appropriately can reduce threats to ecosystems from climate change and pollution.



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5 Restoration science and practice are synergistic

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In order to achieve the highest and best level of recovery possible, ecological restoration projects are guided by the experience and knowledge of practitioners, and local stakeholders, particularly Indigenous groups. They are also guided by knowledge gained from scientific research and adaptive trail-and-error.

SERA encourages the development of partnerships between scientists and practitioners. Scientists bring a rigorous approach to problem-solving that can assist practitioners to identify the reasons behind the success or failure of restoration activities. The on-the-ground knowledge of practitioners can alert scientists to innovative restoration approaches worth trialling in other situations.

Project managers are encouraged to develop partnerships with scientists at regional universities and **with** practitioner groups such as Bush Heritage Australia, Greening Australia, the Australian Association of Bush Regenerators and many other organisations and agencies who can assist with advice.

6 People are essential to the success of ecological restoration

The Standards are available at www.seraustralasia.com.

A Recovery Wheel App is available for Android from Google Play or for iOS from itunes.

Our values as humans will shape the future of all ecosystems. Active participation in ecological restoration provides people with an opportunity to meaningfully engage in the stewardship of the ecosystems that surround them. The hands-on work of restoration can lead to a sense of wellbeing and a deeper connection to place and community.

The Standards emphasise stakeholder engagement as the first step in the planning and design of an ecological restoration project. Genuine engagement by practitioners with the people who live and work near a restoration site will help foster practical collaboration and a sense of community ownership over the project. Providing community members with opportunities for paid or voluntary work gives them knowledge and skills to take into the future: knowledge about how their local ecosystems function, the threats they face, strategies for repair, and ways the restored sites can be sustained in the long term.

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Performance standards at a glance

The National Standards for the Practice of Ecological Restoration in Australia includes a checklist of specific performance standards that guide restoration planners, practitioners and managers on how to (1) plan, (2) design, (3) implement, and (4) monitor and document an ecological restoration project, based upon the six key principles.

1 Planning and design	2 Implementation	3 Monitoring, documentation, evaluation and reporting	4 Post-implementation and maintenance
1.1 Stakeholder engagement is essential to the sustained success of any project	2.1 No further lasting damage is caused by the restoration works	3.1 Monitoring evaluates progressive restoration outcomes	4.1 The management body is responsible for ongoing maintenance and carries out monitoring to ensure that the site does not regress
1.2 Plans are informed by regional conservation goals and priorities	2.2 Treatments are interpreted and carried out responsibly, effectively and efficiently	3.2 Adequate records of treatments (inputs) and all monitoring are maintained	
1.3 Plans identify the site's current ecosystem and its condition	2.3 All treatments are undertaken in a manner that is responsive to natural processes and fosters and protects natural recovery	3.3 Evaluation and documentation of the progress of the work against goals and objectives	
1.4 Plans identify and describe the appropriate local native reference ecosystem(s)	2.4 Corrective changes of direction in response to unexpected ecosystem responses	3.4 Reporting of progress to key stakeholders	
1.5 Plans identify clearly stated restoration targets, goals and objectives			
1.6 Plans contain clearly stated treatment prescriptions for each zone			
1.7 The long-term conservation management of the site is indicated before undertaking a restoration plan			
1.8 The potential for resourcing the project and likely risks is considered			
1.9 Plans include a schedule and time-frame for review			

The Society for Ecological Restoration Australasia (SERA) is an independent, non-profit ecological restoration organisation that connects the restoration community (industry, government, practitioners) across the Australasian region, and is a regional chapter of the peak international body for restoration, the Society for Ecological Restoration.

Further information on SERA can be found at www.seraustralasia.com.

Based on the *National Standards for the Practice of Ecological Restoration in Australia*, Second Edition.

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