Forest Management Plan (FMP) 2004-2013

Mid- term audit report

The Forest Products Commission (FPC) response to the Conservation Commission (CC) regarding concerns that the increased use of machine harvesting for timber production will lead to further shortfalls in the area of soil disturbance.

Summary

Machine harvesters have been in use in the south west of Western Australia (WA) for approximately 20 years.

They have a number of advantages over manual tree felling, the most important being the additional safety provided for the operator. They also can have drawbacks if operators are not well trained and harvest operations not well planned, for example contributing to adverse soil disturbance levels.

The data contributing to the report against Key Performance Indicator (KPI) 21 suggests that the position of extraction tracks is the greatest contributor to adverse soil disturbance outcomes. Machine harvesting can exacerbate the potential for this to occur if the machine harvesting and subsequent log extraction is not well planned.

Where harvest cells are narrow or irregular in shape it is likely that the soil disturbance thresholds will be exceeded. This is likely to occur with or without machine harvesting due to the configuration of extraction tracks required to access the harvest cells. In these circumstances the guiding principle should be that the harvesting operation is well planned and managed to minimise soil disturbance rather than remaining within definitive limits.

The FPC is also of the view that the data contributing to the report against KPI 21 shows a trend of continuous improvement during the period 2004 to 2008. This reflects the importance and priority FPC has placed on the achievement of acceptable soil disturbance outcomes.

FPC concludes that the broader benefits of using machines in harvesting significantly outweigh any potential risks in soil management. The overall reduction in soil damage has occurred at a time when there is a high level of use of machine harvesters.

Introduction

The purpose of KPI 21 is to report on the success or otherwise of the implementation of the FMP in achieving its targets with respect to soil disturbance levels as a result of timber harvesting.

Soil disturbance monitoring undertaken by the Department of Environment and Conservation (DEC) and reported in KPI 21 suggest that soil disturbance levels associated with timber harvesting operations have exceeded allowable limits, in

some instances, in each year of the first four years of the FMP. All instances were associated with the use of machine harvesting. The assumption is drawn from this that there is a heightened risk of soil disturbance levels continuing to exceed allowable limits with the continued use of machine harvesting.

Background

Following a worldwide trend in the application of mechanised harvesting, machine harvesters were introduced into native forest harvesting operations in south west WA in the late 1980's. Initially their use was restricted to regrowth karri thinning operations but subsequently as machine design advanced they began to be used in the mature forests. Today their use has become common practice with approximately 25 machine harvesters deployed by harvesting contractors in native forest timber harvesting operations in WA's south west.

The annual area of native forest harvested in the south west of WA each year has averaged approximately 9,600 hectares for the past four years. This includes jarrah, karri, karri regrowth thinning operations and wandoo forest. The majority of this area has been machine harvested.

All harvesting operations are monitored for soil disturbance according to the requirements of the 'Interim Manual of Procedures for the Management of Soils Associated with Timber Harvesting in Native Forests', DEC SFM Manual No.1 2007. Both FPC and the DEC are required to undertake soil surveys to assess the level of soil disturbance. KPI 21 has reported only against soil surveys undertaken by the DEC. KPI 21 states that FPC data was not considered, "*primarily because monitoring is conducted prior to completion of operations and does not represent the final level of disturbance for a feller's block.*" Of note is that FPC survey results tend to record lower soil disturbance levels than DEC surveys for the same harvest cells. This is no doubt partly due to the statement above however it is also a consequence of assessed soil disturbance levels being a judgment rather than a precise measure.

Importantly as stated in the KPI 21 report "*the data are not a random or unbiased sample of operations. Surveillance and monitoring undertaken by the Department are carried out in a risk management framework and often focused on sites that are at the highest risk of exceeding disturbance limits.*"

Also importantly although KPI 21 indicates all instances where allowable soil disturbance was exceeded were for machine harvested areas it does not follow that all machine harvested areas incurred excessive soil disturbance. Thus properly managed machine harvesting operations are capable of remaining within allowable soil disturbance limits.

KPI 21 also makes the observation that problems with soil disturbance were often associated with either new machine operators or Supervisors. This again is an important element highlighting the need for well trained and motivated harvesting contractor personnel with a clear understanding of the desired soil outcomes associated with timber harvesting operations.

Review of Data Supporting KPI 21

In order to determine any trends which may have lead to the reported soil disturbance limits being exceeded, the data supporting Tables A25, A26, A27 and A28 in the KPI 21 report has been reviewed. This included seeking copies of original

soil survey booking sheets and any documented comments from the DEC staff undertaking the surveys. Results of the review are summarised overleaf in Table 1.

Table 1 Data on which KPI 21 is based

YEAR	HARVEST CELL	RISK PERIOD	HARVEST TYPE	DISTURBANCE %		COMMENTS
				D2	D3	
2005	Lowden 01 Cell 7	MH	JARRAH	11.4	4.8	
	Torrens 4 Cell 4	MH	JARRAH	18.8		snig pattern following harvester felling pattern
	Torrens 4 Cell 7	MH	JARRAH	12.9		small cell, better use of snig layout
	Torrens 4 Cell 6	MH	JARRAH	11.4		skidder using harvester tracks not approved pattern
	Torrens 4 Cell 10	M	JARRAH		3.8	multiple primary extraction tracks
	Windsor 5 Cell 5	M	JARRAH	18	3.1	snig pattern ok small cell big volume
	Windsor 5 Cell 6	M	JARRAH		8.8	snig pattern ok small cell/small volume
	Torrens 4 Cell 11	M	JARRAH	10.9		3 primary extraction tracks off landing
	Windsor 5 Cell 27	L	JARRAH	10.1		narrow cell
	Torrens 4 Cell 14	M	JARRAH	10.2	3.4	multiple extraction tracks off landing
	Torrens 4 Cell 16	M	JARRAH	9.3		snig pattern following harvester felling pattern
	Torrens 4 Cell 22	M	JARRAH		3.8	multiple extraction tracks off landing
2006	Torrens 4 Cell 21	L	JARRAH	8.8	6.6	4 primary ET's
	Torrens 4 Cell 25	L	JARRAH	14.6		better results better layout of snig pattern ET1 not surveyed
	Clinton 1 Cell 1	L	JARRAH	13.2		better use of herring bonesnig pattern
	Lang 4a 21	L	JARRAH		8.4	% related to damage observed versus snig pattern layout
	Lang 4a 23	L	JARRAH		3.6	inappropriate snig pattern used
	Clinton 1 Cell 2	L	JARRAH	10.9		better use of herring bone snig pattern
	Clinton 1 Cell 8	L	JARRAH	11.8		better use of herring bone snig pattern
	Clinton 1 Cell 12	L	JARRAH	24.3		multiple ET's
	Clinton 1 Cell 14	L	JARRAH	9.9		snig pattern ok
2007	HADFIELD 0305 12b	H	JARRAH	10.7	4.5	
	Wearne 5 Cell 12	MH	JARRAH		2.7	survey only 1424 points
	Wilson 1 Cell 29	M	JARRAH		2.1	survey only 1343 points
	Wilson 1 Cell 35	L	JARRAH	11.3	5	
	Wilson 1 Cell 30	L	JARRAH	14.2	5.4	
2008	Yabberup 307 Cell 2	L	JARRAH	18.3	4	
	Amphion Cell 13	L	JARRAH	8.8	2.3	survey only 1414 points
	Sutton 7 Cell 6		K CLEARFELL		2.7	survey only 1121 points, narrow cell
	Nairn 3 Cell 1		K THIN		2.4	survey only 1170 points, narrow cell
	Randall Cell 4	L	JARRAH		2.3	survey only 1108 points
	Balmoral Cell 3	L	JARRAH	11.9	4.2	

Note: Blank boxes indicate soil disturbance level was within limits

Table 2 Summary of trends (excludes incomplete survey data)

YEAR	FOLLOWING HARVESTER PATTERN	EXTRACTION TRACKS	SMALL NARROW CELLS	OTHER	TOTAL CELLS
2005	3	4	4	1	12
2006		9			9
2007		3			3
2008		2			2

From Table 1 for 2005 there were 12 separate harvest cells contributing to the data set. All were significantly over the allowable soil disturbance limits. The reasons for 7 of these cells exceeding allowable limits were avoidable, 3 following the machine harvester pattern and 4 having multiple extraction tracks. 4 others were small narrow cells which are difficult to manage within soil disturbance limits. For the remaining cell there was no information on which to judge the reason for exceeding the limits, however KPI 21 page 85 of the Mid Term Audit Report indicates that all moderate (D2) and severe disturbance (D3) exceeding allowable limits was due to extraction tracks.

It should also be noted that the way the data was presented in Table A25, 3 harvest cells contributed twice. These were Lowden 01 cell 7, Windsor 5 cell 5 and Torrens 4 cell 14 contributing to both D2 and D3 level disturbance percentages.

For 2006, 9 separate harvest cells contributed to the data set. From the information available, following the harvester pattern was not a contributing factor however multiple extraction tracks remained a concern with 4 cells observed to have this attribute. For the remaining 5 cells it appeared that extraction track patterns were generally better however again these contributed sufficient D2 and D3 soil disturbance to exceed allowable limits.

For 2007, 5 harvest cells contribute to the data set. Of these however 2 are only marginally above the allowable limits for D3 soil disturbance. The data for these 2 cells is also based on limited soil surveys of less than 1,500 assessed points. . Removing these incomplete 2 cells on the basis of inadequate data leaves 3 harvest cells exceeding allowable limits. Soil disturbance limits exceeding the allowable limits in the remaining 3 cells was related to the extraction track network.

It should also be noted that the way the data was presented in Table A27, 1 harvest cell contributes twice. This was Wilson 01 cell 30, contributing to both D2 and D3 level disturbance percentages

For 2008, 6 harvest cells contribute to the data set. Of these 6 harvest cells 4 soil surveys fall short of the requirement of 2,500 point surveys and 3 fall short of the minimum requirement of 1,250 point survey. These 4 harvest cells have been recorded as only marginally exceeding the allowable soil disturbance limits. Removing these incomplete 4 cells on the basis of inadequate data leaves 2 harvest cells exceeding allowable limits (It should be noted however that 2 of the 4 harvest cells had a narrow configuration and in those an extended survey may not have changed the observed outcome). Soil disturbance limits exceeding the allowable limits in the remaining 2 cells was related to the extraction track network.

It should also be noted that the way the data was presented in Table A28, 1 harvest cell contributes twice. This was Amphion cell 13, contributing to both D2 and D3 level disturbance percentages.

In summary although the data has some weaknesses the trend for the four years from 2005 to 2008 is that where reported soil disturbance limits exceeded allowable limits it was due to extraction track management rather than machine harvesting. Well planned and managed extraction following machine harvesting can reduce the occurrence of soil disturbance exceeding the allowable limits.

The potential occurrence of soil disturbance limits being exceeded can not be removed entirely as, as indicated in KPI 21 there are circumstances where it is not physically possible to stay within the allowable limits due to harvest cell configuration, size or slope. The application of machine harvesting in these circumstances has little if any influence on this outcome. In these circumstances the guiding principle should be that the harvesting operation is well planned and managed to minimise soil disturbance rather than remaining within definitive limits.

An important trend to note in the above data (refer Table 2), removing those harvest cells that have an incomplete survey associated with them is a trend of continuous improvement, with the number of harvest cells reported annually by the DEC as exceeding the allowable soil disturbance limits reducing from 12 harvest cells in 2005 to 9 in 2006 to 3 in 2007 and 2 on 2008. Although this trend may be contributed to by a decreased level of monitoring and reporting by the DEC over time, it is the FPC's view that it does reflect the real increase in focus and attention that is placed on soil management outcomes by the FPC.

Discussion

The main reason for the wide use of machine harvesters is that they are capable of higher production rates as compared to hand fallers and as a consequence have comparatively low unit costs of production. They are also able to control tree fall and so place trees to avoid damage to standing retained trees. Their ability to bunch logs into heaps without the need for skidding machines to travel to every stump to extract logs also reduces the area of the harvest coupe at risk of compaction and provides for more efficient extraction of logs to roadside landings (rubber tyred skidders have approximately double the ground pressure of machine harvesters).

Probably the most important outcome of the use of machine harvesting systems is greatly increased operator safety and comfort and reduced risk of acute injury. In the four decades leading up to the mid 1980's the incidence of injury to tree fellers in WA was relatively high with an average fatality rate of one death per year. The last fatality of a tree feller in WA occurred in 1995.

Operator cabins on harvesting machines are constructed to Falling Object Protection Standards (FOPS) providing protection to the operator from falling limbs and trees. In one incident in 1997 a marri tree fell on the cabin of a machine harvester crushing the cabin to half its original size without serious injury to the operator. Conservation and Land Management (CALM) staff who supervised the harvesting operation at the time were convinced the feller would have been killed had he been using a chainsaw instead of operating a machine harvester. There have been further examples of the value of cabin protection since.

There are downsides to machine harvesters if used poorly impacting issues including damage to retained trees, log utilization and the potential to contribute to unacceptable soil disturbance due to the skewing of tracks as the machine is maneuvered through the forest. All of these downsides can equally apply to the use of handfallers if not well managed. For example excessive soil disturbance through scrub rolling prior to handfalling operations can contribute to unacceptable soil disturbance outcomes. Handfallers tend to leave higher stumps than machine falling impacting on log utilization.

Machine harvesters initially developed from earth moving excavators fitted with customized tree felling heads. As a consequence of this they were not ideally suited to all situations. For example large machine harvesters with a tail swing outside of the excavator track base have the potential to cause unacceptable damage to retained trees. Customised machine harvesting equipment is now available such as zero tail swing machines which negate the above concern. It is likely that over time as older machines are replaced by harvesting contractors with more modern equipment environmental outcomes will continue to improve.

While machine harvesters used in association with skidders can result in some excessive soil disturbance, the major determinant of damage is through the management of the coupe. At present the overall trend appears to be a reduction. There are many reasons why machine harvesting could be considered as the superior method of felling trees, although there is not definitive evidence to demonstrate either case.

From the survey data the overall scale of excessive soil disturbance cannot be considered a major issue. The proportion of the harvest area identified in these risk-based surveys is less than 0.15% being excessively disturbed. It is highly questionable whether the biological or productive values of the forest suffer any real effect from this minor level of impact. Given the number of significant threats facing the biological, economic and social value of the forest, soil disturbance appears to be less important and warrants no additional attention above that currently in place.