



STAFF REPORT

TO: Environment & Planning Committee

FROM: Andrew Burton, Resource Scientist

REFERENCE: L213

SUBJECT: **SOIL INTACTNESS MONITORING PROGRAMME - REPORT**
EP05/06/07 – Report Prepared for 1 June 2005 meeting

1. EXECUTIVE SUMMARY

This soil intactness monitoring programme has been completed to help identify trends and issues relating to soil disturbance and land instability in the Tasman District. The monitoring programme is based on data collected off Council's aerial photography flown between December 2000 and January 2002 and hence relates to the state of the soils in the year 2001.

Our aerial photograph set covers only 64% of the District but does include the vast majority of privately owned land that may be used for land-based productive purposes, i.e. it covers 94% of the land not administered by the Department of Conservation within the District. The data collected is based on a statistically significant sample of 6,005 points.

The survey identifies whether points are on stable or unstable landforms. It indicates through the presence or absence of vegetation whether points are at risk of soil disturbance. It also differentiates whether disturbance results from the shifting around of soil by land use activities, or erosion and accumulation by natural processes. Finally, it assesses the extent of vegetative cover whether natural or planted - and measures its effect with respect to soil conservation.

2. SOIL INTACTNESS

85% of the soil in the survey area is intact. It is vegetated and is either stable land or inherently unstable land that is currently inactive and completely vegetated.

8% of the soil is disturbed by land use activities. These sites are where tracking, roading, cultivation, harvesting and earthworks are present. Vegetation may be completely absent or revegetation may be occurring but bare topsoil or subsoil is apparent.

6.3% of the soil is unstable due to natural disturbance. These disturbances include landslide, slip, earthflow, gully, sheet, stream bank erosion, rockfall and windblown sand. Some of these erosions may be fresh and others may show signs of revegetating.

3. LAND USE IMPACTS

Fresh disturbance by land use related activities such as roading, cultivation, harvesting and earthworks is most intensive on dairy farms, where the majority of the disturbed area is due to the presence of farm tracks and lanes. Although the majority of dairying is based on flat land where surface water run-off is less prevalent than, say, on hill country, localised sedimentation is known to occur and affect the in-stream values of small streams. Another main contributor to disturbance on dairy farms is cultivation. The measured incidence of stream bank deposit is also significant and is also likely to be associated with a small incidence of stream bank erosion which unfortunately this survey method does not adequately pick up.

Fresh disturbance in exotic forests also is significant. Exotic forestry is the largest commercial-based land use type situated on hill country in the survey area hence the effect of the disturbance can potentially be significant, as silt in run-off from the disturbed sites is likely to enter water bodies. The table below demonstrates the levels of disturbance.

Land Use	Percentage of Survey Area	Percentage Freshly Disturbed by Land Use
Intensive land use	1.3	5
Dairy pasture	4	18.5
Dry stock	15	6
Exotic forestry	17	11.4
Scrub	14.7	2.9
Native forest	40	0.2
Mountain scrub/tussock	3	0.4

Activities such as roading and harvesting are the major disturbance types and have the potential for soil loss. Only a very small proportion of the area surveyed that is in pine plantation is freshly disturbed by natural processes.

4. NATURAL EROSION RATES

Land use practises can also accelerate natural erosion processes. Fresh disturbance by natural processes such as landslide, slip and stream bank erosion is low over most of the area.

Mountain scrub and tussock has the highest incidence, with half of the area affected by fresh disturbance.

None of the production-based land uses have incidences of disturbance by natural processes exceeding 2%; this is similar in incidence to native forest and indicates that, in general, production-based land use in 2001 was not significantly affecting natural erosion rates.

The highest incidence of natural erosion is found under scrub cover, where close to 5% of sites are affected. Sheet, landslide, slip and stream bank erosion were the major forms noted under scrub.

5. VEGETATION COVER

Dense primary vegetation functions as a soil conservation measure, providing topsoil with protective cover against disturbance by land use. Likewise, the retention or planting of secondary vegetation plays an important role in soil stability. The majority of land in the survey area is covered by dense vegetation.

Of land under intensive land use, such as orchards, vineyards, grain crops and greenfeed crops, 21% has no secondary vegetation present. Where it is present, grass cover is dominant and is mainly in the orchard areas, where it is present on 78.3% of sites. On the other intensive land uses i.e. vegetable production, grain and greenfeed crops, there is no secondary vegetation on 82% of the sites.

Under dairying, three-quarters of dairy paddocks are clean pasture without secondary vegetation. Secondary vegetation occurs on over half of the drystock pasture. This high percentage in drystock pasture partly reflects less intensive grazing management compared to dairy farms. Few areas of secondary vegetation exist or have been established for the purpose of soil conservation on hill slopes. In general, the majority of exotic secondary vegetation is found on stable areas. More native forest and scrub is found on unstable sites.

Over half the forest plantations have secondary vegetation that is visible through the forest canopy. Its diversity is a clear consequence of forest management and ranges from grass and scrub cover between young plantings to areas of scrub, trees or wetlands along streams, gullies and steep faces. These are the sites that would be most prone to erosion. A small number of them are where soil conservation trees have been planted but the majority is scrub or native forest vegetation that has been left or regenerated.

6. LAND USE RELATIVE TO LAND CAPABILITY

Land use (or land cover) relative to land capability is an excellent measure of the “pressure” on the soil resource, as it measures the match of land use on a particular land type.

The Land Use Capability (LUC) Classes I to IV land cover 12.9% or 79,370 hectares of the survey area and represent the vast majority of intensively used land in the District (plains, terraces, valley floors and gently sloping land). Not surprisingly, 84% of Class I to IV land is used or managed for productive purposes ranging from market gardening through to exotic forestry.

Class VI land, which has moderate limitations and hazards under perennial vegetation cover, covers 16.5% or 101,524 hectares of the survey area. Exotic forestry and pastoral farming are the two major productive uses of Class VI land and occupy just over 60% of the area. A very small area of orchard exists on the “Moutere Hills” on Class VI land but generally the contour would have been modified and measures implemented to minimise erosion. Scrub and native forest occupy a combined 37% of the area. Obviously, the limitations to use such as contour and potential erosion even on what would be classed as “medium hill country” have a significant influence on how much of this land is used for productive purposes.

Class VII land covers 35.6% or 219,047 hectares of the survey area. This class of land has severe limitations or hazards under perennial vegetation. In general, it can only support extensive grazing or erosion control forestry. The limitations to the Class VII land are similar to those affecting Class VI land but are intensified. Risk of erosion is frequently the dominant land limitation, requiring careful conservation management practices. This obviously influences land use in Class VII land, which is dominated by native forest and scrub at 62% (135,809 hectares) of the area. Exotic forestry covers 28.5% (62,428 hectares) of the area, improved drystock pasture 3.9% (8,543 hectares) and unimproved drystock pasture 2.6% (5,695 hectares).

Class VIII land covers 30.3% or 186,436 hectares of the survey area. Class VIII land has very severe to extreme limitations or hazards which make it unsuitable for arable, pastoral or production forestry use. Land use in Class VIII land is dominated by native forest and scrub covering 83% (154,742 hectares). Exotic forestry and pastoral use covers 2.2% (4,102 hectares) and 0.8% (1,491 hectares) of the area respectively.

An examination of the 3% of the Class VIII area under land-based production indicates that the levels of all natural erosion types (i.e. other than earth exposed by roading, harvesting and earthworks) are lower in exotic forestry when compared to native forest and scrub. The number of sites in pastoral use was not large enough to provide statistically significant results.

The land use relative to land capability comparison suggests that generally land use is following an appropriate trend through the land use capability classes. Also, there are no significant differences in natural erosion rates between land uses that highlight a problem. One could argue that the 3% of Class VIII land that is used for land-based production is 3% too much because of the erosion potential. It is probable that the scale of the land use capability mapping may not be of sufficient detail to give an accurate picture. It would be worthwhile to investigate these small areas of forestry and pastoral areas more intensely to address this and see if any issues exist.

The survey indicates that although there is only a low level of natural erosion through the survey area and land use is not showing up as accelerating this level, the intensity of land disturbance by roading, harvesting and earthworks on steeper land, particularly dominant in exotic forest operations, does pose a real risk to soil intactness.

7. RECOMMENDATION

That the Committee receive this report.

Andrew Burton
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