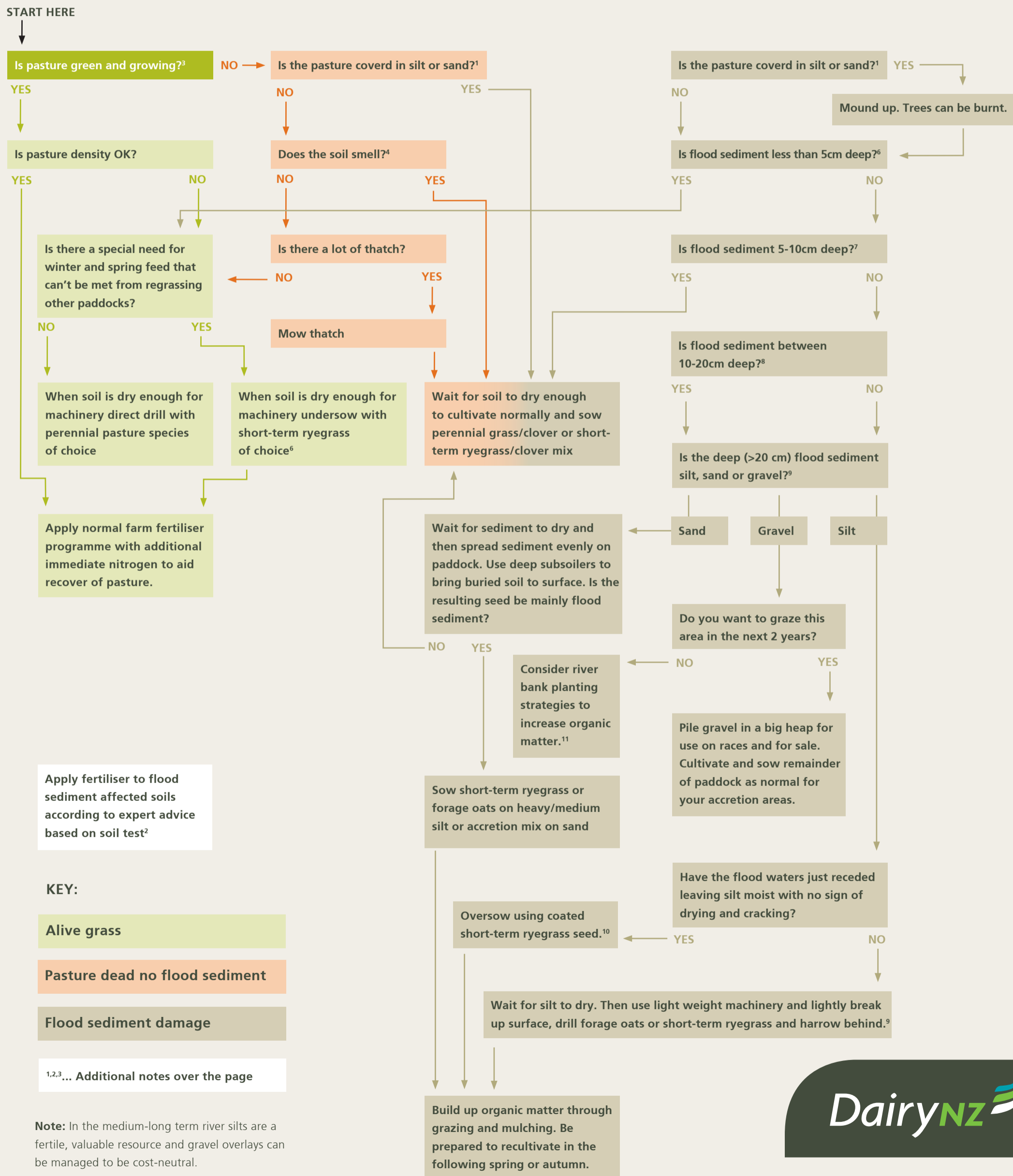


Decision tree for flood damaged farms

First few days			Next week		Over next 6 weeks	
Farm floods	Keep alive: look after family, stock and neighbours	Get cows milked and fed, clean up house and look after family and neighbours. Accept help	Assess damage to access, fences and pastures (type and depth of silt). Get soil test of silt ² . Talk to bank manager and other resource providers. Accept help	Prioritise actions: 1. Access to farm 2. Water system 3. Start on fences 4. Feed plan.	Feed plan⁵ Plan feed requirements /supplies given pasture damage. Reduce stock numbers, consider drying off some stock, get rid of culls. Devise strategy that meets short and long feed goals. Use decision tree below. Fertiliser strategy. Call contractor, order seed	Implement regrassing plan. Continue repair of infrastructure. Document all damage and actions for possible government assistance and for your own records.



Regrassing flood sediment

1. Sediment structure: Flood sediment characteristically lacks structure and organic matter and comes in varying textures ranging from heavy to light i.e. from clay to silty loams to sand. The clay loams are normally flat and feel smooth and silky and are usually found in ponding areas some distance from the river. The clay loams retain water for some time and if deep can't be cultivated for considerable time because machinery will bog. Silt to silty sands are often ruffled in surface texture and slightly gritty to touch. The surface of this medium flood sediment dries fairly quickly but the subsurface remains moist. Sand flood sediment is often rolling, gritty to touch and drains very rapidly and is usually adjacent to the river and may contain a lot of gravel and flood debris.

As a river floods, the coarser sand material is deposited in the higher reaches of a river and closer to the river bank and these will be of poorer quality – less fertile and less suitable for pasture growth. Further down a river and further away from the river more clay loams are deposited and in theory, contain higher nutrient levels. But the immediate fertility of the clay and silt loams will be highly variable and should be tested. Silt and sand can intermingle in layers making mixing a good option. The regrassing response will differ depending on the depth of silt. Shallow silt (<5 cm) can be ignored, up to 10-15 cm silt can be cultivated and greater than 20 cm will either need to be oversown or partially cultivated.

2. Silt fertility: The silt washed onto your land can either be fertile material from a neighbour's farm upstream, or it could be subsoil washed from slips on steeper land. In any case it will contain very little or no organic matter, will probably have very low nitrogen (N) content, and may also be low in phosphate. Sands will be the least fertile and the clay loams will be more fertile. Flood sediment pH level is different to that of existing pasture. Soil tests can be taken in wet silt as the sample is dried in the laboratory. However remember that when the soil is wet less soil is collected per sample so more samples will be required. It can take up between 3-14 days to get the results back.

Initial soil testing has shown silts from this flooding are pH high 6's, Olsen P's 4-11, K very low, sulphur OK, ASC (anion storage capacity) very low. Flood sediment will need potassium and phosphate fertilisers and nitrogen. Pure silt should not have large amounts of fertiliser in one dressing as flood sediment has limited capacity to store fertiliser due to its low anion storage capacity. Smaller more regular fertiliser applications will be necessary. Seek expert opinion based on your soil test.

Analysis of flood sediment flowing under the Manawatu bridge showed that the resulting soils that will form from this flood will be highly fertile after the flood sediment has weathered.

3. Pasture damage: Pastures that have been under water for 2-3 days will probably recover, but those under water for a week or more in warm summer conditions will be dead. Paddocks recently grazed before the flooding will be worse affected as will pastures with at least 5 cm of silt cover. If a pasture hasn't shown signs of recovery after a week then consider it to be dead. Better quality grasses and clovers will die first leaving plants with rhizomatous spreading habits – couch and browntop and creeping buttercup.

4. Is the silt smelly? When river silts become smelly this indicates that toxins are present as a result of anaerobic organism activity. It is probable that seed germination after sowing directly on smelly silt will be impeded by these toxins. However recovery of the anaerobic silt following cultivation will be rapid. It is recommended that anaerobic silt be aerated or cultivated.

5. Plan recovery. Understand the feed requirements for the upcoming winter and following spring and summer and plan pasture recovery practices accordingly. There is little point to putting the entire flooded farm into temporary pastures to find that an identical feed pinch exists in the following spring when the pastures have to be renewed again. Assess each paddock for time under water, density of live pasture remaining after 10 days, silt type (sandy, clay/silt loam) and depth (<5 cm, 5-10, 10-25, >25 cm). Using the damage information and feed requirements in the future, plan the recovery using the appropriate mix of short term and permanent pastures. Then develop a time line for regrassing. Some paddocks will need immediate action while others will need to dry before cultivation. Back up plans are needed if the contractor is delayed or will only visit once e.g. is there some way to get pasture established using own machinery or that available from other farmers?

6. Flood sediment less than 5 cm. If there is less than 5 cm of silt and the grass has been under the water for less than 3 days then it is probable that the existing grass will come through the crust. Existing grass recovers much more quickly than sown grass. If there are open parts in the pasture then these can be undersown using

perennial grass: clover mixes. If you are expecting a feed pinch in winter and spring due to the flooding and this can't be met from other regrassed then as a special case open pastures can be drilled with short-term ryegrasses. Apply nitrogen fertiliser (N) at about 50 kg N/ha to assist recovery, either as urea (110kg/ha), as ammonium sulphate (at 200kg/ha), or as DAP (at 275 kg/ha). Avoid using more than 25 kg N/ha down the spout if sowing seed with a drill.

7. Flood sediment 5-10 cm. If silt has completely covered the pasture it will not survive and will need to be regrassed. Normal cultivation methods will apply at these depths. Cultivation is recommended because silt is relatively infertile, will contain no organic matter or N, and have poor structure making it prone to pugging. A barrier to water drainage may also occur on the interface between the old pasture and flood silt. It is better in the long run to cultivate these depths of silt so silt and underlying topsoil are combined. Sandy silts will dry quickly and heavy and medium silts more slowly. The resowing should have a high chance of success as it is normal farm practice in moist areas of lower North Island to resow pastures in early autumn March-early April. When sowing the whole paddock it is best to decide whether to sow short-term species, or perennials, as it is not always wise to mix them. Short-term Italian and hybrid ryegrasses will be preferred where feed production this winter is crucial, or where weeds/fertility are expected to make it difficult to establish a good perennial pasture mix this year. Apply potassium and phosphate fertilisers with regular dressings of nitrogen as there will be little or no nitrogen cycling in the silt.

8. Flood sediment 10 to 25 cm: In silt of this depth there will deeper and shallower parts in the paddock. By levelling the paddock it may be possible to bring most of the paddock into the 10-20 cm depth category. Once the silt has dried heavy machinery can be used and deep ploughing (e.g. swamp plough) will help to mix the silt with the topsoil. If this is successful then cultivate and sow as normal. If the resulting soil is predominantly flood sediment rather than topsoil then sow in either short-term ryegrasses or forage oats or other deep rooted short term crops and return to permanent pasture the following spring or autumn.

9. Flood sediment >25cm. There are two options for deep clay/silt loam flood sediment and these are either oversowing with a helicopter or cultivating the silt and drilling. In either case be prepared to recultivate in the following spring or autumn due to poor soil structure. If cultivating deep silt wait for the silt to dry sufficiently to support machinery. Use light weight machinery (including small tractors) and lightly break up surface, drill forage oats (annual, good option from farmer experience) or short-term ryegrass and harrow behind. After winter grazing forage oats can be mulched to aid in organic matter or made into silage in spring. On very sandy areas use the same seed mix as you normally use on your accretion area.

10. Oversowing is not an option for very sandy flood sediment but is an option for clay/silt loams. Oversowing needs to occur when the silt is still damp and sticky and must occur quickly once water has receded. Only use coated seed. Once the silt has caked and cracked it is too late for oversowing. Relying on rewetting the silt after rain to foster germination of oversown seed is not likely to work. Oversowing is a more risky sowing method than cultivation or direct drilling, so use higher than normal seeding rates. If the silt is too wet, the seed may rot, and if it is too dry then the surface of the silt will cake and crack, and the ryegrass seedlings will struggle to grow primary roots into the "new" soil. Once silt is dry seed may also blow away and birds become a major problem because they can land on the dry silt. Oversow with short-term ryegrasses. Stocking of newly sown areas should begin as soon as possible without pugging. Mulching before regrassing is a good option for building up organic matter.

11. Revegetating shingle will be difficult. If grazing is required within 2 years then the sand/shingle needs to be removed and stacked in a big stockpile. It can then be used for races or sold. Alternatively the area can be retired and revegetated using such things as blue lupins. However be careful not to build up seed stores of undesirable species if you are intending to regrass at a later date.

Information contributors: This information has been compiled on behalf of MAF sustainable farming fund and Meat and Wool Innovation using information provided from experienced farmers, researchers from AgResearch and Massey University and rural professionals from Greenfield's Communications, DairyNZ, Wrightsons, Ravensdown, Hills Laboratories, E-Lab, Agriseeds, Agricom, Balance, QuinPhos, Pioneer, Hills Laboratory, Wilsons and Keeling, Horizons Regional Council, Pyne Gould Guinness, and Williams and Kettle.