Table 2: Recommended herbicide control

Herbicide	Glyphosate (Roundup®/Roundup Biactive®)
Active ingredient	Glyphosate 360 g/L (present as the isopropylamine salt)
Rates of dilution for spot spraying	2%
Knapsack amount of product per 10 litres water	200 ml
Rate of product per hectare	8 L
Wetting agent	If no surface water present use Pulse® (20 mL/10 litres of water)
Time of application	Late summer/autumn, if surface water present throughout rest of the year. If dry, apply in spring/early summer.
Comments	Good results depend on skill and care taken by the operator, especially ensuring all of plant including the centre is covered with herbicide. Apply selectively and carefully to avoid off-target damage.

Key points

- Sharp rush is a significant threat to wetlands and estuaries of south-west Australia.
- It is closely related to and often confused with a number of native rush species. Be aware when collecting seed or acquiring material for restoration work.
- Applying herbicides is effective but correct timing and exercising care is essential.

Developing and implementing a weed management strategy

❶ Understanding distribution

Map infestations - accurate distribution maps allow targeted control of populations, provide information for costing a weed management strategy and provide assessment of where control has not been effective. Knowledge of nearby infestations may also be useful to help prevent reinvasion.

Map other features - understanding distribution of native flora (flora list), the native plant communities (vegetation map) and patterns of disturbance (vegetation condition map) are additional planning tools.

❷ Plan

Identify and target small populations of sharp rush in good condition vegetation first. Assess feasibility of physical removal versus use of herbicides. **Control of large infestations** – plan to contain their spread. Also target populations in low-lying areas where water flow is the dispersal agent.

❸ Implement control

Undertake **physical removal or herbicide control** of small populations first. Apply herbicides to large populations, starting at the perimeter working inwards. Apply herbicides during optimum times. Care should be taken to avoid off-target damage and when spraying near water bodies. Consider impacts on rare plants or rare ecological communities.

❹ Maintain and/or restore the native plant community

Maintaining and/or restoring cover of native vegetation, especially sedges and rushes, is vital for suppressing further weed germination and increasing resilience. Weed management is about the protection and restoration of diverse natural ecosystems.

❺ Monitor

Monitor the effectiveness of the weed management program and possible impacts on the native plant community. Revisit distribution maps. Use this information to guide future management actions.

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Urban Nature Program

The Department of Environment and Conservation's Urban Nature program aims to increase the level of technical advice and support available to all bushland managers. Urban Nature offers advice, training, best practice guidance on urban bushland and wetland conservation management.

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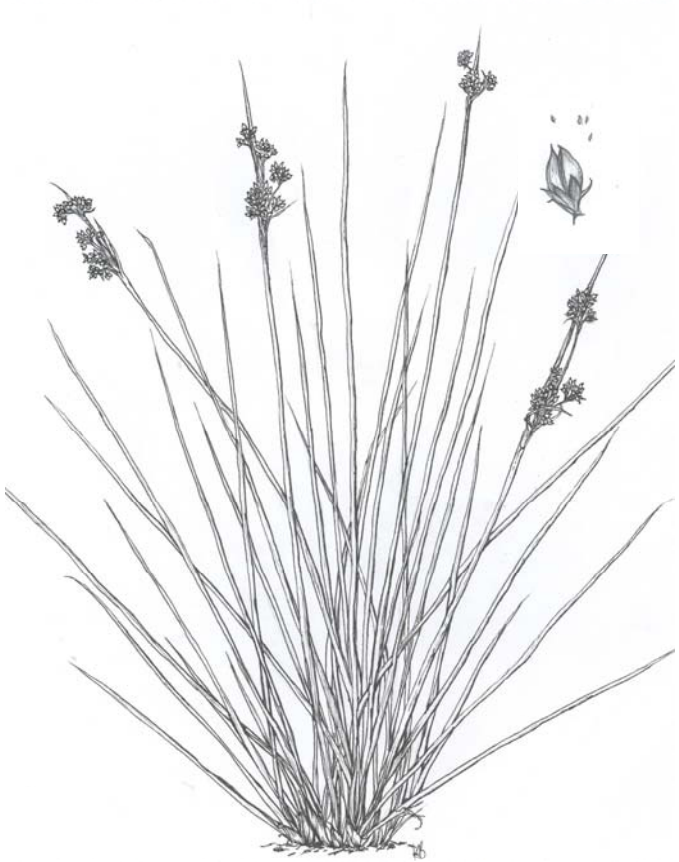
MANAGING WEEDS IN BUSHLAND



SHARP RUSH

Juncus acutus

WEEDS OR WILDFLOWERS
Environmental Weeds Action Network (Inc)

Department of Environment and Conservation

Sharp rush (*Juncus acutus*)

Spiny rush or sharp rush as it is more commonly known belongs to the rush family Juncaceae. As a *Juncus*, it derives the latter part of its botanical name from the Latin term for 'sharpened' or 'pointed', referring to its sharply pointed leaves and stems. Sharp rush has a wide natural distribution occurring in Africa, Europe and North America.

Sharp rush is a problematic weed in New South Wales, Victoria and South Australia and is of increasing concern in Western Australia. Here it poses a serious threat to wetlands and estuaries from Geraldton to Esperance. Once established it can displace native vegetation and render large areas impenetrable to animals and people. In south-west Australia, it closely resembles a number of our native rushes. In addition, it is notoriously difficult to eradicate.

Distinguishing features

Sharp rush is an erect robust tussock-forming perennial herb to 1.5 m high. It has numerous unbranched cylindrical flowering stems (culms) 2 to 5 mm in diameter that are glabrous, rigid, slightly furrowed and filled with a continuous pith. Similar in appearance, leaves are blue-green, numerous and emerge from the base of the plant giving it its hemispherical shape. A distinguishing feature is the stiff, sharply pointed, leaves and bracts that terminate in a tip that is painful to touch.

Sharp rush flowers throughout the year but mainly in spring and summer. Inflorescence are 4 to 13 cm long, with clusters of one to six green to reddish brown, small, sessile flowers. There are one or two leaf-like bracts 4 to 25 cm long at the base. Fruits are brown ovoid three celled capsules 5 to 6 mm long, and pointed at the apex. Seeds are small, 1.3 to 2 mm long with a tail at each end.

Habitat and distribution

In Western Australia sharp rush can be found invading wetlands of calcareous soils from Geraldton south to Esperance and inland to the Wheatbelt. It occurs mainly in low lying, freshwater or saline, low fertility areas. With increasing salinisation in the south-west of the state, sharp rush is becoming more widespread. Wet, sandy open substrates are favoured sites for seed germination and establishment of new populations.

Life cycle and biology

Sharp rush is:

- A long lived perennial that produces rhizomes which can resprout after fire.
- Wind pollinated, and can flower and set seed from three years of age onwards.
- Any leaves and stems which die each year are replaced by new growth mainly in spring.
- Each capsule can hold up to 200 seeds and each plant can produce up to 4000 seeds. The seed has high rates of germination between 75 and 95%. Recruitment can occur throughout the year.
- Seeds need light to germinate, and competition from other plants suppresses germination. In fringing areas of open saline lakes where native annuals are dominant and/or there are naturally low densities of native perennials, inhibiting seedling recruitment can be difficult.
- The seed of *Juncus* species may persist for several years. Any monitoring and control program should take this into account.

How does it spread?

- Sharp rush spreads and reproduces mainly by seed, but also gradually underground by rhizomes.
- Seeds are very small, numerous and can be transported by wind but are mostly water dispersed. Seed accounts for the majority of movement into undisturbed vegetation.
- Plants can also spread via other means such as stem material, rhizomes or seed in soil on agricultural machinery and vehicles.
- Sharp rush is sometimes mistaken for native species and used in revegetation projects.

Look-alikes - similar native species

Many native and several introduced rushes are closely related and similar in appearance to sharp rush. Growing in freshwater and brackish environments, the native sea rush (*J. kraussii*) and pale rush (*J. pallidus*) are among the most similar and frequently mis-identified species.

Where sharp rush co-occurs with native species, several differences are quite obvious. A summary of the major differences is shown in Table 1. Bigger tussocks and wider individual stems make sharp rush more robust in appearance than most native rushes. Flowers and seed heads also tend to be larger and reddish brown in colour. As a quick test it is difficult to squash its stems and leaves between thumb and forefinger. Perhaps it can be most clearly distinguished by the very pointed tips; while tips of most other rushes are sharp they are not painful to touch

Table 1: Summary of most significant differences in features

Feature	*J. acutus*	*J. kraussii*	*J. pallidus*
Height	0.7-1.5 m	0.3-1.2 m	0.5-2 m
Form	hemisphere	erect	erect
Flowering	mainly spring	Oct-Jan	Oct-Dec
Flower colour	red-brown	red-brown	green
Capsule length	5-6 mm	2.5-3 mm	2.8-3.5 mm
Leaf colour	dark blue-green	dark green	pale green
Seed length	1.3 – 2 mm	0.5 – 1 mm	0.5 – 0.7 mm
Seed (x10)			

Where it grows in isolation, sharp rush may be more difficult to identify. The distinguishing feature to look for is the seed capsule protruding well beyond the tepals (equivalent to sepals and petals) surrounding it. In comparison, the fruit of most native rushes is roughly the same length as the tepals.
Note: sharp rush has been known to hybridise with J. kraussii. If you think this may be occurring at a particular site seek expert advise.

Management and control

There is limited information on the control of sharp rush; most is anecdotal or part of limited or ongoing trials. It is worth noting the seed needs light to germinate, so once mature plants are killed and/or removed revegetating the site may be necessary to help suppress germination.

Physical control

Physical removal can prove effective where there are small populations. Small or isolated tussocks may be dug up using a mattock or similar tool, taking care during disposal not to disperse the seed. This form of control may not be viable for large infestations as it can be time consuming, costly, cause excessive soil disturbance and require intensive follow-up control of any persistent rhizomes and plants recruiting from the soil seed bank for several years.

Slashing and/or burning result in low levels of mortality (slashing alone at ground level will kill around 30% of mature individuals) and will cause most plants to resprout. Removal of slashed material and/or burning may be needed to reduce the amount of above ground biomass and allow access to a site for replanting or to facilitate regeneration of native plant communities.

Chemical Control

Of the herbicides tested for their effectiveness on sharp rush, Brushoff® (metsulfuron methyl) is the least effective while glyphosate used at a rate of 2% gives the highest mortality rate. Burning or slashing and then applying glyphosate to new growth can increase the herbicide uptake, thereby making any treatment more effective.

The most effective and environmentally sound herbicide to use in wetlands is a form of glyphosate, Roundup Biactive®. To limit environmental impacts, this herbicide needs to be applied during summer and autumn when water levels in wetlands and estuaries are at their lowest. To maximise uptake, herbicides are best applied during these warmer months when plants are actively growing. High daytime temperatures causing plant stress, greater evaporation and low herbicide uptake need to be avoided.
Note: glyphosate is non-selective, and extreme care should be taken during spraying to avoid off-target damage. It is important that training in the correct use of herbicides is undertaken. Always read the label and follow instructions.