

# **Weed removal by tractor-mounted undercutter on the Ashley-Rakahuri river**

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## **Report to ECan. August, 2020**

### **Background**

Shorebirds breeding on braided rivers require clear shingle on which to nest. Over recent years the incidence of woody weeds has increased significantly on the Ashley-Rakahuri (AR) river. It is estimated that the area of clear shingle in the core bird breeding stretch of the river (21km between the Okuku river junction and the SH1 bridge) dropped from around 200 ha in 2014 to about 30 ha by January 2017. Subsequent major floods in 2017 increased this area to around 250ha, but maintenance of cleared areas will forever be a major challenge. To this end, a pilot trial using a bulldozer and rippers was carried out in July 2018. Its aim was to simulate a riverbed ripping technique which has been used for maintaining open bird breeding habitat within braided rivers in Hawkes Bay. Last year (2019) a customised ripper mounted behind a farm tractor was used. Reports on both the 2018 and 2019 work were written for ECan and DOC.

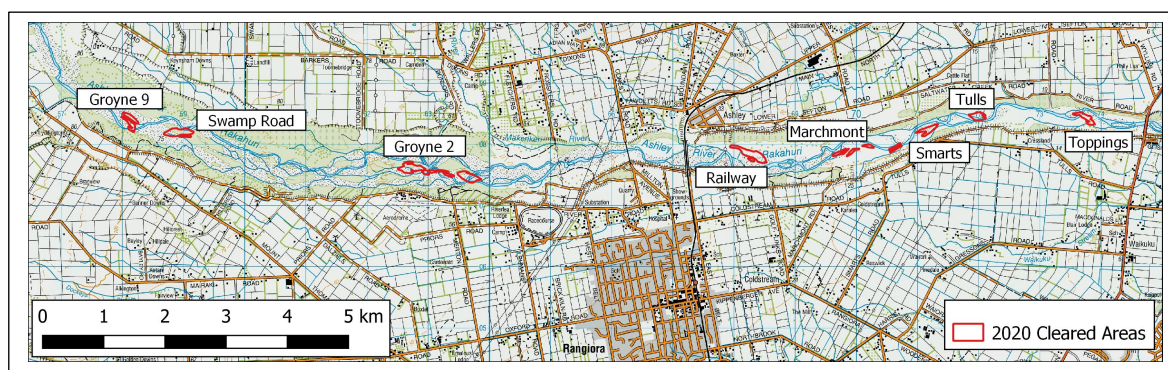
This report covers continued weed removal using the tractor-mounted machine in July, 2020. ARRG is most grateful for this weed clearance work being funded by ECan.

### **Method**

In 2019, a local farm contractor, Nathan Stewart (NS) of Cresslands Contracting Ltd (Tulls Road, Rangiora) was approached to develop and test a ripper for weed control use in the riverbed. Cressland's yards and engineering workshop are within a kilometre of the riverbed, which allowed for ready field testing. NS had machinery in his yard which he was sure could be adapted to do what was required. Initially, a twin set of tynes was mounted on the ripper, but these did not remove weeds efficiently, plus they quickly clogged up and were not robust enough for the stoney riverbed. For the Mark II version, it was suggested that an angled blade be added for towing at 10-15cm depth under the ground surface. This certainly improved the clearance of weeds – to the extent that the tynes were considered unnecessary and removed. The Mark III version just consisted of blades mounted in 3 sections, behind which some railway irons were towed to smooth the weed-cleared surface. This proved to be effective and robust, although clogging was still an issue, especially where vegetation cover (mostly yellow lupins) was dense. Approximately 10ha of ground was cleared by the end of August, 2019. The same machine was strengthened (mainly heavier undercutter blades) for use in 2020. This Mark IV version was used to clear 8 sites covering a total of 33.8ha in mid July. Despite the variable ground, often containing half-buried logs and medium sized boulders, this set-up survived well - apart from one hydraulic hose blow-out, and problems with chain linkage to the towed railway irons (which may be unnecessary and will be omitted next year). All the driving was done by Cresslands employee, Lachlan Shaw (LS). This was important as he was a good operator and soon learnt what was required and how to achieve the best outcome.

## Location

All the sites cleared by the tractor are shown on the map. A total of 33.8ha was treated by ARRG estimation. The area as calculated by the tractor GPS was slightly larger.



## Results and Discussion

The Mark IV version of the undercutter was capable of clearing 90%+ of the weeds, but much depended on depth of the undercutting blade (ideally 10-15cm), the density of that cover and the type of riverbed surface being worked. The blades could undercut a width of 4.5m, but on uneven ground one edge would often be higher than the other. Where this occurred, LS tried to overlap each pass by 30-50cm. On stoney ground with light vegetation under 50cm in height, weed clearance was well over 80%. Even quite deep-rooted broom plants were severed underground and left on the surface. However, it was not so successful in more dense vegetation, especially where there was a high component of sand/silt present. Often the more silty areas had the most dense vegetation cover – in some patches up to 100% closure of 1m+ tall lupins. Sticky soil conditions brought about by some heavy rain did not help, and created extra clogging. Every time the ripper clogged up, it had to be raised to be cleared, and a mound of riverbed stones / silt and vegetation was left behind. Despite the above it is felt that it would be difficult to improve the effectiveness of this machine, or to design a better one to remove light weeds on gravel.

For documentation purposes, drone orthophoto mosaics were made of all but the Groyne 2 and Swamp Road sites post clearing. This was also done prior to clearing at the Tulls and Railway sites.

**Use of areas ripped in 2019.** Most of the 15.5ha cleared in 2019 did not appear to attract increased numbers of breeding birds. A few pairs of BDs did nest at most of the sites, and a wrybill pair was present at Groyne 2, but these species have been seen at the same sites in previous years, when no weed clearing was undertaken. The exception was at the Railway site, where a large colony of both terns and gulls nested. Numbers of gulls first started nesting further upriver at the Rossiters/Pylons site in early October, but were washed out by a flood in mid-October- after which they moved to the much more suitable Railway site. Numbers quickly grew to record levels (over 4000 birds), almost certainly augmented during November by birds retreating from the flooded Waimakariri river.

**Preferred gravel surfaces.** During the 2019-20 bird breeding season, GD investigated the type of gravel surface most favoured for bird breeding (see internal report - Grant Davey, 2020. Black-fronted tern and black-billed gull colonies, 2019-2020 season. 39pp). Over 100 nests were photographed. It was found that terns and gulls preferred a loose coarse gravel surface with close proximity of stones from 8-15cm in width. Sand and silt surfaces were not favoured, although they were used by some BD pairs. Also not favoured were compacted gravel surfaces, which often result where blades are used for weed clearance. At the Smarts site, where Taggarts Earthmoving Ltd cleared an area of some hectares as part of their gravel extraction operation, there was a large expanse of weed-free but compacted gravel. An island component of this was loosened by the undercutter, plus another part was 50% loosened, while the rest was left in its compacted state. The intention was to create a range of gravel/sand surfaces in the hope that birds might indicate their preferences for breeding.

**Cost.** Due to the varied nature of the riverbed surface and vegetation cover, the tractor (a Claas, 200hp) was often working hard – quite a lot harder than would be needed in normal farm ground development operations. Future use will depend on the cost-effectiveness of the method.

It is estimated that around 34 ha were cleared of weeds over the days of July 9, 10 13-15. The pre-operation agreed price was \$250/ha. On average, clearance of a hectare took about one hour, but varied according to the gravel surface type and density of the vegetation cover. Use of a bulldozer in previous years has worked out at \$400/ha. More recent quotes of under \$200/hour have been received for bulldozers and a grader (probably the cheapest). Hence, when considering these comparative costs, the tractor/undercutter may appear expensive, but compared to the use of blades, it appears to create the loose, coarse gravel surface most suitable for bird breeding.

**The future.** Weed control in the riverbed has to be considered over the long-term. Any soil disturbance will bring a new crop of seeds to the surface and promote weed growth. However, if clearance is undertaken over 2 years (and longer), that seed bank in the soil should not only be considerably diminished (as long as there is no new floods to bring in more seeds), but the effort needed to clear the ground of low stature weeds will be much less – so the ripper can cover more area/hour. The above depends on the seed weeds having a short life in the soil, and this appears to be the case for the dominant yellow lupin (see student study below). Fortunately, gorse and broom plants are either small or not too common on the site, so their much longer-lasting seed bank may not be large. A further point to be considered is that the majority of yellow lupin plants do not flower in their first year. Therefore, if they can be removed before that year is out, there should not be a new crop of seeds being produced on-site.

However, it has been shown that floods of 10-year return period can remove islands which have provided good nesting habitat and at the same time make new ones. In comparison, mean annual floods (return period of 2.33 years) in the Ashley River seem to deteriorate nesting habitat by depositing sand on islands. Therefore, we will always be dealing with a changing, dynamic environment and cannot expect to retain nesting sites long term.



All the above emphasises the need for this weed clearing trial work to be continued into the future – with the incidence of major floods determining the actual location and extent of clearance needed. To date, the tractor-mounted undercutter has only been used in the Ashley-Rakahuri river, but it should be equally suitable for use in other braided rivers.

**Student study.** In conjunction with the tractor-undercutter weed clearing work, a student is studying the details of associated vegetation successions on the gravel surfaces created. This University of Canterbury student, Sanaz Safavian, started her 3-year PhD degree in July, 2019, under the supervision of UoC lecturers and DOC. In her 2019 trials at the Tulls and Smarts sites, she compared vegetation growth and successions between cleared sites and control plots left undisturbed. The Tulls site was reworked as part of the 2020 clearances. Sanaz is also looking at resident seed banks in the gravel, including the seed viability and longevity of the dominant weed, yellow lupin. Needless to say, it is hoped that the areas cleared of weeds will attract breeding birds. This will be closely monitored by Sanaz. In 2019, the Tulls site was only used by two pairs of BDs.

### **Acknowledgement**

ARRG is most grateful to ECan for the funding of the above 2020 weed-control work. In 2019, DOC was a joint funder along with ECan.



Clearing weeds at Toppings





Railway site

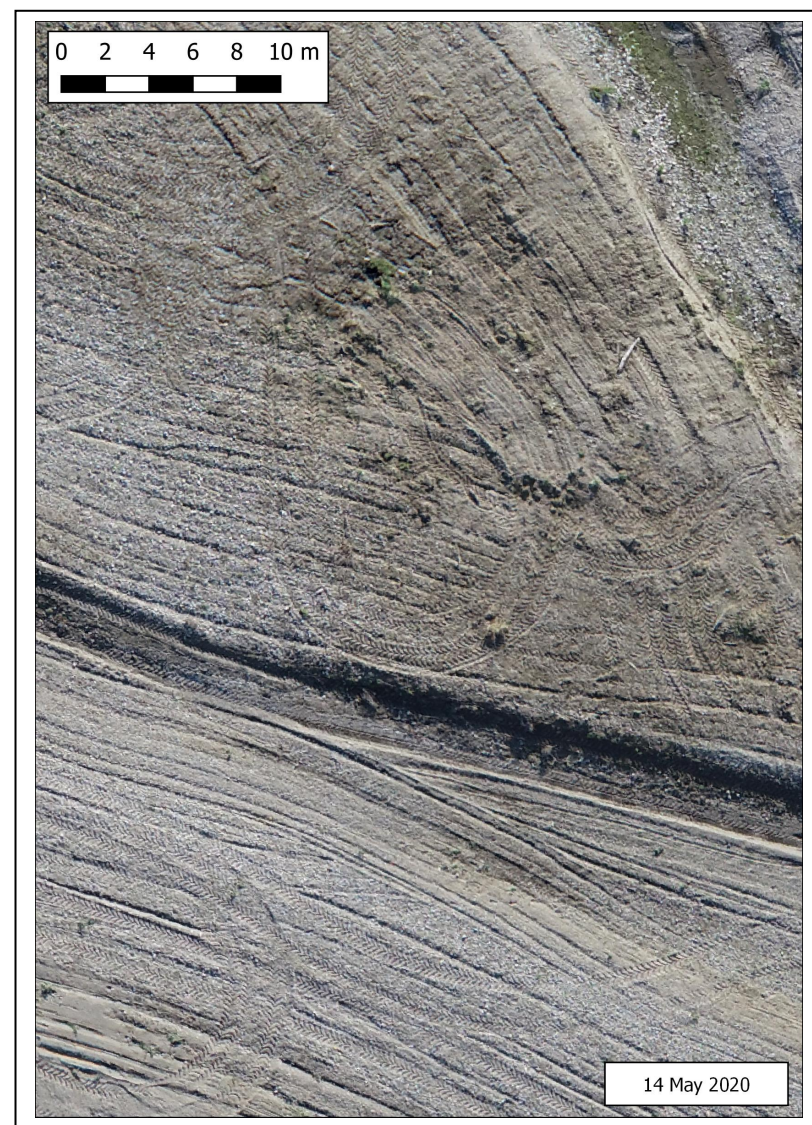


Loosening compacted surface at Smarts – Taggart gravel extraction area





Part of Railway area prior to clearing



Same area after clearing