

Assessing the damage

Length of Pasture - The shorter the pasture prior to flooding the quicker the recovery rate. If the pasture was longer than 10 to 15 centimetres during inundation it will generally collect more silt and mud. This will cause it to lodge then breakdown and smother the newly emerging shoots.

Any long, mud covered rotting vegetation will not be palatable to stock. Other methods of trash removal (such as slashing or mulching) may need to be used once the paddock is trafficable.

Type of pasture - Some species handle the flooded conditions better than others. For example paspalum handles flooding reasonably well where lucerne is very susceptible. Clover and ryegrass are unlikely to survive more than a couple of days of flooding.



Assessing the damage

The three main areas to assess are:

1. Survival and health of the plants
2. Soil structure, fertility and health
3. Infrastructure

Survival and health of plants

Damage to pasture can range from minor sediment deposition with rapid recovery, through to deep sedimentation of silt, sand or gravel deposits on pastures, erosion of topsoil, scalding and total loss of existing pasture.

Of the number of aspects to consider, first is an assessment of how many of the desired plant species have survived. For some this simply involves making a visual assessment, but for others it may require a count of desired plants still alive per square meter.

For ryegrass and clover pastures the target is to have greater than 70 per cent of the plants survive. If plant population gets under 50 per cent then action should be taken.

It is also important not to have too many gaps in the pasture as this will greatly reduce productivity and allow weeds to take a foot hold.

The table below indicates what are often considered acceptable ranges of plants per square meter for lucerne. The count should be taken from at least 10 different locations per paddock.

Species	Ideal plant - number/m ²	Take action if less than
Irrigated Lucerne	108 – 270	64
Dry land Lucerne	8 – 20	5

Table 1. Acceptable lucerne plant densities

In some instances, the floodwater may not have killed the plants, but still will have caused serious stress to them. This will often result in poor future growth for a period of time, and these plants will also often succumb to pest and disease outbreaks. As a result, further thinning of the desired plants and increased invasion of weeds will occur.

The likely impact of the floodwater on the seed bank will also need to be considered. Sub clover seed survival is very hard to determine. It is likely some of the seed bank will be lost and the sub clover varieties that have survived will probably be the less desirable, older, earlier maturing varieties. Unfortunately it is difficult to assess how much sub clover seed has survived until after the break, or irrigation has commenced.

A recommend strategy would be to sow an annual ryegrass into these paddocks, so if the sub hasn't survived in high enough populations, the ryegrass will still be productive and then the sub can be re-sown the following autumn.

Importantly, weeds also need to be considered when assessing the health of remaining pastures. In cases where there are desired species left but a lot of gaps in the pasture, weeds will rapidly fill these spaces. While these pastures may provide useful feed in the short term, developing weed issues will contribute to making the paddock unproductive in the future.

For example, where some paspalum has survived the gaps in the paddock are likely to be filling with weeds such as couch. If nothing is done then both the paspalum and the couch will go dormant over the winter and very little will grow over the winter period.

Once this happens there is not much in the way of control options and next summer the dormancy will be broken and the undesirable weeds will out-compete desirable species – and the problem continues.

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If the pasture or crop has survived in acceptable populations, it is likely to benefit from topping with a mower/slasher to remove any rank growth and/or sediment that might affect palatability. A fresh application of fertiliser may be warranted to replace nutrients that may have been leached (especially nitrogen and sulphur).

Soil structure, fertility and health

There are a wide range of potential soil based issues that need to be assessed and they will vary according to your soil type, water table, salt levels and flow rate of flood water.

Some of the more common issues are erosion, surface crusting, ground setting hard and leaching of nutrients (most commonly the relatively mobile nutrients including nitrogen and sulphur). In some areas the floods have caused the water tables to rise and could bring salt back to the surface or upset the delicate balance of the soil chemistry.

It is important to seek information that is specific to your situation as it will vary significantly from paddock to paddock and from district to district. Another more detailed fact sheet will be available from the DPI on these issues.

If you suspect you have paddocks with salt, sodicity or other soil structure issues, you will need to work with an agronomist or other advisor to identify appropriate recovery options.

Whilst developing a longer term plan for these areas, recovery can be focussed on paddocks that are less likely to have these issues. It may unfortunately be a longer term project to get some of the damaged soils back to their best as salinity can significantly impact on germination and growth.



Infrastructure

The flooding is likely to have affected irrigation infrastructure. It may have damaged channels, drains, check banks and also may have altered the lay of the bays themselves through erosion or depositing silt. Before an irrigated pasture/crop is sown, an assessment of the level of damage to any irrigation infrastructure damage is critical.

Areas where damage is quite common include:

- Channels with parts of the banks washed away
- Channels with blockages in them
- Wheels/flume gates that have been damaged
- Outlets blocked, damaged or undermined
- Check banks damaged - washed out
- Drainage system blocked
- Parts of bays washed away
- Parts of bays with deposits of silt, on them

There may also be significant damage to fences or stock access tracks to the paddock. If these are likely to take some time to fix, it may be necessary to delay sowing these paddocks until you can provide access and control pasture allocation in the area.

If you are unsure on how the paddock may irrigate after it has been flooded, it may be necessary to run water down the bays prior to sowing to make sure they can be effectively and efficiently irrigated.

Key points:

- **Assess pasture/crop densities and consider weed invasion in thinner pastures.**
- **Distressed plants will be susceptible to pests and disease, and often recover poorly.**
- **It is hard to assess the damage done to seed banks, so it is advisable to sow something into appropriate paddocks to guarantee feed.**
- **Consider the potential impact of erosion and soil structural changes causing surface crusting, hard setting ground and leaching of nutrients.**
- **Damage to irrigation infrastructure and paddock access will influence what and when you sow.**

Re-sowing guidelines

If I need to re-sow, what is the process?

After you have decided on the paddocks to re-sow, you then need to prepare them for renovation.

Removing trash

When the flood water leaves the paddocks, they may be covered in trash and debris. The trash may be made up of what was washed onto your paddocks, or it may be the remnants of the crop or pasture.

Over time this trash will break down and provide valuable organic matter and nutrients to your soil, but in the short term it can make the sowing operation and pasture/crop establishment a headache. For this reason the trash may need to be removed or reduced prior to sowing.

Residual trash can cause considerable trouble during cultivation and sowing operations as it can block up the implements and drag along with tines causing it to build up into large piles of trash.

If left the trash can cause issues during establishment if it interferes with seed to soil contact. If the seed ends up resting against the trash and not the soil particles, then it will have a poor establishment rate. The trash can smother seedlings however this is rare as the tines normally open up the areas around the seed.

The removal of the trash can be challenging. It requires a touch of imagination and is often limited by machinery availability. Due to the variable nature of trash and debris and the range of soil types involved, different methods can be used.

Some of the more common ways to remove trash are:

- Use offset discs to cut up the trash and mix it into the soil.
- Cut, rake and bale (this can be hard on equipment if the trash is damp or dirty).
- Burn it. It will be hard to burn if it is covered in silt or is still moist. If it is dry enough harrows can be used. Tow them through the trash until they block and then ignite this trash and tow the harrows around spreading the fire. Burning permits may be required. Check local CFA and Shire regulations.
- Using an implement (like harrows, scarifier or seed drill) to drive around the paddock until it blocks up. These blockages can then be dragged into larger piles on a sacrifice area.

Weeds

The flood water is likely to bring new weeds onto those paddocks that have been inundated. The change in soil conditions may also favour different weeds than those that have grown in the past.

In addition, a period without competition from a pasture or crop and plenty of moisture will enable weeds to get established. Therefore, it will be advisable to get a good chemical knockdown of the weeds prior to sowing the pasture or crop.

The effectiveness of chemicals will be reduced if the paddock has trash, debris or silt still on it. It is important the chemical can make good contact with the target plants.



Preparing a seedbed

Successful pasture/crop establishment is dependent on good seed to soil contact. It is also desirable to have a friable soil (easy for the roots and shoot of the plant to move through). Depending on soil type, structure and available equipment, this may be achieved via direct drilling with an appropriate drill. For others that won't have friable soil or a good seed soil contact, paddocks may require pre cultivating.

In some cases soil structure/chemistry issues (e.g. Sodic soils, salt affected soils) will need to be addressed prior to cultivation to minimise further damage and make the most of any recommended treatments.

Key points:

- **Trash can cause issues during establishment if it interferes with seed to soil contact.**
- **New and old weeds can be a significant problem following flooding; remain vigilant.**
- **Pastures covered in sediment and organic matter can inactivate some chemical products; contact your local chemical advisors.**
- **Soil structural issues will need to be addressed prior to cultivation to minimise further damage.**

Choosing the right crop

What is the best pasture or crop to sow?

There are a range of different species appropriate for regenerating flood affected land. This may be an opportunity to reassess the forage supply in your dairy farm system. If you are considering any major changes to your forage base, please discuss your options with a skilled advisor to ensure the potential impacts to your whole farm system and exposure to risk are taken into account.

The list below outlines considerations in choosing the right species, depending on the range of paddock conditions on your farm:

- End purpose of the species e.g. lots of high quality grazing; summer feed; large bulk of feed to conserve.
- Water availability.
- Soil type/paddock layout e.g. free draining, good irrigation layout.
- Fertility of paddock.
- How the paddock fits into a whole forage system e.g. already have heaps of cereal sown; too far away from dairy to graze with milking cows; close to wheel and easy to water.
- Season outlook e.g. likely to have wet/dry autumn/winter/spring.

The more common options that will suit most farmers are:

- Perennial ryegrass.
- Annual ryegrass (with or without annual clovers).
- Italian ryegrass (with or without 'Shaftal' or other annual clovers).
- Cereals - wheat, barley, triticale and oats.
- Sub clover.
- 'Shaftal' (Maral, Persian clover).
- Lucerne.

To help decide which options might best suit you this autumn an overview on these species has been put together including pro's and con's and the situations they are best suited to.

Ryegrass

Ryegrass has been the main stay of Victorian dairy pastures for a long time now. This is because it offers many advantages.

- It can produce high yields of good quality feed.
- Depending on the farm system a large proportion of the

feed can be direct grazed, saving both time and money.

- It is suited to a large range of soil types and climatic conditions.
- It is relatively easy to establish and manage.
- It can be flexible depending on variety chosen.
- It has good resistance to pests and disease.

There is a range of ryegrass species used in pastures. The most important difference between them is their lifespan.

Perennial ryegrass such as Vic, Impact, Banquet, Avalon and Fitzroy. It will survive for more than two years with greater persistence and grazing tolerance. The major benefit of perennial ryegrass is if you have enough irrigation water they produce relatively high quality feed year round. They don't need to be sown each year and depending on forage system and cow numbers, most of it can be directly grazed. It is relatively easy to manage. When water is available at a relatively low price it provides a high quality cheap feed source.

Italian ryegrass such as Crusader and Feast II. A biennial that will normally grow for two years. The first year is the most productive as it generally thins out by the second year in the hotter, harsher environments. It can add more flexibility than a westerwold ryegrass due to its ability to keep growing into the early summer if adequate moisture is present.

Annual Westerwold ryegrass such as Tetila and Winter Star. Strictly an annual as there is almost no growth in the second year unless there is some seedling regeneration from seeds set in year one. This means they will need to be re-sown each year. The biggest difference in this group is flowering dates. Later flowering dates generally lead to a longer growing season.

Cereals

Cereals include wheat, barley, triticale, oats and to a lesser extent rye corn. Most northern Victorian dairy farmers have used these over the drought years to manage their risk. Cereals are relatively drought tolerant and generally yield better than ryegrass when moisture is limited.

During the vegetative stage their grazed quality is comparable to ryegrass. However the more mature a cereal gets the more its quality declines.

Cereals are fairly cheap (depending on variety and methods used) and simple to establish. Once understood, their management is quite simple. They are suited to a range of soil types, fertility levels and climatic conditions.

Cereals will generally suffer badly from water logging and pugging. While cereals are suitable for grazing, under most situations grazing will reduce the total yields. Cereals can only be grazed up until the time they switch over to reproductive mode (average grazing window of four to eight weeks), or large yield penalties will apply.

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Frequently, a large proportion of a cereals' yield will need to be conserved. Conservation adds extra cost onto the feed produced from cereals. This conserved feed, depending on when it was harvested, is normally only of modest quality, which can only make up a limited proportion of a dairy cows diet without milk yield penalties.

'Shaftal', Maral Persian Clover

The clover commonly referred to as 'Shaftal' or 'Maral' is a late maturing, soft-seeded Persian clover and isn't actually in the Shaftal clover family. It is a very popular clover in the northern irrigation region of Victoria as it is suitable for early irrigation starts and late irrigation finishes. Whilst it can be sown alone as a productive, high quality crop, in more recent years it is more commonly sown with Italian ryegrasses to provide a safer more balanced feed and to improve productivity during the winter when the clover growth slows.

Most often, Italian ryegrass is sown with Shaftal because it has a late maturity which matches the clover better than most annual ryegrasses. An added benefit of Shaftal is that it has the ability to germinate at much higher temperatures than most of the other clovers, ryegrass and cereals. It is often used as insurance against high early temperatures, when farmers are starting up pastures and crops early (before mid March).

Sub Clover

Sub Clovers have a wide range of maturity dates which affects the length of the growing season and potential dry matter production. Early maturing varieties will increase the likelihood of achieving seed set even if the season ends early but as a trade off, will reduce the annual production potential of the sward. Sub varieties vary in their ability to perform well in different soil types and ability to withstand water-logging. Always seek local advice on varieties.

The normal recommended sowing rates of sub clovers are for establishment only and are too low to be productive in the first autumn. So it is often necessary to sow an annual ryegrass with it to improve productivity in the first year if there isn't enough residual sub clover seed already present. Remember, the seed bank of flood affected land is likely to be reduced.

Lucerne

Lucerne is a high quality, productive perennial legume that produces most of its feed during spring, summer and autumn. It is suited to a wide range of soil types but does require a free draining soil with a pH in the range of 5 to 8 (CaCl). Due to its deep root system, once established it is quite drought tolerant, although continued dry conditions will cause the stand to thin out.

Lucerne is relatively expensive and slow to establish. It requires a longer preparation period prior to sowing to get weeds under control and soil issues managed. It requires a considerable upfront investment which normally takes a couple of productive years to be repaid.

Lucerne can be successfully established from autumn and spring sowings. Sowing in autumn often has the advantage of being able to get the soil prepared well and have a lot of control over when you sow. One of the major disadvantages of autumn sowing is that it will be very slow growing until spring time, and often it is not until late September when the first quick grazing is available. This means the paddock is out of production for a long period, and also it doesn't provide competition against weeds during this time.

Spring sowing has the advantage that the lucerne will be faster to establish due to the warmer conditions and increasing day length, and provide more competition to weeds.

Also it allows for a good weed control opportunity prior to sowing during the autumn and winter. Spring sowing can be problematic if wet conditions don't allow for machinery access to paddocks, or prevents a good seedbed being established. Wet conditions can force a delayed sowing; if sown in late spring, early hot weather can compromise the establishment of lucerne.

Despite a lot of advice to the contrary, lucerne can be re-sown into existing lucerne stands. It was believed that the older lucerne plants produced a toxin preventing the establishment of new lucerne plants however, this theory wasn't based on any science. Nonetheless, it is still high risk to oversow in to existing lucerne stands (including recently perished stands).

To get a good establishment of lucerne you need to have a good seedbed and control competition. This is very hard to do in existing lucerne stands as the old lucerne plants provide a lot of competition. Importantly, over time a lot of disease, pest and weed pressure builds up on lucerne stands. Therefore, it is recommended to grow a different type of crop/pasture in an old lucerne stand for a year or two to break the disease, weed and pest cycle.

Another short term option for a thinned out lucerne stand is to sow a winter crop through it such as a cereal or ryegrass to make it productive again for the coming season. This however, will cause further thinning of the stand and won't provide a weed, pest or disease break required for longer term re-establishment.

Key points:

- **Any major changes to your forage base will impact your whole farm system and change your exposure to risk; use a trusted advisor.**
- **All forages listed can provide quality feed at some stage; consider when you want the feed, how you will balance the diet and if you have the right conditions to get the best production possible.**

When to sow

Mid-summer flooding has meant it is too late to get much benefit out of sowing summer crops; by the time they establish, productivity will be short lived due to cold weather.

Normally in February, it is too hot to reliably establish successful winter crops and pastures. This means there is a window of opportunity to plan and prepare your paddocks for re-establishing crops and pastures in autumn as normal.

When deciding the best time to sow or irrigate up pasture and crops, several key factors need to be considered:

- Temperature - Will the pasture/crop successfully germinate and what will the growth be like?
- Moisture – How much irrigation water do I have? When will it rain? What is the risk of a false break? Is the irrigation infrastructure able to irrigate the paddock?
- Species chosen – What temperature requirements does it have? What is its growth habit?
- When is the feed needed?
- Is the irrigation infrastructure ready to be used?
- Will the infrastructure needed for access and pasture allocation control be ready in time?

If you have some paddocks that have been more adversely impacted from floods than others, it may be best to focus on getting the paddocks that are right to go up and going first to enable some earlier feed, before focusing on the more troublesome areas.

Effects of temperature on germination

High temperatures limit the germination of many crops and pastures even if soil water is available.

Clovers

For annual clovers such as subterranean, balansa and berseem, the proportion of seeds that will germinate is greatly reduced at soil surface temperatures above 25°C.

However, the Persian clover cultivar 'Maral' (also known as Shaftal clover) is able to successfully germinate at soil surface temperatures up to 35°C.

The germination of other Persian clover cultivars at high temperatures is between that of subterranean and "Maral" Persian clover.

Ryegrass

The germination of ryegrass is reduced at soil surface temperatures over 25°C. This limits the likelihood of successful ryegrass establishment from early starts.

Cereals

Germination of cereals is normally satisfactory within a surface soil temperature range of 10°C to 25°C. Some varieties can germinate at higher soil surface temperatures, but no varieties will germinate at 35°C.

If soil temperatures are above 20°C the coleoptile (first shoot) will normally be shorter. If adequate soil moisture is present it is best to sow cereals shallower than four to five centimetres to allow them to establish successfully. However, the seed still needs to be sown deep enough to ensure it has access to enough moisture.

An indication of maximum daily soil temperature can be determined by placing a thermometer at the planting depth from mid to late afternoon.

Starting up pastures in autumn is a matter of balancing up the risk of poor establishment and/or high water use verses the reward of getting early feed and greater production. A worthy strategy is to stagger your start times by only starting up a percentage of your farm at a time.

This allows you to spread the risk of a hot spell and/or high water use and also avoids a large bulk of feed ready to graze all at the same time.



Fertiliser

The use and need for fertiliser is going to vary for different paddocks and districts. In the past it has been observed that sulphur and nitrogen have often been leached from the soil during flood events although this isn't always the case. Additionally, the breaking down of large amounts of organic matter (rotting pastures) in the soil uses a large amount of nitrogen.

Some areas may need soil conditioners like gypsum to help repair soil structural and chemical damage that cause crusting and hard setting soils.

The basic principles of fertiliser application do not change because areas have been flooded. Some of these principles are:

- Plants have a requirement for phosphorus very early in their development; if phosphorus isn't readily available in the soil then the plants will benefit greatly from drilling the phosphorus into the ground near or with the seed.
- Not much nitrogen is required early in the plant's life. Nitrogen can also move through the soil much more rapidly than phosphorus so if you are unsure, you can wait and see before applying nitrogen.

As conditions can vary significantly between regions and even paddocks, it would be advisable to seek information specific to your circumstance on the use of fertiliser.

Consider conducting soil tests when soils are no longer saturated. This will assist you to determine any nutrient changes and the degree of critical soil structural damage; guessing what is required can further damage vulnerable soils or waste money.

On many farms there will be paddocks that have been affected to varying degrees. For some paddocks it may take some time before they can be brought back to a productive level. It would be better in these circumstances to focus on getting the better areas back up and going first.



Contact us

For further information or individual advice please contact your local agronomist or a DPI dairy extension officer at the following locations:

- **DPI Echuca on (03) 5482 1922**
- **DPI Tatura on (03) 5833 5222**
- **DPI Cobram on (03) 5871 0600**

Authored by Tom Farran, Phillip Shannon, Kevin Kelly and Lyndal Metcalf from the Victorian Department of Primary Industries.

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Authorised by the Victorian Government, 1 Spring Street, Melbourne 3000

ISBN 978-1-74264-674-9 (print)

ISBN 978-1-74264-675-6 (online)

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