

PROTOCOL



**For Possum Population Monitoring
using the Trap-Catch Method**

April 2008

This protocol has been produced for use by agencies and contractors involved with vertebrate pest control to provide a standard methodology for possum population monitoring. The protocol may be updated from time to time, so please check whether your version is current by checking the publications section on www.npca.org.nz, or contacting NPCA direct.

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INTRODUCTION

Background

The Trap-catch Protocol (the Protocol) was developed as a result of the Animal Health Board (AHB), Regional Councils (RCs) and the Department of Conservation (DoC), wishing to have a standardised method of estimating relative possum population densities.

Purpose

This Protocol outlines a method for estimating an index of possum abundance. It is based on sampling populations by means of traps. The indices derived depend for their statistical robustness on meticulous adherence to the concept of random selection of survey sites and consistency and accuracy in its application, recording of results and analyses of data. Basically, the Protocol describes how many monitoring trap-lines are to be used and how they should be located, how many traps should be used on each line and how the traps should be set. It details the required norms and standards of design considerations and field-work involved.

The capture data obtained from the trap-lines is used to calculate the residual trap-catch index (RTCI). The RTCI represents the percentage of trap-nights which captured a possum. This is calculated as a mean figure with associated statistics such as range and confidence limits.

RTCI estimates from before and after a control operation can be used to estimate % kill of a population, with associated confidence limits. This % kill index is less commonly used.

Scope of the protocol

The Protocol describes how a standardised possum population monitoring programme should be set up to provide management agencies with sound estimates of relative population densities. It is not a training manual for people involved in monitoring operations. Nor does it address issues such as occupational safety and health, public relations, behaviour or ethics of those doing the monitoring.

RTCI estimates, associated statistics, or individual line capture data may be used as performance criteria in possum control contracts. Contract performance criteria based on monitoring information are set by the management agency, typically the AHB or DoC. Such performance criteria are not prescribed in the Protocol, nor are they directly derivable from it. Management agencies may demand programmes that increase the sensitivity of monitoring by means of stratification e.g. of areas with difficult access or habitat; or by increasing the sampling pressure by using more lines than would normally be the case e.g. in areas with a high Tb risk. Either requirement may result in a greater likelihood of some individual lines with RTCI exceeding maxima that have been set by management agencies. Agencies and their contractors need to work through these issues before contracts are entered into.

Updated edition

This edition of the Protocol is an update of the earlier September 2005 edition. To assist readers who have been using the earlier edition, a summary of the amendments in this 2008 edition is contained in Appendix 1.

Layout of the protocol

The protocol is divided into three parts:

1. **Design.** The requirements of management agencies are determined and a suitable monitoring programme put together. This involves stratification, measuring areas of potential possum habitat, deciding the number of trap-lines that are necessary and randomly selecting the start points of those lines.
2. **Field Work.** Field operatives locate the start points of trap-lines, lay traps according to the prescribed standards and record the outcomes of trapping.
3. **Information management.** This involves collation, analysis of data and interpretation of results.

Application of manual and digital techniques

Design, planning, data analysis and reporting can be achieved either manually or with the aid of various software and digital data.

In practice, various blends of manual and electronically assisted techniques are used, dependant on resources.

This Protocol establishes appropriate methodologies, principles and standards. You may implement these by either manual methods, or some electronically assisted process.

For example, drawing management boundaries on a map, calculating habitat area, and randomly selecting line start points may be achieved either on a paper map or with a GIS package.

PART 1: DESIGN OF A MONITORING PROGRAMME

1.1 Define the management boundary

Draw on a map (no less detailed than 1:50,000) the boundary of the management area in which possum density is to be assessed. Calculate the total management area hectares.

This protocol presumes monitoring lines may be placed up to the boundary of a management area. However, some managers may choose to incorporate a buffer to allow for possum immigration. If this is the case, then the reduced area becomes your management area.

1.2 Define strata boundaries

We may need to divide our management area into various strata. Stratification is carried out either to increase the statistical precision of the RTCI estimate, or to ensure lines are allocated to specific areas of interest or concern. Try to keep stratification to a minimum, as it adds complexity and often additional lines (cost) to the monitoring.

If the treatment area has parts that vary significantly in possum density or control techniques (e.g. aerial and ground control), then simple random sampling can be made more efficient by stratifying the sampling. However, to stratify effectively on this basis (i.e. to improve statistical precision) it is necessary to know something about the relative density of possums in each stratum. In most cases this information is not known with any confidence. If the management area has clearly identifiable strata in which possum densities are likely to be different, then stratification is warranted. Where very low residual populations are expected, e.g. less than 2% RTCI, there is little point in stratification for statistical reasons.

We may also need to stratify for management reasons, to ensure adequate monitoring information is available for the client from specified areas. Stratification could be for a number of reasons such as differentiating disease risk status, or establishing progress payment blocks.

There are three default classes on which to base stratification;

- Continuous habitat (e.g. large forest or tussock areas),
- Farmland (other areas characterised by patchy habitat)
- Bush-pasture margins (i.e. the interface between large areas of forest, and farmland).

Draw on a map (no less detailed than 1:50,000) the boundaries of the strata. Calculate the management area of each stratum.

1.3 Define possum habitat area

You will calculate the hectares of possum habitat for each stratum, or the entire management area if unstratified. This habitat area will be used to determine how many trap lines are required.

Potential possum habitat is defined as those areas where possums may potentially nest. Major habitat areas e.g. forest, tussock etc, may form separate areas but smaller habitat patches will, generally, be part of farmland. Potential habitat includes but is not restricted to:

- Native or Exotic Trees
- Tussock
- Bush – Forest Patches
- Isolated Trees
- Scrub Patches/Gorse
- Fern Patches
- Flax/Cabbage Trees
- Gardens
- Orchards
- Buildings
- Alpine (Altitude at Managers discretion)
- Rocky Outcrops/Piles
- Shelter Belts/Tree Lines
- Hedgerows
- Willows/Riverbeds and Banks
- Swamps
- Hay Bales
- Unused/Abandoned Machinery

The approach and tools required to determine habitat area depends on the default stratification class. Continuous habitat, farmland, or forest pasture margin.

1.3.1 Continuous habitat area

If a management area or stratum is continuous possum habitat (e.g. forest or tussock) then the possum habitat area is the same as management area.

Aerial photographs are the best source for identification of bush or forest habitat. The Land Cover database (LCDB) or ECOSAT can also be used. As a minimum, 1:50,000 topographical maps are necessary.

1.3.2 Farmland habitat area

Calculating the area of farmland habitat is more challenging. You can take one of two approaches depending on the habitat information you have available. One approach is to map all habitat patches, and directly calculate their total area. Alternatively, if adequate habitat information is not available, then use the Land Cover Database (LCDB) to estimate total habitat area. The approach you take here will affect the line selection methodology, and field operator responsibilities later.

To map all the habitat patches, and calculate their area directly, you must be able to identify areas of habitat 30m by 30m or larger, and, any linear features such as hedgerows >2m wide. Mapping and area calculation can be achieved by either manual or digital means.

The only data sources that can currently identify habitat to this degree of resolution are:

- a) Aerial photographs (colour or black & white) with a scale of 1:25,000 or better and photographed within the last 5 years, or
- b) Satellite imagery (e.g. ECOSAT) combined with aerial photography. ECOSAT does not have the capability of identifying 2 metre linear features (e.g., shelter belts) or non-woody habitat (e.g. patches of bracken), so it is necessary to use 1:25,000 aerial photos as well.

In the absence of high resolution habitat data, use the LCDB to map larger habitat patches directly, and estimate the remaining habitat area as follows;

- Calculate the total farmland management area in hectares.
- Identify the total habitat area in hectares using the LCDB (excluding tussock) and express this as a percentage of the management area.
- Calculate expected % habitat area by adding 5 percentage points if the percentage habitat area is less than 50% of the management area. If more than 50% of the management area is defined as habitat by the LCDB, then use the LCDB estimate directly.

For example, if the management area is 10,000ha and the LCDB indicates that 1000ha, or 10%, is potential possum habitat area, then:

1. Habitat area (ha) = 10% + 5% points =15%
2. 15% of 10,000ha = 1,500ha expected habitat area
3. Subtract the cumulative habitat area of habitat patches greater than 16 ha to create separate >16ha and <16ha strata.
4. Add the area of known tussock country on to the total habitat area estimate.

1.3.3 Bush-pasture margin habitat area

Aerial photographs or ECOSAT are good sources of information for identification of bush-pasture margins. As a minimum, 1:50,000 topographical maps plus Land-Cover Data Base (LCDB) should be used.

There are two measures of habitat pertaining to bush-pasture margins;

- (i) The **length** of the margin, and;
- (ii) The **area** of the bush-pasture margin.

Measure the length of the margin (using a map wheel, digitiser or similar). When two sides of an area are less than 200m apart, such as a tongue of forest or indentation of pasture into forest, then **only one side** should be included.

The bush-pasture area is taken to be a strip of 200m back into the bush. Therefore to calculate the area, multiply the length of the margin above (in km) by 20 to obtain the area in hectares.

If your monitoring design includes the adjacent forest as a monitoring stratum, then subtract the bush-pasture margin area equivalent from the forest habitat area.

1.4 Number of traps, trap-nights and trap-lines

1.4.1 Traps per line and trap nights

Each trap line will normally consist of 10 traps spaced at 20m intervals.

Each trap line will normally be trapped for 3 nights.

Sometimes the default combination of 10 traps and three nights may not be ideal. Table 1 provides the combinations of line, trap and night numbers will give precision similar to the default combination.

Table 1. Alternative combinations of traps per line and trap-nights.

10 traps/line		5 traps/line		15 traps/line		20 traps/line	
3 nights	2 nights	3 nights	2 nights	3 nights	2 nights	3 nights	2 nights
10	13	18	25	8	9	6	7
15	18	26	35	11	13	9	10
20	25	35	48	15	18	12	14
25	31	44	59	19	22	16	17
30	37	53	71	22	28	18	21
35	43	60	81	26	30	21	23
40	50	70	94	30	34	25	27
45	55	79	106	33	38	27	30
50	62	88	118	37	43	31	34

The rest of the protocol is written assuming a default arrangement of 10 traps per line over three nights is used. If a designer decides to use lines with a different number of traps or nights, then the text in other parts of the protocol will have to be suitably interpreted.

1.4.2 Number of trap lines – no stratification

Table 2 gives the minimum number of lines that should be established in unstratified areas based on the total habitat area. More lines may be used to improve confidence in the RTC estimate if required.

Always plan additional contingency lines in case some planned lines are not able to be trapped for whatever reason.

In areas that are considerably less than 500ha, fewer than 10 lines can be used if that is all that can be fitted into the area.

Table 2. Minimum numbers of trap-lines in unstratified areas

Habitat area (ha)	Option 1 Where ground control has been applied	Option 2 Where aerial control has been applied
0-500*	10	10
501 or greater	For every additional 200ha add one more line up to a combined total of 60 lines. e.g. Treatment area = 5500ha First 500ha = 10 lines Additional 5000ha = $5000/200 = 25$ lines Total lines required = 35.	For every additional 300ha add one more line up to a combined total of 40 lines.

When monitoring **bush-pasture** margin as a stand alone monitor, then the number of trap-lines required is half the number of kilometres (i.e. 1 trap-line for every 2 km of bush-pasture margin). No fewer than 5 lines should be used except when it is physically not possible to fit 5 lines in the space available. A maximum of 30 lines is sufficient, so a bush margin of 60km would have 30 lines as would a margin of 100 km.

1.4.3 Number of trap lines – with stratification

When an area has been stratified, each stratum is allocated its share of lines on the basis of habitat area as follows;

1. Add together habitat area from all strata (remember to reduce the habitat area of forest strata by the area equivalent of the bush pasture margin).
2. Use this total habitat area to determine the total lines required using Table 2.
3. Allocate lines to each stratum according to its percentage of total habitat area.
4. If a stratum gets less than 5 lines then increase the number of lines to the minimum of five, except where there is not enough space to fit in 5 lines.

For example, consider an operation comprising a 1000ha forest strata, 2000 ha of farmland of which 500 ha is habitat, and 6 km of bush pasture margin (120 ha habitat area equivalent). First we correct the forest habitat area by subtracting the bush-pasture margin $1000-120=880$ ha. Then our total habitat area is $880+120+500=1500$ ha. From Table 1 (option1) we determine the total line requirement is 15 lines. Then allocate these among the strata;

- Forest stratum $880/1500*15= 8.8$ hence **9** lines.
- Farmland stratum $500/1500*15 = 5$ lines
- Bush-pasture stratum $120/1500*15 = 1.2$, observe minimum, hence **5** lines

When interpreting data, it should be noted that the unit for which monitoring results are valid is any one stratum and not for any smaller or different area. Where significant management decisions will be applied to an individual stratum based on the monitoring information, it is recommended the minimum number of lines per stratum be increased to 10. Where information is used to determine payment to control contractors might be one instance.

1.5 Placement of lines

For sampling to be unbiased all potential possum habitat has to have a chance of being sampled.

Techniques for line placement depend on default strata. (i.e. continuous, farmland or bush pasture margin). All techniques can also be applied to unstratified areas.

If the start point for a line, generated by the random selection process, is the same as one used in previous monitoring, it is acceptable to use that start point again provided the prior monitoring was carried out more than 6 months previously. With systematic sampling, the origin of the sampling grid is placed to ensure a minimum of 200m clearance from any grid origin sampled within the previous 6 months.

1.5.1 Random placement in continuous habitat strata

In continuous habitat overlay a numbered grid (intervals no greater than 100m) over the sampling area. Then use random northings and eastings to generate random co-ordinates.

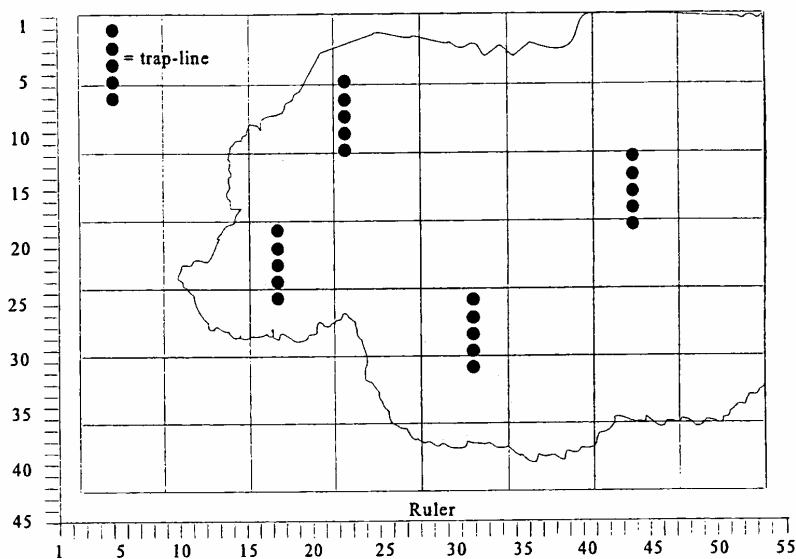
Discard any point that lands outside the sampling area, or within 200m of a previously selected line.

Mark in the lines from the random start points on a pre-determined bearing. Zero degrees magnetic is commonly used. The bearing does not really matter, as long as the same bearing is used for all lines. If a start point is close to the operation boundary, then you can reverse the bearing (e.g. 180 degrees magnetic) to ensure the line stays inside the boundary.

Figure 1 provides an example. To select random starting points, select one number between 1 and 45 for the north-south axis, and one number from 1 to 55 for the east-west axis. For example, the numbers generated were: 12, 22, 25, 17, 32, 32, 18, 43 etc. The starting points for the first two lines are therefore 12 north-south and 22 east-west, and 25 north-south and 17 east-west (see diagram). In Excel you would use the function =randbetween(1,45) to return a random number between 1 and 45. The F9 key will calculate the next random number. If an error message is returned, you will need to install the analysis toolpack, Tools/add-ins/analysis toolpack/OK.

Alternatively a GIS can be used to select random co-ordinates in a given area.

Figure 1



1.5.2 Random Placement in bush-pasture margin strata

Mark out the bush-pasture margin at 100m intervals, numbered from 0 to “n”. If one was to face the bush from the pasture, point #0 is at either the left-hand or right hand end of the margin, whichever the designer decides is the most practical .

Then, randomly select the required number of start points for trap-lines from the range 0 to [n-1], (because if point “n” were selected, it would not be possible to fit in a trap-line).

For example: say the length of a margin has been measured as 34.4 km. With a 100m interval between points, the number of potential start points is therefore $34.4 \times 10 = 344$. The range from which to randomly select lines is 0 to 343. Assume point #0 is at the left hand end of the margin. If the random process selects point #3, that line would start 300m from the left-hand end of the margin, and the line path will be left to right.

Once a line is started it should follow the edge even when the edge turns sharply and travels either out into the farmland or into the forest. If the line happens to go around the end of the forest projection or forest indent, continue to lay traps even if these traps are close to ones that have already been laid.

There should be a separation of at least 100m between the ends of all bush-pasture margin lines. So discard a randomly selected point if it is within 300 metres of a previously selected point.

Where the bush-pasture margin is part of a stratified monitoring operation, allocate lines to the bush-pasture margin first and then to the farmland and/or forest strata. Reject any line in the farmland or forest if any part of it is within 200m of a line already selected for the bush-pasture margin.

This method can also be used for monitoring other linear habitat types such as riparian corridors.

1.5.3 Random placement in farmland strata – all habitat mapped

If all habitat in farmland strata has been accurately mapped, then random start points can be allocated directly into areas of habitat. Discard any line that falls within 200m of a previously selected line.

A GIS can randomly allocate line start points. Once random start points are selected, draw line paths into available habitat. In the first instance attempt to lay the line path approximately on a zero degree magnetic bearing. The line paths may meander along available habitat, or you may need to connect consecutive patches of habitat to allocate the 10 traps. If there is no viable line path on magnetic north, then search clockwise around the compass for the first opportunity to lay the line. If there is insufficient habitat to place a 10 trap line, then discard the line.

Lines can also be selected using manual techniques, typically using photos as follows;

- Mark all potential trap-lines on the photo and where patches are too small to fit in lines of 10 traps, link two or more patches until 10 traps can be fitted.
- If there are large patches of habitat in which several lines would fit, then place a 200m x 200m grid (the required size of a trap-line) over the patch and mark each grid cell as a potential trap-line. In addition, identify potential trap-lines around the edges of the patches.
- Number each potential line from one to the maximum and then select which lines to monitor using a random selection process (software such as Excel may be used).

There are some cases where habitat may be distinctly grouped into small and large areas (e.g. many tree lanes, and larger patches of forest remnants). Be aware, that there may be a bias which tends to over sample the smaller habitat areas. If this is the case, then consider grouping your habitat areas into <> 16 hectare strata to resolve the bias.

1.5.4 Random placement in farmland strata – habitat estimated

Where we have estimated the habitat area using the LCDB, we cannot allocate all lines directly into habitat, because we don't know where it is.

Remember we previously estimated habitat area using the LCDB, and created two strata. Greater than 16ha patches and less than 16ha patches.

We do know where the greater than 16 ha patches are, so use the methods in the previous section (1.5.3) to allocate lines directly into this stratum.

For the less than 16 ha stratum you will allocate random points directly into the management area using an xy grid system (1.5.1). Spacing in the selection grid must be no more than 50m on the ground.

1.5.5 Systematic placement – all habitat classes

Systematic sampling is the alternative to random sampling. All habitat classes can be sampled systematically where sampling intensity over the landscape is required to be consistent.

The calculated minimum number of lines, and the procedures for stratification are unchanged. Lines are assumed to be the default of 10 traps for three nights, unless some other combination was chosen in accordance with Table 1.

The steps for systematically placing lines in any stratum are;

1. Calculate the required grid spacing. Grid spacing (Km) = $1/\text{square root}(\text{line density})$. Where line density is lines/km². For example, say our stratum has a management area of 3000 ha, with 2100ha of habitat area. Then from Table 2, our minimum number of lines is 18. The management area is 30 km² (3000 ha/100). Hence the required line density is $18/30 = 0.6 \text{ lines/km}^2$ and thus the required grid spacing is $1/\text{square root}(0.6) = 1.29 \text{ km}$.
2. Create a grid of the calculated spacing to encompass the entire stratum.
3. Generate one random point within the stratum (using the technique described in 1.5.1 for instance). Place an intercept of the grid on this random point with the grid lines aligned in true North/South and West/East directions. This ensures the sampling grid is randomly placed.
4. Finally, mark the start points for monitoring lines in the centre of each grid square where that grid square falls within the stratum boundary (NOT on the intercepts).

Depending on the shape of the stratum boundary, and how the grid is randomly placed, you may find that slightly more or less than the calculated minimum number of lines are actually mapped. The sample size must not be more than 10% below the required minimum. Where the sample size is more than 10% below the required minimum, randomly place the grid a second time. If the resulting sample size is still too small, then start again, using a finer grid.

In discontinuous habitat, the field operator may not find habitat at the mapped point. In that case, the operator must travel to the nearest habitat within the grid square and commence trapping. Once a line is started within a grid square it may finish outside that square. If there is no trappable habitat within the grid square, the line is abandoned.

To generate a systematic sample of bush pasture, or other linear habitat, calculate the number of 100m intervals (n) in the margin by multiplying the length of the margin (km) by 10. The intervals are numbered from 0 to "n". If one was to face the bush from the pasture, point #0 is at either the left-hand or right hand end of the margin, whichever the designer decides is the most practical.

Then, generate the systematic spacing variable "x" by dividing "n" by the number of lines required. Generate a random number between zero and "n-1". The first line starts at this point. Additional lines are mapped every "x" intervals.

For example: say the length of a margin has been measured as 20 km and ten (10) lines will be deployed. The number of 100m intervals (n) is therefore $20 \times 10 = 200$. The range from which to randomly select lines is 0 to 199. Assume point #0 is at the left hand end of the margin. If the random process selects point #126, that line would start 12.6km from the left-hand end of the margin, and the line path will be left to right. Further lines are mapped at intervals of $x = 200 \text{ intervals} / 10 \text{ lines} = 20$.

Hence line starts are at interval numbers 126, 146, 166, 186, - but at this point there is not enough pasture margin left to accommodate any more start intervals, so one has to start again at the left hand end of the margin, so the next interval is at 6, and subsequent intervals are at 26, 46, 66, 86, 106.

Once a line is started it should follow the edge even when the edge turns sharply and travels either out into the farmland or into the forest. If the line happens to go around the end of the forest projection or forest indent, continue to lay traps even if these are close to ones that have already been laid.

1.6 Trend monitoring

Trend monitoring is used to track the change in possum populations over time. Typically these are populations not subject to control. It is preferable to use the same lines over time so that each line is only measuring the change over time without the additional variation of changes in location as would happen if lines were shifted. Lines should not be trapped more than once every 12 months.

Using the possum catch on each line, the change over one or more years is calculated using regression analysis. The change from each line is then used to calculate an overall mean change for the monitored area along with its standard error and confidence limits. Results cannot be extrapolated outside the survey area, and it is recommended that a biometrician be consulted before trend analysis is undertaken.

Trend monitoring in this context does not refer to pre-control monitoring. However, recent trend monitoring data can be used as a pre-control estimate if control is going to be undertaken. Any post control monitoring will then require a new set of lines to be selected.

1.7 The field plan

The final stage of the design process is preparing a field plan for the field operators. The minimum information that needs to be provided is;

- Whether the line placement is random or systematic.
- Uniquely numbered lines, their stratum, and New Zealand Map Grid (NZMG) co-ordinates
- Contingency lines, their stratum, and New Zealand Map Grid (NZMG) co-ordinates.
- Topographical map (1:50,000) showing line starts and paths and the sampling grid when appropriate.
- The direction in which bush-pasture margin lines will be laid
- Number of traps per line
- Number of nights trapping
- Set type (ground, leaning board, or other raised set)
- How contingency lines are to be used (either in the numerical order you provide them, or the contingency line closest to the untrappable line).
- Whether a trap line summary is required as well as trap records
- Whether back riders are classified at the default 800gram weight, or some other specified weight.
- Time frame for completion

Additional information may also be provided, such as;

- Property boundaries included in map
- Orthophotos in addition to 1:50,000 topographical maps
- Occupier names, addresses, phone numbers
- Detailed written instruction for getting to line starts, and escape routes

If kiwi or weka are present in the management area, raised sets must be used. The appropriate Department of Conservation staff in the conservancy office or local area office shall be consulted. Where kiwi and weka are absent, ground sets must be used.

A standardised methodology for raised sets using a leaning board is presented in section 2.2. This is the recommended method for raised sets. In some cases, such as remote forest locations, resource limitations may not enable leaning boards to be used. Alternative raised sets using some type of platform or bracket can then be used, and the standards presented for the leaning board method applied as far as applicable. Your Field Plan will specify the set type the field operative is to use.

A review of available information indicates that RTCI derived from the leaning board method can be expected to be more similar to ground set RTCI than other raised set types. RTCI derived from platform or bracket type sets can be expected to be significantly lower than ground set RTCI. Consider this when you report the outcomes, or attempt to compare the RTCI across different areas or timeframes.

PART 2: CARRYING OUT THE FIELD MONITORING

2.1 Ground sets

No. 1 double-coil spring traps are to be used. The triggering weight should be approximately 500 grams. **Operators must ensure all traps used are consistently maintained and that their traps operate at near new performance levels.** Use of any type of protective coatings or oils is not recommended. It should be noted that some makes or types of traps may deteriorate faster than others. Research will be directed at categorising the minimal acceptable mechanical performance of traps. When results are available, operators can use this information for their purchase and maintenance of traps.

Traps must be lured with a mixture of plain white flour and icing sugar (5kg flour/1kg icing sugar). No flavours should be added. Spread flour behind the trap up the trunk of the tree, stump, log or backing board to a height of 50cm (+/- 10cm) above the ground to make a white blaze (Figure 2). If using a log as a backing for the trap, smear the flour along the log behind the trap creating a horizontal blaze of 50cm (+/- 10cm) directly above the trap (Figure 3). Do not set a trap at a site that does not have a backing for lure that is at least 20cm high (i.e. do not set traps against a root that has no backing for the flour).

The photographs below show how traps should be set.



Figure 2.



Figure 3.

Figure 2: Traps should be bedded into the substrate, approximately one hand width from the trunk of the tree, and with the trap dog nearest the tree. Note that the trap site has been cleared of obstructions.

Figure 3: If using a log (or tree root) that is less than 50 cm high as a backing for the trap, smear the flour along the log behind the trap creating a horizontal blaze of 50cm (+/- 10cm) directly above the trap.



Figure 4.

Figure 4: Traps should be set fine (i.e. trap dog just under the trigger latch) with the trigger plate at the same level as the jaws.

Wire or nylon cord can be used to secure traps to soft or small sites that cannot hold a staple securely (e.g. punga). In areas such as open tussock country and flax areas where there are no suitable anchor points for traps and/or no backing for lure, then stakes or backing boards must be used. The stakes/boards must be 50cm long and 10 cm wide. They must be white on both sides, either white corflute, or a painted board or similar. If a road marker is used it must not incorporate any reflective material. The white board creates the visual “blaze” attractant, and a small handful of flour and icing sugar lure is placed at the base of the board to encourage the possum to spend time at the trap site as for a tree set.

Do not cover traps or fence them on the sides with sticks or rocks. The trap site should be cleared of any vines or saplings to prevent captured possums from entangling the chain and increasing the risk of injuries. Traps must be firmly bedded.

Ensure all traps can be relocated and recorded accurately. A suggestion is to use colour plastic cruise tape as a marker. If markers are used, do not place them directly above the traps where they may act as an additional attractant.

2.2 Raised sets

A standardised methodology for raised sets using a leaning board is presented below. In some cases, such as remote forest locations, resource limitations may not enable leaning boards to be used. Alternative raised sets using some type of platform or bracket can then be used, and the standards presented for the leaning

board method applied as far as applicable¹. The Field Plan will specify the set type you are to use.

The board must be of wood² or be wood-based (e.g. plywood) with dimensions of 1 m long (minimum), 50–80 mm wide, and rigid. Adequate rigidity is determined by supporting the board at both ends so that it is horizontal and then placing a 3-kg weight in the centre – the centre of the board should not be displaced more than 10 mm. Boards may be hinged or otherwise joined, but they must be straight when set. The surface of the board should be rough in texture (i.e. rough-sawn not dressed) and the material should not be painted. If treated timber is used for the boards, they should be weathered for a minimum of 1 month before being used. There can be a 15-mm-deep notch (i.e. saw cut) in one side of the board (for the trap chain) 50 mm from the (top) end. The top of the board should also have two holes drilled for locating the nails used to attach the board to the tree (these holes will help to prevent the board from splitting, and will allow for easier fixing and removal). A V shaped notch cut in the top of the board will help the board rest securely against the tree.

The board should be placed against the nearest suitable tree at an angle of $\geq 45^\circ$ so that the trap when set is ≥ 70 cm up the trunk of the tree. The top of the board must be firmly attached to the tree using nails, wire, or cord so that the board is stable and will not wobble when a possum climbs it. The trap must be firmly attached a hand width down from the top of the board using two bands of rubber so that it does not move. The bands for attachment can be either commercially available heavy-duty rubber bands (e.g. Dixon No. 104, 15.9 × 102 mm) or strips of rubber inner tube tied into bands. Traps should be fine set with the trigger plate horizontal (in relation to the trap) and the dog away from the tree.

The trap chain should be attached directly below where the board meets the tree and at a height such that the chain is not loose. The point of attachment must be low enough so that when a possum is captured and the trap dislodges from the leaning board, the possum and trap are not left hanging. The trap site should be cleared of any vines or saplings to prevent captured possums from entangling the chain and increasing the risk of injuries.

¹ Research consistently shows that a raised set other than a leaning board set (i.e. not in contact with the ground) is likely to result in a reduced RTCI estimate compared to ground sets or leaning board sets. From Henderson et. al. 2007, unpublished Research Report to Animal Health Board R-80660 *Configurations of leg-hold traps that were not effective were 'raised' leg-holds* *'Raised' leg-holds have historically had low capture efficiencies relative to leg-hold traps set on the ground during previous field trials (Thomas & Brown 2001, Nugent et al 2001, Henderson et al. 2004)*. However, where platform type sets are used, any type of platform or bracket is acceptable, as long as the required specifications are met, being;

- Bracket holds trap firmly and horizontally, 25-100mm away from the tree, with the trap dog away from the tree (experience shows most traps are triggered from above).
- Trap is 700 mm above ground (as for leaning boards), and where weka are not present a height of 350mm is adequate.
- Trap is able to disengage from the platform, and trap chain is of adequate length and fastened so trapped animal can easily reach the ground.
- Lure blaze placed from the trap up the trunk 50 cm (+/- 10cm), and a small handful of flour is placed at the base of the tree also.

² Leaning boards can be made from pawlonia or cryptomeria (Japanese cedar). Both timbers are light and very strong, and when cut into 2 lengths, are readily stowed in a back-pack. A short section of channelling attached to either side of one half of the board allows the other section of board to readily slide into the side-supports and thus provide a board that is 1.2 m long. Another option is to join 2 sections of timber with short lengths of dowel. Anecdotal evidence suggests that boards hinged in the middle are inclined to collapse after a possum has been caught, and this can result in injuries to possums if the trap chain gets entwined around the board.

Note that although they are not considered habitat, fence posts can be used as “trees” for raised sets provided they are the nearest trap site to the 20 metre point, are tall enough for raised sets to be set according to the protocol, and are within 30 metres of any habitat.

For luring raised sets, spread the flour and icing sugar lure up the trunk of the tree, from the trap to a point about 50 cm (+/- 10cm) above this, and also place a small handful of flour at the base of the board on the ground. No lure should be placed on the leaning board.

Raised Set



Figure 5.

Raised trap set on a hinged leaning board at approximately 45° and showing the position of the chain (directly under the trap), the rubber band holding the trap to the board, the trap dog away from the tree, lure extending upwards for a height of 50cm (+/- 10cm), and some additional lure on the ground.

2.3 Laying trap-lines

Navigate to the line start points using GPS, or orienteer there using maps, compass and hipchain. You are required to navigate to within 50m of the mapped start point of the line. Where you have had to travel some distance to habitat to start a line (in farmland for instance), then the actual start point will be required to be within 50m of the nearest habitat to the mapped start point, as determined by the following procedures.

When you get to the mapped start point, there may not be any trappable habitat, dependent on the quality of information available to the designer. The procedures are;

- If you are trapping bush pasture margin, then move on a magnetic bearing north, south, east or west, whichever gets you to the margin in the shortest distance. Providing that point is 100m or more from a previously laid line, start at that point. If it is within 100m of another line, you may have to walk some distance along the margin before starting the new line.
- If you are trapping any other stratum, face north and turning in a clockwise direction select the first suitable habitat within 200m. If no habitat is available within 200m, the next contingency line is selected. If the habitat selected proves to be too small to contain 10 traps, then when you emerge from that patch face north, turn in a clockwise direction and select the nearest suitable habitat to continue trapping.
- Contingency lines must be used as prescribed in the field plan. This will be either in the numerical order they are given for the stratum, or the closest one to your position. Ensure that you select a contingency line in the SAME stratum as the untrappable line.
- In the event that line selection is by systematic sampling. If there is no habitat at the mapped start point for the line, then commence trapping at the nearest habitat inside the sampling grid square for that line. Once you have started trapping, you can continue outside the grid square to complete the line on the prescribed bearing. If there is no trappable habitat within the sampling grid square, then abandon the line.

Lines must not end up within 200m of each other at their closest approach (or 100m between ends of lines in bush pasture strata). If this occurs, move directly away from the location of the line already placed and commence monitoring in the nearest habitat at least 200m away.

The number of traps per line will be specified in the design. Most often there are 10 traps per line but a designer may specify a different number. It is important therefore to check the plan to see what is required.

The first trap on a line should be 20m from the start point. Traps should be set at 20m intervals on the nearest trap site for ground-set traps (i.e. the nearest tree or fence post that will hold a fence staple or to which a trap can be secured by alternative means) and the nearest suitable tree for raised sets (i.e. preferably with a diameter in the range 100–250 mm). Hip-chains must be used for measuring the distance between traps. All hip-chain cotton must be retrieved to prevent the entanglement of birds.

Lines are required to be within 10% of their overall design length. For instance a 10 trap line must be 200m long, +/- 20m (i.e. from 180 to 220 m. long).

If a line is being laid on a compass bearing and a trap-site is not on the line of the compass bearing then return onto the line before proceeding to next trap-site. Where

a line is laid on a bearing, it is required to be +/- 10 degrees of the bearing specified in the plan. Where a line has no pre-determined bearing (e.g. farmland) then the line must be laid straight at the default of zero degrees magnetic if the habitat allows.

When following a compass bearing, small barriers that can be walked around in the space of 100m or less, should be traversed placing traps at the standard 20m intervals whilst making the traverse and the line then continued on the designated compass bearing. If a barrier is encountered that cannot be traversed (e.g. perpendicular sides on a gorge, or vertical bluffs that extends for 100m either side) then turn the line 90 degrees from the original bearing either to the right or left and follow this new bearing until the line is completed.

If a clearing is encountered whilst laying a line and there are acceptable trap sites e.g. logs within the clearing, continue to lay traps at 20m intervals and on the compass bearing. If, however there are no trap sites, treat it the same as an obstacle i.e. go around the clearing laying traps at 20m intervals until the compass line can be resumed. If roads or creeks are encountered, select the nearest trap-site on one side or other of the road or creek.

Whenever a deviation has had to be made from the original direction of a line being laid on a compass bearing, you must ensure that the trap line will not encroach within 200m of another line.

When laying lines around bush-pasture margins, each line should be placed on or as near as possible to, the margin as possible. Lines should follow the general line of the forest edge not individual trees or shrubs. If stock is likely to interfere with traps placed along the margin, then lines should be placed inside the margin.

A plan may specify that lines are to be laid along river banks or other situations resembling bush pasture margins, inasmuch as the lines will have to conform to the topography.

Be aware of the risk to domestic cats if trapping in the vicinity of inhabited dwellings.

A trapping permit will be required from DoC if working on conservation estate.

2.4 Weather considerations

Traps must normally be run for three fine nights i.e. with weather unlikely to significantly lessen possum activity. If you know rain started 4 hours or later after dark, that night can be accepted as a fine night. Although it is not always possible to predict stable fine weather, long-range forecasts should be used to maximise the chances of achieving this requirement.

If traps are already placed on lines and on the second or third day rain is predicted, close traps and reopen them when the weather clears. The number of nights that traps are closed should not exceed five.

If rain falls on the third night and traps are set, then trap-catch from the first two nights can be used for calculating an index of density.

Note: This may disadvantage control contractors who have been set upper catch limits on lines. The issue needs to be addressed in contracts let by agencies.

If it rains heavily on the first or second night, and catch rate is likely to be significantly reduced (but some possums were caught), then monitoring should be started again using a new set of monitoring lines. In forest, shift lines 100m either side of the current line. On farmland or BP margins, use contingency lines. However, if no possums were caught at all, the same lines can continue to be used until a total of three fine nights is achieved.

2.5 Checking trap-lines

Traps must be checked within 12 hours of sunrise, as required by the Animal Welfare Act, 1999.

Remove all fur off jaws of traps when setting them to enable you to clearly identify an escape when checking traps the following day.

Replenish lure daily or as required to maintain the original white blaze.

All possums and non-target introduced species (rats, hedgehogs, etc) must be killed as quickly and humanely as possible and removed from the traps. Leave carcasses at least 5m from the trap-site. If you bleed stunned possums do so away from the trap site.

If native birds are caught uninjured or with only minor injuries (i.e. no broken limbs), then release them. Seriously injured or dead native birds should be taken to the nearest DoC office if possible. Contact your local DoC Species Protection Officer to obtain information on how to handle injured wildlife.

Possible trap outcomes are shown in Table 3. A possum weighing 800 grams or less is regarded as a “backrider” and must be recorded as such (backriders are not counted as possums caught when the data are analysed). To ensure uniformity of “backrider” classification, operatives must carry with them scales that are capable of measuring the weight of 800 grams within 20 grams of accuracy. In some cases a manager may specify some weight other than 800gm for backrider classification. Check your field plan.

It is important that possum escapes (ESC) are clearly evidenced. If there is any doubt at all, then the outcome must be recorded as sprung and empty (S).

Trapping results must be recorded daily on standardised forms (Figure 6 shows an example but alternative layouts are acceptable). For practical convenience reduce the form to note-pad size (preferably wet-notes).

Alternatively, data may be captured in the field by electronic means.

When trapping is completed, supply all trap records to the designer.

Also include a written summary of any relevant issues and problems encountered during the trapping. This would include reasons for any contingency lines used, exceptional weather events, or deviations from planned line paths for instance.

The designer may also require you to submit a line summary, Figure 7.

Table 3 – Possible Trap Outcomes

Description	Record
Possum caught	Male or female, mature or immature i.e. MA, FA, MI or FI
Possum caught with kitten (backrider)	Possum caught (only one) i.e. FA
Backrider (animal no more than 800 grams) caught	Backrider i.e.BR
Trap still set with flour on tree	Still set i.e. SS
Trap still set with flour removed by rats or possums	Still set i.e. SS
Trap sprung and empty, but still in set position	Trap sprung and empty i.e. S
Trap sprung and empty, chain extended to full length	Trap sprung and empty i.e. S
Trap not found, but no clear evidence of a possum	Trap sprung and empty i.e S
Trap sprung, caught non-target species.	Non-target i.e. Rat, kiwi, heg (hedgehog), ferret, stoat etc.
Trap not found, but clear evidence of a possum	Possum escape i.e. ESC
Trap sprung with possum fur in jaws	Possum escape i.e. ESC

Figure 3 - Trap-Catch Data Record Sheet

Field Operative: _____ Location: _____

Monitoring period: _____

Line: _____ Stratum: _____ Habitat: _____

Survey: pre-control / post control / maintenance (circle one)

	DATE...../...../.....	DATE...../...../.....	DATE...../...../.....
Trap No.	Rain:	Rain:	Rain:
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

Possum caught = Male/Female; Mature/Immature = MA, FA, MI or FI. Animals weighing 800 grams or less (unless specified otherwise) =BR (and are to be treated as “non-target”, rather than “possums caught”).

Possum with backrider = FA

Traps still set = SS (for ease of recording and processing the results, trap numbers with no notation, or a dash can be assumed to be SS)

Trap sprung and empty = S

Non-target species caught = Rat, kiwi, hedgehog, ferret, stoat etc

Possum escape = ESC

PART 3: INFORMATION MANAGEMENT

3.1 Reporting Requirements

Collection, recording, collation and analysis of data from monitoring surveys should be carried out in an ordered way to ensure that all relevant information can be reported. The report should include important operational information, monitoring information and results, and be presented in an easily understood way.

Retain all raw data records in case of disputes regarding analyses and their interpretation.

Operational information:

- Location or name. This will allow the monitoring report to be cross-referenced to the report of the control operation.
- Size of the management area.
- Size of possum habitat area.
- Control method(s).
- Dates of start and completion of control operation.

Monitoring information:

- Weather for each night.
- Number of trap-lines .
- Total trap-nights.
- Weight below which possum classified as back rider
- RTC results by line, stratum, and combined strata with confidence intervals
- Habitat for each line.
- Set type (ground, leaning board, or other raised).
- Approved operators who were involved with the monitoring.
- Map with trap-lines marked.
- Discussion of reasons for use of contingency lines, and any non-conformances.
- If data are to be used for determining population trends, provide description of starting points and compass bearings of trap-lines.

3.2 Analysing Stratified Residual Trap-Catch Index

Follow the steps below for calculating the Residual Trap-Catch Index. This methodology applies to both random and systematic line selection. Some statistical assumptions may be violated, so accept that 95% confidence intervals are approximations.

1. For each line, count the total number of possums.
2. Determine which escapes will contribute to the possum total, and which ones will be treated as Sprung and empty records. An escape will be counted as a sprung and empty record if there is a possibility that the escapee was subsequently captured on the **same** line, and therefore double-counted. Some examples of which escapes would be excluded/included under this principle are;
 - If only one escape is recorded on a line, with no other captures on the same, or subsequent nights, then the escape is included in the possum total.
 - If an escape occurs after having caught a possum on a previous night, then the escape is included in the possum total.
 - If the escape on the first or second night is followed by a possum capture or further escape on that line, then the escape is treated as a Sprung-and-Empty (S) trap.
 - If there are two escapes on the same night (or subsequent nights) and there are no possum captures, then it may be the same animal that has escaped twice. One escape will be included in the possum total, and one will be treated as a sprung trap.
 - If a possum claw is found in a sprung trap subsequent captures on the line should be checked and if no possum with a missing claw is found the escape is counted as a possum.
1. Calculate the corrected trap-nights by multiplying the number of trap nights by the number of traps on the line, and subtracting half a trap-night for each non-target (NT), backrider³ (BR) or sprung but empty (S) trap.
2. Divide the total number of possums (include both possums caught and escapes), on each line by the corrected trap-nights on the line. This will give you the mean number of possums captured per trap-night (total possums/corrected trap-nights).
3. Using the possums captured per trap-night from each line calculate the mean possums captured per trap-night for each stratum. I.e. sum of mean possums captured per trap-night/number of lines. Multiply by 100 to get the % RTC.
4. Calculate a weighted mean based on the mean catch rate per stratum, and the proportion of total habitat area each stratum contributes to the total. [(habitat area stratum 1/total habitat area * mean RTC stratum 1) + [(habitat area stratum 2/total habitat area * mean RTC stratum 2) etc to n strata].

³ In some regions of New Zealand mean adult possum weight is relative low, and in such areas an 800gm possum may be old enough to survive independent of its mother. It is within the manager's discretion to specify a lower target weight for Back Riders, or to treat all caught possums as adults, effectively ignoring the back rider provision. It is not recommended that this discretion is applied in the case of performance monitoring, however, that is a matter of agreement between the parties to any contract.

5. Calculate the standard error (SE) for each stratum. I.e. standard deviation of the mean possums per trap-night/square root of the number of trap-lines.
6. Calculate the combined SE for all strata. = square root[(habitat area stratum 1/total habitat area*SE stratum 1)+(habitat area stratum 2/total habitat area*SE stratum 2)+ etc to stratum n]
7. Multiply the combined SE by 2 to calculate the approximate 95% confidence interval.

An example of the analysis will help. You have 10 trap lines, trapped for 3 nights. The forest stratum is 500ha, and the farmland stratum is 200ha. Escape records have already been allocated into the appropriate columns for these examples (escapes or sprung/empty).

Line	Stratum	Possums captured	Possum escapes	Non-targets	Sprung but empty	Corrected trap-nights	Mean possums per trap-night
1	Forest	1	0	1	0	29.5	0.0339
2	Forest	2	0	1	1	29	0.0690
3	Forest	0	0	0	0	30	0.0000
4	Forest	1	0	2	0	29	0.0345
5	Forest	1	0	1	0	29.5	0.0339
	Forest	Stratum				Mean RTC	3.43%
						SE	1.05
6	Farmland	5	1			29.5	0.1695
7	Farmland	1	1			29.5	0.0339
8	Farmland	10		1		29.5	0.3390
9	Farmland	4				30	0.1333
10	Farmland	3			2	29	0.1034
	Farmland	Stratum				Mean RTC	15.58%
						SE	5.09
	combined result					Mean RTC	6.9%
						SE	1.64
						95% CI	+ or - 3.3

Some of the calculations in the above table are;

- Mean RTC forest stratum = $(0.0339+0.0690+0.0+0.0345+0.0339)/5*100=3.43\%$
- SE forest stratum = standard deviation $(0.0339+0.0690+0.0+0.0345+0.0339)/\text{square root}(5)*100 = 1.05$
- Combined RTC = $500/700*3.43+200/700*15.58 = 6.9\%$
- Combined SE = $\text{square root}((500/700*1.05)^2+(200/700*5.09)^2) = 1.64$
- Combined 95% CI (approx.) is the combined mean RTC +or- $1.64*2 = 6.9\%$ +or- 3.3

An excel data entry and analysis spreadsheet is available for free download from www.npca.org.nz. This spreadsheet automatically allocates escapes correctly in the calculation of the RTCI.

3.3 Analysing Percent Kill

Follow the steps below for calculating the estimate of the percent kill from pre and post control trap-catch monitoring data.

- Calculate the mean catch rate and SE for both the pre control lines, and the post control lines (using methodology in previous section 3.2).
- Calculate the estimate of the percent kill

$$\%kill = \left[1 - \left(\frac{Mean_{post}}{Mean_{pre}} \right) \right] * 100$$

Corrected pre-control trap-catch data

Line	Corrected trap-nights	Possums captured	Mean number of possums captured per trap-night
1	30	11	0.3667
2	29.5	22	0.7458
3	29	12	0.4138
4	28	12	0.4286
5	29	13	0.4483

Corrected post-control trap-catch data

Line	Corrected trap-nights	Possums captured	Mean number of possums captured per trap-night
1	29.5	1	0.0339
2	29	2	0.0690
3	30	0	0.0000
4	29	1	0.0345
5	29.5	1	0.0339

	Total	Divide by number of lines	Mean
Pre-control	2.4032	2.4032 / 5	0.4806
Post-control	0.1713	0.1713 / 5	0.0343

$$\%kill = (1 - (0.0343 / 0.4806)) \times 100 = 92.9\%$$

- Next calculate the standard error for the percent kill estimate. There are two options for calculating the confidence limits.
 - (a) When the post-control monitoring lines have been selected independently of the pre-control monitoring lines (i.e., both the pre- and post-control lines have separate random starting points), the standard error of the %kill =:

$$\%kill_{se} = \sqrt{(1 - kill)^2 * (C_{pre}^2 + C_{post}^2)} * 100$$

Where C_{pre}^2 and C_{post}^2 = coefficient of variation for the pre and post estimates.
For example, the coefficient of variation for the pre-control mean is: **se pre/mean** pre. Kill is the proportional kill (e.g., 0.896, not 89.6).

Example:

	Pre-control	Post-control
Mean	0.4806	0.0343
Standard error	0.0676	0.0109
Coefficient of variation	0.1407	0.3184

Standard error of the kill	0.0248
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- (b) When the pre- and post-control monitoring lines have been paired (i.e., in parallel sets), then the SE of the kill estimate is:

$$\%kill_{se} = \sqrt{(1 - kill)^2 * (C_{pre}^2 + C_{post}^2 - 2C_{pre} * C_{post} * Correlation(ppnt_{pre}, ppnt_{post}))} * 100$$

Where ppnt = possums per trap night on each line, and correlation is the correlation coefficient between the pre- and post-control lines (use a spreadsheet to obtain this coefficient).

Example (assuming the above pre- and post-control lines were paired)

Correlation coefficient	0.7817
Standard error of the kill	0.0161

- The approximate 95% confidence limit is then the standard error times 2.

Example using the unpaired monitoring lines

Kill	0.929
Standard error of the kill	0.0248
Approximate 95% CL	0.049

- If an estimate of the kill for multiple strata has been obtained, an estimate of the overall kill for the total control area can be calculated by weighting each stratum estimate by the proportion that each stratum contributes to the total area. For example, if there were three strata (1,2,3) contributing 0.2, 0.3, and 0.5 to the total area, and the percent kills within each stratum were 80%, 90%, and 40% respectively, the kill estimate for the total area would be $(80 \times 0.2) + (90 \times 0.3) + (40 \times 0.5) = 63\%$.

The approximate 95% confidence limit for this example is:

$$\pm 2 * \sqrt{(0.2 * se_1)^2 + (0.3 * se_2)^2 + (0.5 * se_3)^2}$$

GLOSSARY OF TERMS

The following terms are used in this Protocol:

Management area	The total area within which possums are to be managed. It may include areas other than typical possum habitat (e.g. areas of developed pasture).
Possum habitat	Areas where possums may potentially nest.
Strata	Parts of the treatment area that have clearly different possum densities, or require individualised monitoring data for management reasons.
Trap-site	A tree, fence post, log, stake or backing board or other attachment site that will hold a fence staple, or allow a trap to be wired on or set on a sloping board. There must be sufficient backing for the lure.
Trap-night	Trapping effort represented by one trap set for one night.
Lure	A mixture of flour and icing sugar (5kg flour to 1kg icing sugar).
Index (population)	A number that relates to population density but is not the actual density.
Percent kill	The percentage of a population killed during a control operation (100 minus percent survival).
Percent survival	The percentage of a population surviving a control operation.
Residual Trap Catch Index (RTCI)	The index (e.g. percent catch) obtained on a line.

MONITORING PROTOCOL EVALUATION AND FEEDBACK

Name: Date:

Contact Details:

Email: Fax: Phone:.....

The NPCA welcomes any feedback and comment you might have on the Protocol, and sees this as an important part of the continuous improvement and development of this best practice.

Please quote the page and reference that your comment(s) relates to, provide a short comment and return to:

NPCA,
 Fax: (04) 473 1603
 Email: npcaxtra@xtra.co.nz

Note: This form can be downloaded from the website: www.npca.org.nz.

Page, Reference	Comment

APPENDIX 1: SUMMARY OF AMENDMENTS TO THE PREVIOUS EDITION

The first edition of this Trap Catch Protocol was published in September 2005. It was reviewed and updated for this second edition. The amendments incorporated into this April 2008 edition are summarised below.

1. A systematic sampling methodology has been provided for Bush Pasture margin (linear) habitat, consistent with similar methodology for farmland and continuous habitats.
2. Monitoring intervals for trend monitoring have been prescribed to be no less than 12 months. Use of trend monitoring information is clarified with respect to subsequent control work.
3. Trap maintenance recommended not to include any protective coatings.
4. Blaze boards in open country specified white both sides, and with flour lure on ground rather than smeared onto the board.
5. Practical recommendations made for the deployment of leaning boards. Leaning board set specification amended, firstly requiring dog to be away from tree, and secondly to place additional flour attractant on ground at base of board.
6. Specifications included for raised sets (i.e. platform type).
7. Provision made for manager's to apply their discretion as to appropriate threshold weight for backrider classification in their region.