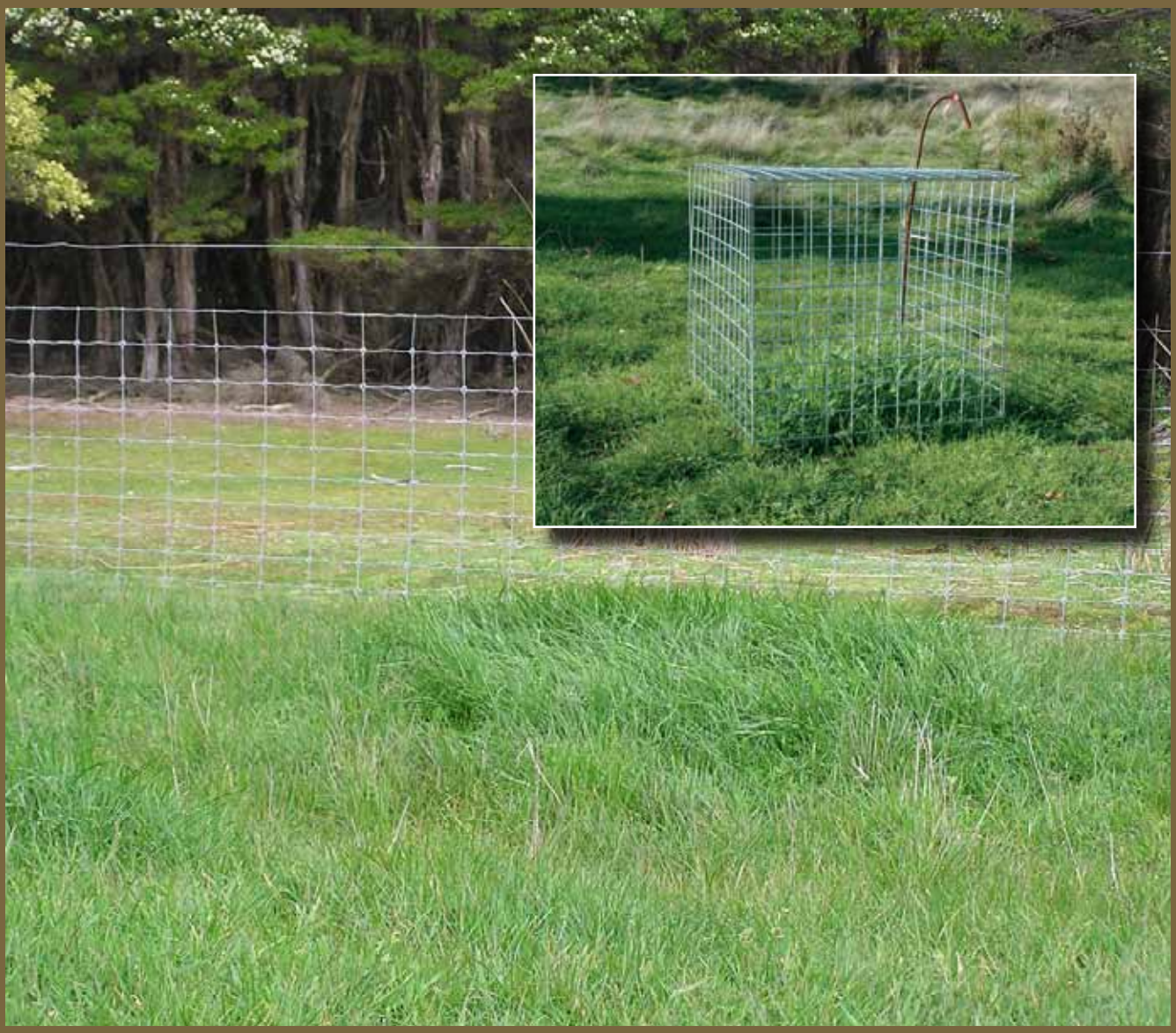
Monitoring and Measuring Pasture Losses to Wildlife



Game Services Tasmania
Department of Primary Industries, Parks, Water and Environment

Tasmanian Government

We were at the stage where we couldn't afford not to fence. Grass wouldn't germinate before the fence was built and we couldn't run 50 sheep in the paddock. Now we run 50 cows and 200 sheep. ***Stewart Archer, Weymouth.***

We share a 12 km boundary with the Crown, which currently means a loss of production equivalent to about 125 breeding cows. The good thing is that if we wallaby proof fence the boundary and it is effective it will pay for itself quickly. ***Steve Pilkington, Redpa.***

We fenced a 20 ha paddock in November and now, two months later, the pasture inside the fence is a foot high and is being grazed by sheep. Outside the fence there is less grass than on a bowling green. ***Leigh Hansson, Bruny Is.***

Is Pasture Loss To Wildlife Really That Important?

Loss of agricultural and forest production to native and introduced wildlife in Tasmania is considerable. Most landowners have only anecdotal records of losses due to wallaby and possum browsing because accurate records are time consuming to collect, but comments above indicate the extent of losses.

Experimental information on pasture loss in Tasmania due to wallabies is limited. However, 4 studies have been reported in scientific journals.

- In a 3 year trial[1] using an electric fence designed specifically to exclude wallabies, loss of production to wallaby browsing averaged 11% inside the fenced areas, compared with 83% in an adjacent similar area with a normal stock fence.
- In another later trial[2], where exclosure cages were used to exclude wallabies in farm paddocks, pasture loss in areas accessible to wallabies outside exclosures varied between 17% and 100% at 9 different locations.
- With wallaby proof wire fences around 5 ha paddocks in the North East and South East of Tasmania over 3 years, an increase in carrying capacity of over 35% on dryland pastures was achieved when wallabies were excluded[3].
- In a short term, preliminary study[4] of the effects of all wildlife on pasture growth at Elliot in North West Tasmania, pasture dry matter production was reduced by 21% under dryland and 34% under irrigation.

A trial[5] on a large property at Ross in the central midlands, measured the impacts of browsing damage by native and introduced wildlife on pasture. Pasture loss was greatest close to bush edges and diminished with distance into the pasture. The main browsing/grazing species were identified as Forester kangaroo, Bennett's wallaby, brushtail possum and fallow deer. However, the relative importance of each of the browsing species in causing the damage has not yet been determined. Other trials[6] in 12 irrigated and dryland dairy pastures in northern Tasmania are recording pasture loss to Tasmanian pademelons (rufous wallaby), near the paddock edge, ranging from 12% to 100% with an average of 65%.

An easily relocatable exclosure.

Loss of production does not relate directly to numbers of browsing animals present because the animals don't necessarily get all their food from the crop or pasture.

However, animal surveys by spotlight counting or faecal pellet counts can help determine which browsing species are present and whether there are large numbers of them.

How Do I Know How Much I Am Losing?

One of the first steps in deciding how important losses to wildlife are on your farm is to try and estimate how big a financial impact they are having.

The presence of animals by itself is not the problem, it is the amount of pasture or crops they are eating, so just counting animals will not give you a good indication of how much impact they are having as you don't know how many you're not seeing, or how much of their diet is coming from your pastures.

Direct pasture monitoring is the best way to really understand wildlife impacts at a property level and is recommended as part of any wildlife control strategy monitoring program.

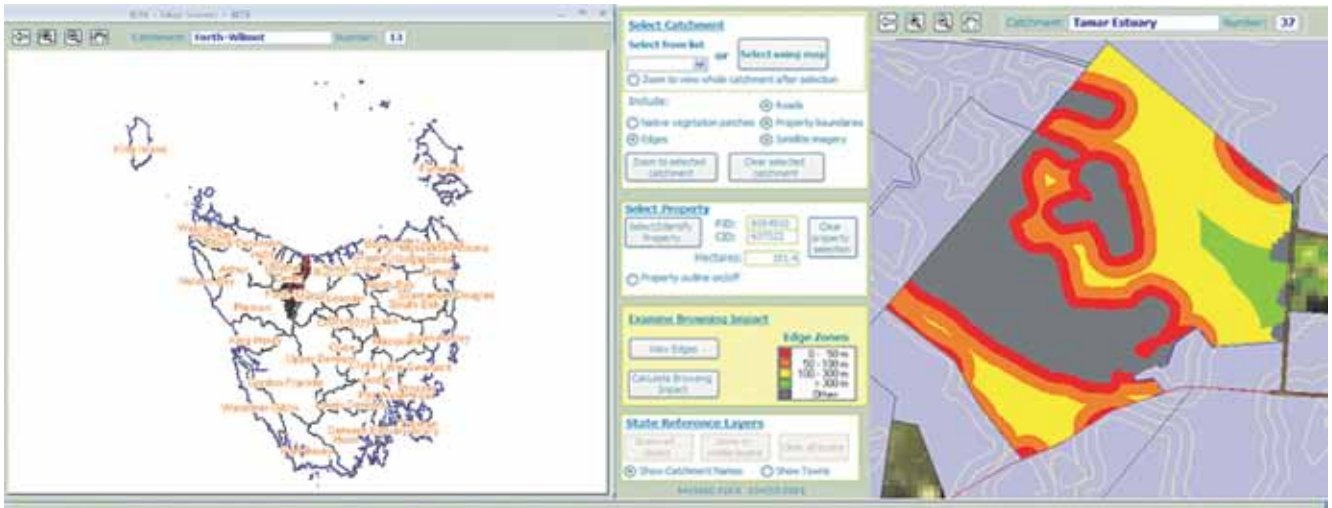
There are several ways you can determine your losses, or at least relative impacts, without going to the time and effort of putting out exclosure plots.

> Our research indicates that the magnitude of pasture loss and its economic implications are seriously under-estimated by many landowners and land managers in Tasmania. The magnitude of the annual financial loss to the pasture-based, primary industries is clearly in the order of many millions of dollars.
>
> Professor Tony Norton.

Method 1: Property History

If you've owned the property for a long time, or have access to longer term records, look back and see how productive the different areas of your farm were 5, 10 or 20 years ago. If you find you're running significantly less livestock than you used to, and that this difference can't be explained by other causes, then this is a good initial estimate of the impact that increased wildlife browsing has had on your farm. Just take the amount of stock you can no longer run and multiply this by how much they're worth to you each year and you have a very good starting point for how much browsing impacts are costing you under your current control strategy.

It may also be more subtle, but are you still cutting the same amount of hay or silage as you were five, ten years ago?



Catchment: Tamar Estuary CAT_ID: 37 Property CID: Property PID: Property area within catchment: 186.5 ha

Enterprise: Beef $ Conversion: 0.23 Pasture Growth: 7782.99 kg DM per hectare per year Pasture Use factor: 0.6 Scenario: Baseline

Edges	Edge Size	Pasture eaten by Wildlife	Net Pasture Growth (per hectare annually)	Pasture Loss from Browsing (per hectare annually)	
0 - 50 metres:	15.81 ha	67.00 %	0.0 kg DM	3128.8 kg DM	$719.62
50 - 100 metres:	14.89 ha	67.00 %	0.0 kg DM	3128.8 kg DM	$719.62
100 - 300 metres:	60.46 ha	34.00 %	1525.5 kg DM	1587.7 kg DM	$365.18
>300 metres:	22.69 ha	5.00 %	2879.7 kg DM	233.5 kg DM	$53.70
Totals:	113.85 ha				

Help | Print Form | Save Current Scenario | Close Form

Total Pasture Production Loss: 197350.5 kg DM per year / $45,390.61 Dollars per year

Adjust Monthly Data

Month	Daily Pasture Growth kg DM per ha	Monthly Pasture Growth kg DM per ha	Monthly Pasture Use kg DM per ha	Percent Pasture Browsed 0 - 50 m	50 - 100 m	100 - 300 m	>300 m	Pasture Loss from Browsing (kg DM per ha) 0 - 50 m	50 - 100 m	100 - 300 m	>300 m	Value of Wildlife Browsing
Jan	20.5	507.9	304.7	67.00	67.00	34.00	5.00	204.2	204.2	103.6	15.2	$2,962.11
Feb	8.1	180.5	108.3					72.6	72.6	36.8	5.4	$1,052.94
Mar	4.8	118.8	71.3					47.8	47.8	24.2	3.6	$692.80
Apr	2.7	65.5	39.3					26.3	26.3	13.4	2.0	$382.11
May	4.1	100.7	60.4					40.5	40.5	20.5	3.0	$587.21
Jun	2.4	58.3	35.0					23.4	23.4	11.9	1.7	$340.12
Jul	6.1	150.5	90.3					60.5	60.5	30.7	4.5	$877.93
Aug	24.9	616.8	370.1					247.9	247.9	125.8	18.5	$3,597.05
Sep	54.9	1317.8	790.7					529.8	529.8	268.8	39.5	$7,685.68
Oct	80.8	2002.8	1201.7					805.1	805.1	408.6	60.1	$11,680.66
Nov	71.4	1712.6	1027.6					688.5	688.5	349.4	51.4	$9,988.16
Dec	38.3	950.6	570.4					382.1	382.1	193.9	28.5	$5,543.83

BITE is a powerful computer software program that can help you estimate pasture loss.

BITE screen images: (Starting from top left in a clockwise direction) Selecting the catchment where your property is located is the first step to finding your property using the map function;A view of the predicted level of browsing for a parcel of land. (The differing colours represent browsing zone classifications based on distances from the bush edge, red = 0-50m, orange 50-100m, yellow 100-300m and green =>300m);A summary of estimated pasture production and potential pasture loss due to wildlife for each zone highlighted on the parcel of land. (The baseline data and assumptions used in the analysis can be easily modified to reflect known pasture growth and potential pasture loss figures for a property).

Method 2: Use BITE

As part of the Alternatives to 1080 Program, Prof. Tony Norton of TIAR has developed a tool called BITE (Browsing Impact on Tasmanian Ecosystems), which you can use to estimate your pasture losses from wildlife browsing.

At its simplest the model requires you to nominate your enterprise type (dairy, beef or sheep) and then locate and select your property and based on some catchment level assumptions about pasture growth, wildlife browsing

Setting out a transect line to do a faecel pellet count. Set it at one metre by twenty metres.

impacts and pasture utilisation derived from a number of research projects, BITE will produce an estimate of pasture losses for your property. However, the model is much more powerful than this, allowing you to modify all assumptions from pasture growth, pasture value and browsing impacts to better match your own knowledge of your property and derive some educated estimates of how much browsing damage could be costing you.

BITE can be accessed by contacting a Game Management Officer within the Wildlife Management Branch.

Method 3: Using a Meat and Livestock Australia (MLA) Pasture Ruler or Electronic Pasture Meter

Another rough way of estimating wildlife browsing impacts is to source either a MLA Pasture Ruler or an electronic pasture meter, and walk a number of transects adjacent to, but at different distances from the bush line, eg. 10 m, 25 m, 50 m, 100 m, 150 m and 300 m (or as far out as you practically can).

If you're seeing a clear increase in pasture mass as you move further and further out from the bush edge then this is a good indication of browsing impacts under most circumstances. Furthermore if you can get a reading far enough out from the bush edge that you are comfortable that the pasture is relatively unaffected by wildlife browsing, then you could do some very rough calculations to figure out percentage pasture losses in the first few hundred metres out from the bush edge.

Again, take this as a guide only; less pasture growth nearer the bush edge could be due to soil differences or variation in fertiliser application. Furthermore, the impacts of wildlife browsing vary between the species, and also quite significantly between the seasons.

Faecel pellets, left to right, Bennett's wallaby, Tasmanian pademelon (rufous wallaby) and brushtail possum.

Method 4: Faecal Pellet Counts

Unlike direct animal counts, faecel pellet counts involve walking a transect line (usually 20 m long adjacent to the bush edge) and counting the number of wallaby and possum pellets seen, and then removing these pellets and repeating this process a week or fortnight later.

Whilst it is again difficult to translate faecel pellet counts into either pasture loss or browser numbers, they do give a good indication of relative browsing impacts across the property as animals tend to defecate where they are browsing so higher pellets counts in some areas are a good indication of higher browsing areas. Low pellet counts in areas are where you are likely to be experiencing lower browsing pressure.

As such this method is more useful for getting an initial indication of relative browsing impacts across your property, but can also be used as a longer term monitoring tool to see where presence is changing over time. It could be a useful tool to use to ground test the areas of high, medium and low browsing impacts for the BITE model.

Method 5: Direct Animal Counts

Several trials conducted by the Alternatives to 1080 Program have demonstrated the deficiencies in using spotlight counting to determine the number of animals on your property and the impact they are having. Spotlighting regularly picks up less than 50% of animals present even at the time the observer is there counting, and in worse case scenarios you can actually see no animals as they have all fled ahead of your spotlight beam. For example, at one trial site, three nights of spotlighting produced a maximum count of 5 possums on a site. 80 possums were then trapped along the spotlight route over 3 weeks.

These problems are further compounded by the fact that animals come out at different times during the night, and don't necessarily come out onto pastures every night so you never really know what percentage of the population you are seeing, and then you further don't know if the animals you have counted take 10%, 50% or 100% of their diet from your pastures so you can't translate what you are seeing into dollar impacts with any meaningful accuracy.

There are however a small number of contractors in Tasmania who have access to infra-red or thermal cameras or scopes, and which offer a service to count animals on your property. When done by an experienced operator, at different times of the night and across several nights, you can get a much more accurate picture of wildlife impacts on your property, but it comes at a cost and still doesn't tell you the magnitude of the problem just that you have one or not.

Like faecel pellet counts, information provided by accurate direct animal counts (see Figure 1) could be a useful tool in determining areas of high, medium and low browsing impacts for the BITE model.

Figure 1. Example of thermal imaging. These are cows in the foreground, with each smaller black dot being a wallaby. Top of hill is 350m from viewing point.

Exclosure Plots - The Only Accurate Way

Once you have obtained an estimation of the scale of pasture losses from historical methods or through investigation of the BITE tool, if you want to get more

A semi-permanent exclosure.

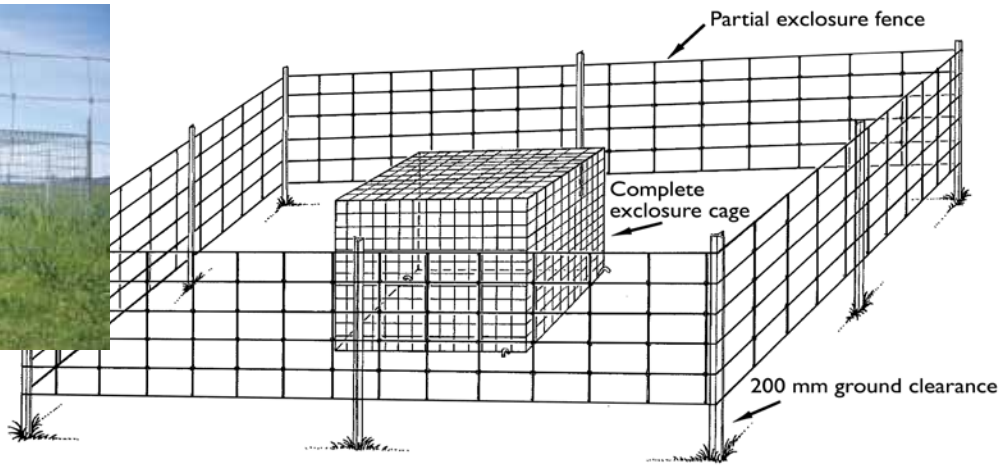


Figure 2. An exclosure that excludes stock, but allows wildlife to enter. Illustration by Bruce Dolbey.

accurate property level information, or set in place a monitoring strategy to see how effective the controls you are about to undertake are, then using exclosure plots to measure pasture losses to wildlife browsing is the only realistic tool to do this.

These small plots are designed to exclude wildlife and therefore any wildlife browsing so that the difference in pasture biomass between the browsed and non-browsed plots can be calculated.

You don't need many exclosures, though it is wise to place a few at different distances from your fence or bushline (eg. 4 exclosure plots: 1 at 10 m, 1 at 50 m, 1 at 100 m and one at the far edge of the paddock furthest from the bush edge).

Using exclosures to determine pasture loss is easiest to do when stock are not in the paddock, so if you rotate your stock, then you might want to consider building movable (folding) exclosure plots that you can move into paddocks that are being rested. If you use set stocking, then semi-permanent exclosures might be a better idea.

However, exclosure plots are not the be all and end all of wildlife monitoring. Measuring biomass lost to browsing wildlife still won't provide the full picture: wallabies and possums preferentially graze certain species and can therefore alter pasture composition and exclosure plots won't necessarily pick this up.

Making an Exclosure

The types of exclosure used will depend on farming practices and materials that are readily available. Two main approaches that could be used involve exclosures designed to be easily relocated based on stock movements out of a paddock, or semi-permanent in set stocking situations.

An exclosure reinforced to exclude rabbits and possums.

Easily relocatable exclosures can be simply made out of weld mesh (approx 1.5 m in diameter, so 5 metres of wire) with rabbit wire around the base. This will exclude most wallabies and other ground based animals from browsing inside the exclosure, though if there are lots of brushtail possums in your area it would make sense to put a top on your exclosure using rabbit wire or some form of netting to prevent losses to these animals. A star picket or two for stability is a good idea to ensure exclosures stay in place, or use tent pegs if cattle will not be present. Put exclosures up around the same time that stock are removed.

Placement of exclosures based on distance from the bushline should vary and suggestions are 10 metres, 25 metres, 50 metres and 100 metres. A spot should be identified outside of the exclosure that has pasture of a similar height to where you have just placed your exclosure. This spot will be measured at the same time your exclosure is measured to allow comparisons to be made, so in effect, it is an open exclosure.

Semi-permanent exclosures allow wildlife browsing calculations to be made with stock present. It involves a little more preparation to ensure a differentiation can be made between pasture consumed by stock and pasture lost due to browsing wildlife. A partial exclosure that excludes stock but allows wildlife to enter and graze is erected around the exclosure that excludes all grazing (See figure 2). An open site is still selected outside of the partial exclosure and come time for pasture measurements all three exclosures are measured. The difference between the partial and open exclosures is the figure used for the 'weight of sample' from outside the exclosure to determine the percentage lost to browsing wildlife in the Calculation of Pasture Loss section.

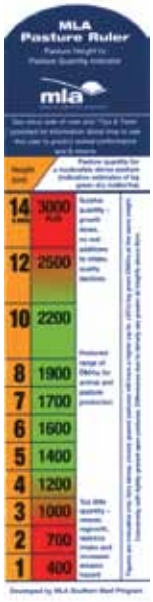
Once you have calculated the pasture mass both inside and outside the exclosure plots you can then convert this into the cost of browsing wildlife.

It's not just about total biomass lost to wildlife, wallabies and possum preferentially graze certain species such as clovers, and therefore have the potential to alter pasture composition.

Calculation Of Pasture Loss

The simpest way to measure pasture loss is to use a Meat and Livestock Australia Pasture Ruler to measure the amount of pasture growth both inside the exclosure and at a spot identified outside the exclosure for comparison. The ruler provides the basis for a quick and easy way to estimate pasture mass and quality and has been designed for use on a moderately dense pasture.

The pasture ruler and other information on pasture quality can be found at www.mla.com.au



For more accurate results you can cut, dry and weigh pasture samples using the method outlined on the next page.

Cut a 50 cm x 50 cm area to ground level from inside each exclosure and a matching one from outside each exclosure. To ensure accuracy, a quadrant, (a square with an inside measurement of 50 cm made from either wood or steel) can be used to mark the area to be cut. Store the cut pasture immediately in a plastic bag, squeeze out all air and seal the top until weighing or drying. Make sure the samples are kept out of the sun.

A rough estimate of the loss can be calculated from weighing the samples as accurately as possible and using the formula:-

$$\% \text{ Loss} = \frac{\text{Wt of sample from inside exclosure - Wt of sample from outside X 100}}{\text{Wt of sample from inside exclosure}}$$

Also try to estimate the relative proportions of grass and clover in the samples from inside and outside the exclosures as wallabies and possums preferentially graze clover.

A more accurate measure of pasture loss can be made by drying the samples from the quadrants and calculating the amount of feed available. This is the method to be used to get an accurate measure of the loss in kg of dry matter per ha.

The procedure is:

1. Weigh the sample before drying, to the nearest gram, and record the weight (W).
2. Take a representative subsample of 100 g.
3. Dry the subsample in a microwave oven for 12 minutes on high. (It is essential to include a cup of water to avoid the sample burning.)
4. Weigh the dried sample to the nearest gram. Put it back in the microwave for a further minute and reweigh. If the dry weight has not changed by more than a gram then record the weight (SS) in grams. Otherwise repeat the previous step.
5. Calculate the sample dry weight as below:

$$\text{Herbage mass} = W \times \frac{SS}{100} \times 40 \text{ (kg DM/ha)}$$

The factor of 40 is used because a quadrant of size 50 x 50 cm is 1/40,000 of a hectare and there are 10,000 m2 in a hectare.

The above calculation is designed to provide you with a total pasture loss estimate, not a determination of pasture loss per species. It is also important to realise if only a few exclosures are used, the results for these sites may be relevant to a particular paddock, but discretion will be required should you wish to use these results to project losses across your whole property.

What's Next?

Once you understand how much pasture, and ultimately income and profit, you are losing to wildlife grazing the next logical step is to strategically plan for browsing wildlife on our property. This will involve making decisions on what is acceptable loss, which range of control options best suits your particular circumstances and how they might be implemented.

Other useful information and resources

DPIPWE website:
www.dpipwe.tas.gov.au/browsingmanagement for practical information on browsing wildlife management.

References

1 Statham M (1994) Electric fencing for the control of wallaby movement. Wildlife Research 21, 697-707.

2 Statham M and Raynor P (1995) Loss of pasture and crop to native animals in Tasmania. Proc. 10th Australian Vertebrate Pest Conference 171-176

3 Statham M (2000) Demonstration of the economic benefits to grazing from effective wallaby control. Report to the National Feral Animal Control Program, Bureau of Rural Sciences.

4 Donaghy DJ and Tegg R (2001) Report on effects of wildlife on pasture growth at Elliot Research & Demonstration Station, 2000-2001. (Industry report: TIAR).

5 R.Smith (pers. comm.)

6 J. Coad (pers. comm.)

Further Information and Contacts
Game Services Tasmania
AgriGrowth
Level 7
1 Franklin Wharf, Hobart
Phone: 03 6165 3225
Email: AGT.admin@dpipwe.tas.gov.au