

# Environmental Consulting Options Tasmania

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## REPORT ON THE ESTABLISHMENT OF LONG-TERM MONITORING SITES FOR *PTEROSTYLIS ATRIOLA* IN STATE FOREST COUPE BG034A



Environmental Consulting Options Tasmania (ECOtas) for Forest Practices Authority  
27 February 2008

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## Background, Scope and Purpose

ECOtas was engaged by the Forest Practices Authority to design and establish long-term monitoring sites in State forest coupe BG034A to allow an assessment of the impacts of forestry practices on *Pterostylis atriola* to be made.

*Pterostylis atriola* (snug greenhood) is presently listed as endangered on the Tasmanian *Threatened Species Protection Act 1995* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (TSU 2000). A relatively recent re-assessment of the conservation status of the species by the author (unpublished statements to the Threatened Species Section) suggested that the endangered status is correct and that listing at the Commonwealth level at the same status may also be warranted. However, this assessment was made on the basis of nine populations supporting (as then known) less than 250 mature individuals. Since that time, three new populations have been discovered: Lake Leake (where the species is scattered over several sites); Pearly Brook area near Scottsdale (unknown number and exact site unknown); and the BG034A site (perhaps somewhere in the order of 100-200 individuals over several hectares). In addition, the Snug Tiers population previously thought to support 80-100 individuals is now known to number in the 1000+. On this basis, the species may qualify as vulnerable on the grounds of its relatively restricted area of occupancy although this criterion is difficult to apply to species with widespread but locally abundant populations. On the present trend it seems likely that several additional populations of *P. atriola* will be discovered.

A previous report on the conservation value of BG034A for native orchid species (ECOtas 2007) confirmed the suspected presence of *P. atriola* in BG034A, as initially observed by members of the Crowther family. In that report, I indicated the approximate location of the known population of *P. atriola* based on the advice of Lucy Crowther, and also indicated the possible wider distribution in BG034A as follows:

"The question of whether *P. atriola* is likely to be more widespread is difficult to answer definitively but the fact that the Crowther collection is restricted to a single patch of forest and that the observations of the Crowthers are reliable, I am inclined to suggest that *P. atriola* has a restricted distribution in BG034A. This is not atypical for the "*Speculantha*" greenhoods, which are often localised in their occurrences. My experience with *P. atriola* sites suggests quite a wide range of densities from highly localised small populations (e.g. South Coast Track, Tebrakunna Road, Mount Montgomery) to widely separated low abundance populations (e.g. Wielangta area) to widespread and locally abundant populations (e.g. Snug Tiers and apparently the Lake Leake area)".

An area of about 50-60 x 200 m (Figures 1 and 2), located in the general vicinity of the initial Crowther collection site, was subsequently excluded from logging in the coupe. The excluded area connects to a 20 ha reserve containing *E. amygdalina* forest on sandstone. The Forest Practices Plan permits upgrading of the existing track through the *Pterostylis atriola* exclusion zone.

Parts of BG034A have since been surveyed for the presence of *P. atriola* by Graeme Bradburn, Peter Tonelli and Lucy Crowther and at least some of the information from that survey (Bradburn *et al.* 2008) has been made available to the author (although it is noted that the datum of the waypoints and some of the specific waypoint transcriptions are difficult to interpret). They observed about 100 plants in the coupe or adjacent to the coupe. Their survey largely confirmed my supposition that the species would have a restricted distribution in BG034A (although I do not know the exact extent of their survey and how far from tracks the survey may have extended). Information from Lucy Crowther (F. Duncan pers. comm.) indicated that they also observed four plants of *Pterostylis atriola* in the exclusion zone described above.

Advice from the Forest Practices Authority to Forestry Tasmania for the management of *P. atriola* in BG034A requires that long-term monitoring sites be established to monitor the potential effects of forestry practices on the species. It is noted that the forest practices plan (GPS 0523) shows areas

of the coupe as excluded to protect potential habitat for the species, and other area excluded for other values included areas designated as "E. amygdalina forest on sandstone" and "habitat area".

The purpose of the present report is to document the design, establishment and initial findings of a long-term monitoring project in BG034A aimed at assessing the potential effects of forestry practices on *P. atriola*.

### Methods

The forest practices plan (GPS 0523) formed the basis of the design of the long-term monitoring site placement. The intention was to establish quadrats that captured the broad range of vegetation types, site characteristics (e.g. topographic position, aspect, drainage features, etc.) and coupe location (e.g. within harvest area, in-coupe exclusion zones, ex-coupe exclusion zones, etc.). In addition, the intention was to establish quadrats in both known sites and sites currently not supporting the species, these latter sites providing an opportunity to monitor establishment in "new" sites post-harvest.

Long-term monitoring projects should ideally have "controls" to allow an assessment to be made of the relative contribution of different factors to variables (e.g. abundance scores) being recorded. For example, if the abundance of *P. atriola* changes after harvesting occurs, it is difficult to assign this change to a forestry effect unless one also knows if the species' abundance is following a similar pattern at other sites in similar situations (i.e. a control site). However, in the present situation the concept of establishing controls is fraught with practical difficulties with the main one being that the species is only known from within the coupe boundaries meaning that the only control locations possible are sites being excluded within or immediately adjacent to the coupe. In theory such sites may be acceptable as controls (excluding discussion of edge effects and the like) if such sites support *P. atriola*. The issue of replication also needs to be discussed. Ideally, to detect an effect, and allow a separation of the contribution of different effects, as many sites as possible in different treatments would be established. However, in the case of *P. atriola* in BG034A, we simply do not have this luxury because of the restricted distribution of *P. atriola* within the coupe.

The design presented below for the long-term monitoring survey takes into account the practical issues presented by the configuration of BG034A, the distribution of *P. atriola* in BG034A and the desire to collect as much information as possible in as efficient manner as possible.

#### Quadrat sites

Thirty-seven quadrats were established throughout BG034A (Figure 1, Table 1). Quadrats were 10 x 10 m with the locatable point (as GPSed to within 5 m using a Garmin Etrex device) in the centre of the quadrat. Once the centre point was located, the north direction was located and the 5 m along each compass direction defining the quadrats quarters estimated visually and by pacing. Each 5 x 5 m quarter (NE, SE, SW, NW) was thoroughly searched for the presence of *P. atriola*. Quadrats were randomly placed throughout the majority of the coupe attempting to sample the range of site characteristics and harvest intentions present.

Most quadrats were not flagged or otherwise marked because harvesting will occur over most sites and precise re-location for sites designated as negative is not considered necessary. The reality is that post-harvest re-location of quadrats using a GPS is likely to be quite successful and the re-survey is likely to cover approximately the same 10 x 10 m quadrat. In practice, our surveys of negative quadrats went beyond the 10 x 10 m extent such that a relatively precise re-location of the initial quadrats will provide a good indication if *P. atriola* has established post-harvest.

Some quadrats were more permanently marked using a 1 m metal pin with a pink plastic tag labelled with "Pt. atriola – Plot xxx" placed in the centre of the quadrat. This method was used for all quadrats designated as positive and several quadrats designated as negative that were located within the area presently occupied by *P. atriola*. These marker pins were usually placed close to tree bases such that they won't interfere with harvesting activities and may survive in-situ to allow

easier re-location of quadrats. However, as mentioned above precise re-location of quadrats is not considered absolutely necessary. Even with positive plots, our initial surveys went beyond the 10 x 10 m limit and plants detected just outside the quadrats were also noted.

For each quadrat established, a photo was taken from approximately 5-10 m directly south of the quadrat. For each positive quadrat established, the number of individuals of *P. atriola* was recorded, and a "mud-map" of the approximate location of plants and some other features (e.g. tracks, stumps, etc.) drawn in the field (later re-drawn for future reference). The maturity of plants was noted (i.e. buds, flowers, etc.).

In addition to the establishment of formal quadrats, numerous additional point locations supporting *P. atriola* were located and GPSed. The number of plants at each such point location was noted. Some of these "points" represent "linear" sites (e.g. a length of walking track) and similar mud-maps of the local distribution of *P. atriola* plants were also made. These point locations are also presented (Figure 1, Table 2) because they may allow for additional post-harvest sites to be re-located.

## Results

Figure 1 shows the location of positive and negative quadrats, and the location of point locations for *P. atriola*. Figure 2 shows greater detail for the area surrounding positive quadrats. Table 1 provides more detailed information on the quadrat locations including the number of plants recorded within each quadrat and immediately outside each quadrat. Table 2 provides information on the point location data. Note that this data has been provided as an .xls file for use by various parties. Figures 3 and 4 display the "mud-maps" of quadrats and miscellaneous point locations, respectively. These should be used as a general guideline only and should not be heavily relied upon but in combination with the quadrat photo (all supplied on CD) may be useful.

Thirty-seven quadrats were established: twenty-six are designated as negative and eleven as positive. Note that all sites GPSed for *P. atriola* will be entered into DPIW's *Natural Values Atlas* by the author but that this may not occur immediately because I do batch inputs on a quarterly basis. Specimens were also collected (under the author's scientific collecting permit TFL 08001) and are being curated for lodgement at the Tasmanian Herbarium.

Of the negative plots, twenty-one are located in areas to be harvested, two outside the coupe (quadrat 7 is well outside the coupe and quadrat 16 shows as just inside the coupe but was beyond the marked blue tape boundary), one inside the "Pterostylis site" management zone, and two within the "E. amygdalina on sandstone" management zone. Two of the quadrats shown on the map as within the harvest area are actually within in-coupe exclusion zones not formally designated on the map provided to me: quadrat 10 was within the blue taped streamside reserve (GPS may not have been precise due to dense vegetation) and quadrat 13 was within the blue taped zone around a deep pit.

Of the positive quadrats, eight are clearly within areas designated for harvesting. Two are located within the "habitat area" close to the private reserve boundary (note that the map may show the quadrats on or even within the private property boundary but all our walking was within taped zones). Quadrat 34 was definitely within the blue taped zone and in an area designated for harvest.

Of the point locations, almost all are within the area designated for harvest (most were simply sites recorded in transit between quadrat locations) but about five (perhaps six) are situated in the "habitat area".

Sixty-eight individual *P. atriola* were recorded from eleven positive quadrats, and fourteen from within about five metres of quadrats, giving a total of eighty-two individuals. Each quadrat is 0.01 ha, so 0.11 ha was formally surveyed, giving a density of approximately 745 individuals per hectare. This is considered a partly nonsensical figure but is presented because many readers will make this often logical calculation. However, the figure can only refer to parts of the coupe actually

supporting *P. atriola*, which from Figure 1 is clearly a restricted area of about 10 ha (the next logical calculation may be that there is therefore 7450 individuals present in BG034A). However, our observation, which seems also to be supported by the informal survey of Bradburn *et al.* (2008), is that *P. atriola* is virtually restricted to the margins of the numerous walking tracks and the occasional old vehicular track, rarely extending more than 5-10 m into the adjacent denser vegetation. Even along open tracks, *P. atriola* is not continuously distributed (as evidenced by the point location data – e.g. see Figures 1 and 2). In my opinion, it is more likely that BG034A supports a population of 250-350 plants. This is based on the summation of the eighty-two individuals recorded from quadrats and immediately outside quadrats, and eighty from point locations, and the supposition that there are likely to be about twice this number not immediately visible from the walking tracks.

### Recommendations

Figure 1 shows that there are several sites for *P. atriola* located within harvest areas and several sites outside the harvest areas (mainly in the “habitat area” but also in the “Pterostylis site”). Setting aside the issues of lack of appropriate controls and replicates, and the lack of an extended pre-disturbance set of data, if the long-term monitoring in BG034A is expected to yield useful indicators of the potential effects of forestry practices, several sites known to support *P. atriola* will need to be subject to the proposed silvicultural regime. The notion of “treading gently” and trying to avoid the specific quadrat locations should be avoided, and the marker pins have been deliberately left unlabelled as to their positive/negative status for this reason.

In my opinion, there are sufficient sites located in areas to be excluded from harvesting activities to ensure that the species will be locally reserved and that a seed source will be maintained. Based on my knowledge of the species from several other populations, and as discussed in more detail in my initial report (ECOtas 2007), I do not anticipate that the type of native forest silviculture being proposed for BG034A will have a medium- to long-term detrimental impact on the species. I anticipate some short-term losses from known sites (simply due to ground disturbance of tubers and soil conditions) and some reduction in abundance (perhaps from canopy and understorey changes) for several years.

How long the species takes to recover to pre-harvest numbers is not known and is one of the objectives of this assessment process. However, it must be noted that caution must be demonstrated in the interpretation of results because of the issues discussed previously (i.e. separating forestry effects from other factors such as seasonal fluctuations; lack of replication, etc.).

It is recommended that post-harvest monitoring occur annually for three years post-harvest and then on a five-yearly frequency. Monitoring should occur in the 2<sup>nd</sup> or 3<sup>rd</sup> week of February each year, and should commence in 2009. This is irrespective of whether the coupe proceeds to harvest before February 2009 or not because if the coupe is delayed, this would provide an opportunity for an additional pre-harvest data point. The collection of two pre-harvest data points does not increase the strength of a pre- and post-harvest comparison because of the replication issue (a trend cannot be inferred from two data points) but may give some indication of variability in numbers (even if between two years only). The first formal post-harvest monitoring should occur in the February after forestry activities commence and should take place even if all peripheral activities (such as excavator heaping and burning) are incomplete.

Re-monitoring will involve the following:

- re-locate positive and negative quadrats using a GPS accurate to around 5 m;
- survey a 10 x 10 m quadrat based on the centre point and oriented against the cardinal compass points (searching each 5 x 5 m quadrant works very effectively);

- record numbers of plants and note number of budding vs. mature plants;
- survey a wider but undefined area outside the 10 x 10 m area to ensure that the original quadrat location has been covered;
- record any additional plants (as point locations) outside formal quadrats.

Re-monitoring should be undertaken by people with recognised botanical expertise (e.g. ecological consultant, staff of the Forest Practices Authority and/or Threatened Species Section) for the first two years. However, it is recommended that the longer term program of monitoring could be continued by Forestry Tasmania staff provided that field training is provided to ensure successful field identification of plants (essentially someone needs to “get their eye in”) and approximate location of quadrats.

Monitoring data should be compiled and maintained by the Forest Practices Authority for future reference for research and survey projects on *P. atriola* (and other threatened plants potentially affected by forestry practices).

### References

- Bradburn, G., Tonelli, P. & Crowther, L. (2008). *Survey of Pterostylis atriola relevant to 'Badger Hills' forestry coupe – BG034A*. Informal note on survey of 08.02.2008.
- ECOtas (2007). *An Assessment of the Significance of Proposed State Forest Coupe BG034A for Species of Native Orchid*. Environmental Consulting Options Tasmania (ECOtas) for Forest Practices Authority 20 September 2007
- Threatened Species Unit (TSU) (2000). *Listing Statement Snug greenhood Pterostylis atriola*. Department of Primary Industries, Water and Environment, Tasmania.

### Acknowledgements

Nina Roberts (Forest Practices Authority) provided field assistance, transport and some field equipment. Fred Duncan (Forest Practices Authority) and Wendy Potts (Threatened Species Section, Department of Primary Industries & Water) provided maps, waypoint data and other information from previous surveys for *P. atriola*.

Table 1. Quadrat details.

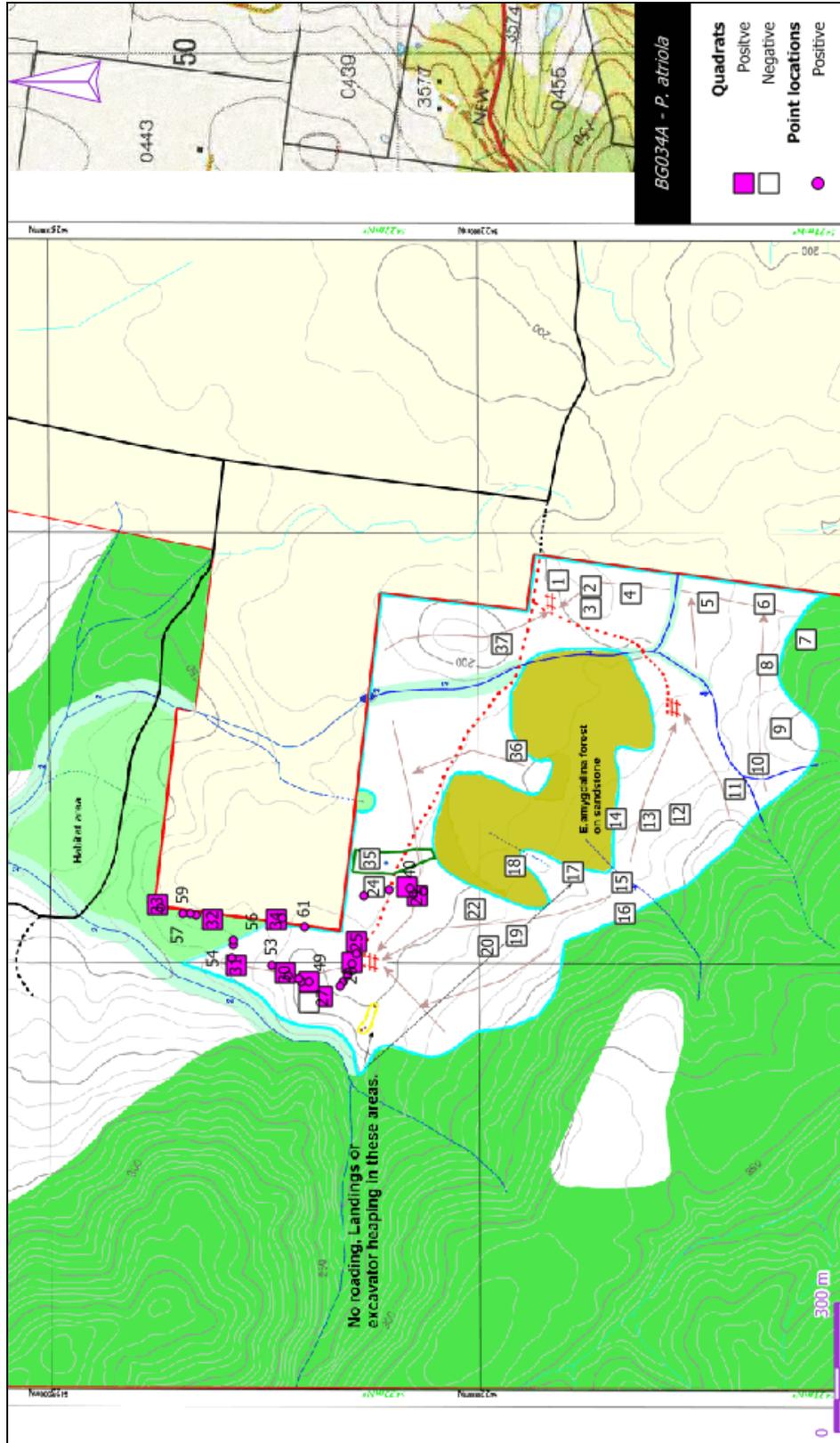
Site	Easting	Northing	Pos/Neg	Number in	Number out	Location
1	448881	5421809	Neg	0	0	Harvest
2	448867	5421736	Neg	0	0	Harvest
3	448817	5421736	Neg	0	0	Harvest
4	448851	5421643	Neg	0	0	Harvest
5	448831	5421463	Neg	0	0	Harvest
6	448828	5421332	Neg	0	0	Harvest
7	448745	5421236	Neg	0	0	Control-outside
8	448687	5421324	Neg	0	0	Harvest
9	448538	5421295	Neg	0	0	Harvest
10	448454	5421346	Neg	0	0	Control-inside (SSR)
11	448395	5421399	Neg	0	0	Harvest
12	448339	5421529	Neg	0	0	Harvest
13	448325	5421598	Neg	0	0	Control-inside (pit)
14	448326	5421676	Neg	0	0	Control-inside (DAS)
15	448178	5421662	Neg	0	0	Harvest
16	448107	5421656	Neg	0	0	Control-outside
17	448203	5421775	Neg	0	0	Harvest
18	448217	5421912	Neg	0	0	Control-inside (DAS)
19	448054	5421907	Neg	0	0	Harvest
20	448031	5421974	Neg	0	0	Harvest
21	448148	5422138	Pos	5	1	Harvest
22	448118	5422005	Neg	0	0	Harvest
23	448168	5422163	Pos	4	1	Harvest
24	448168	5422238	Neg	0	0	Harvest
25	448043	5422278	Pos	3	4	Harvest
26	447992	5422291	Pos	15	1	Harvest
27	447913	5422357	Pos	5	1	Harvest
28	447900	5422388	Neg	0	0	Harvest
29	447947	5422388	Pos	9	1	Harvest
30	447968	5422445	Pos	6	1	Harvest
31	447987	5422558	Pos	8	4	Harvest
32	448095	5422612	Pos	5	0	Control-inside (habitat area)
33	448128	5422741	Pos	7	0	Control-inside (habitat area)
34	448093	5422465	Pos	1	0	Harvest
35	448235	5422247	Neg	0	0	Harvest
36	448485	5421907	Neg	0	0	Harvest
37	448735	5421940	Neg	0	0	Harvest



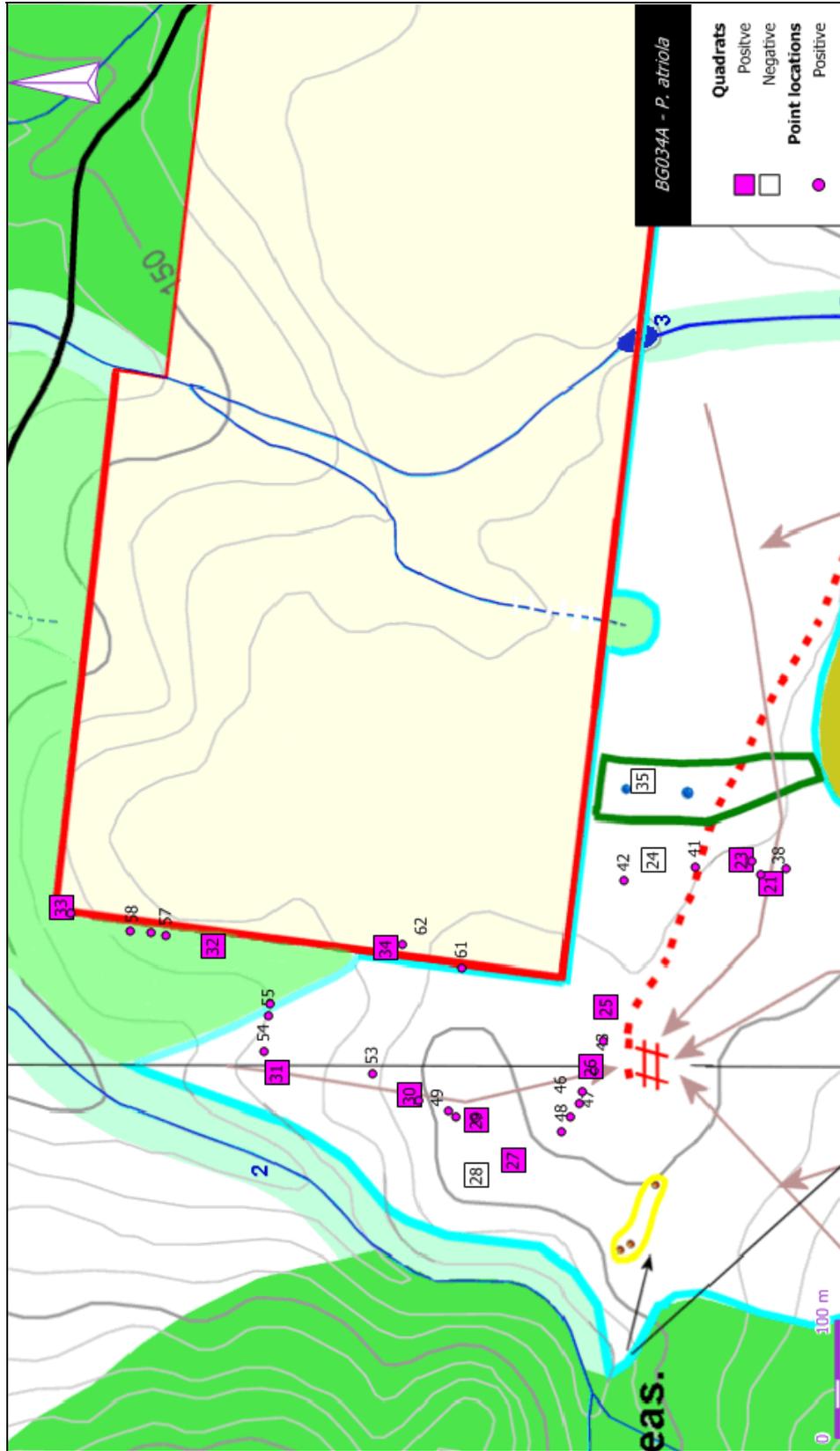
**Table 2.** Point location details.

Site	Easting	Northing	Pos/Neg	Number in	Number out	Location
38	448156	5422147	Pos	1		Harvest
39	448160	5422125	Pos	6		Harvest
40	448167	5422155	Pos	3		Harvest
41	448162	5422203	Pos	4		Harvest
42	448150	5422263	Pos	1		Harvest
43	448014	5422281	Pos	22		Harvest
44	447989	5422288	Pos	6		Harvest
45	447971	5422299	Pos	2		Harvest
46	447961	5422301	Pos	7		Harvest
47	447949	5422309	Pos	2		Harvest
48	447937	5422316	Pos	1		Harvest
49	447950	5422406	Pos	2		Harvest
50	447948	5422389	Pos	4		Harvest
51	447954	5422412	Pos	2		Harvest
52	447964	5422437	Pos	1		Harvest
53	447986	5422477	Pos	2		Harvest
54	448005	5422569	Pos	1		Harvest
55	448035	5422565	Pos	2		Control-inside (habitat area)
56	448045	5422564	Pos	1		Control-inside (habitat area)
57	448104	5422652	Pos	1		Control-inside (habitat area)
58	448106	5422665	Pos	1		Control-inside (habitat area)
59	448107	5422683	Pos	2		Control-inside (habitat area)
60	448122	5422733	Pos	3		Control-inside (habitat area)
61	448076	5422401	Pos	2		Harvest
62	448096	5422451	Pos	1		Harvest

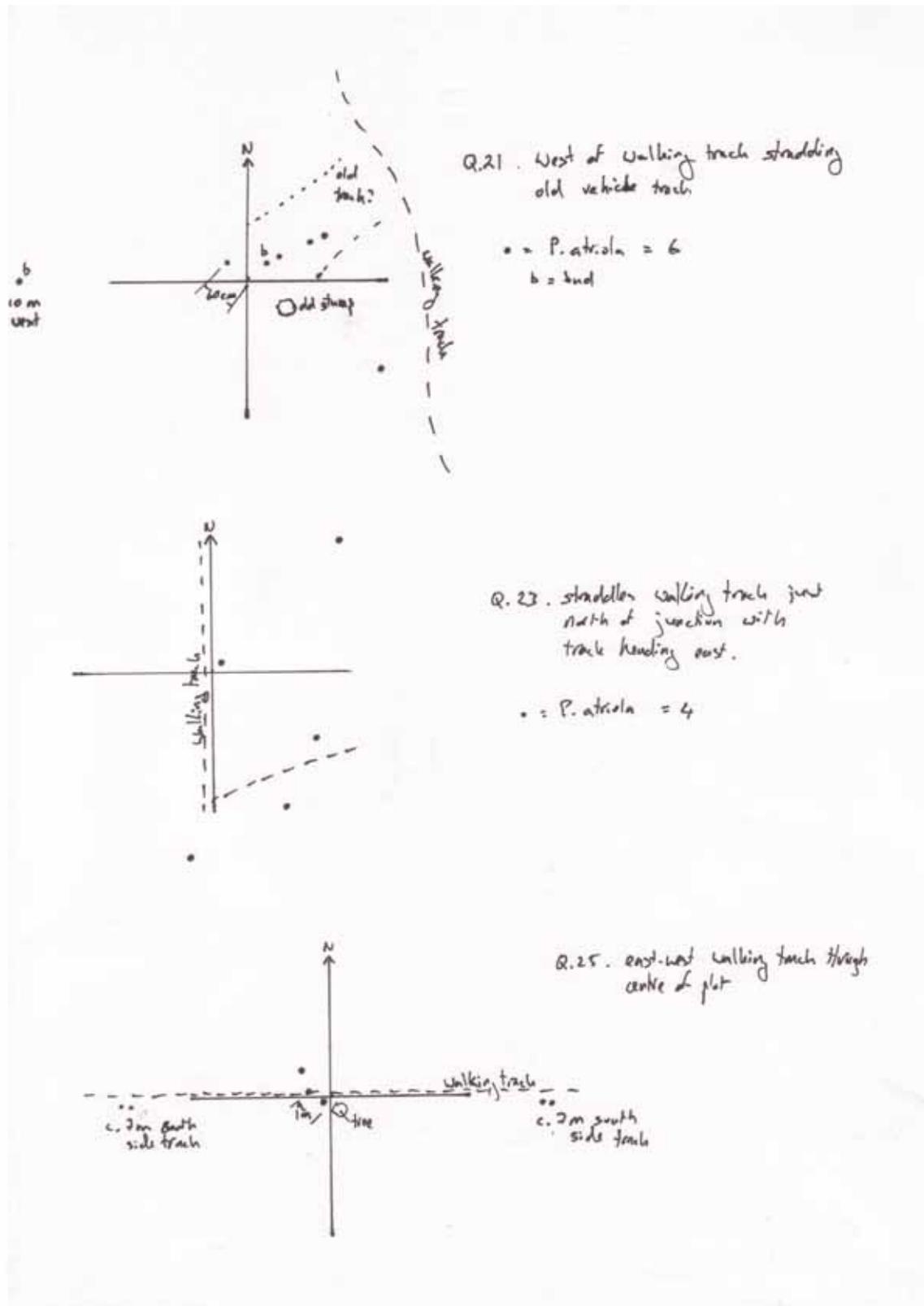




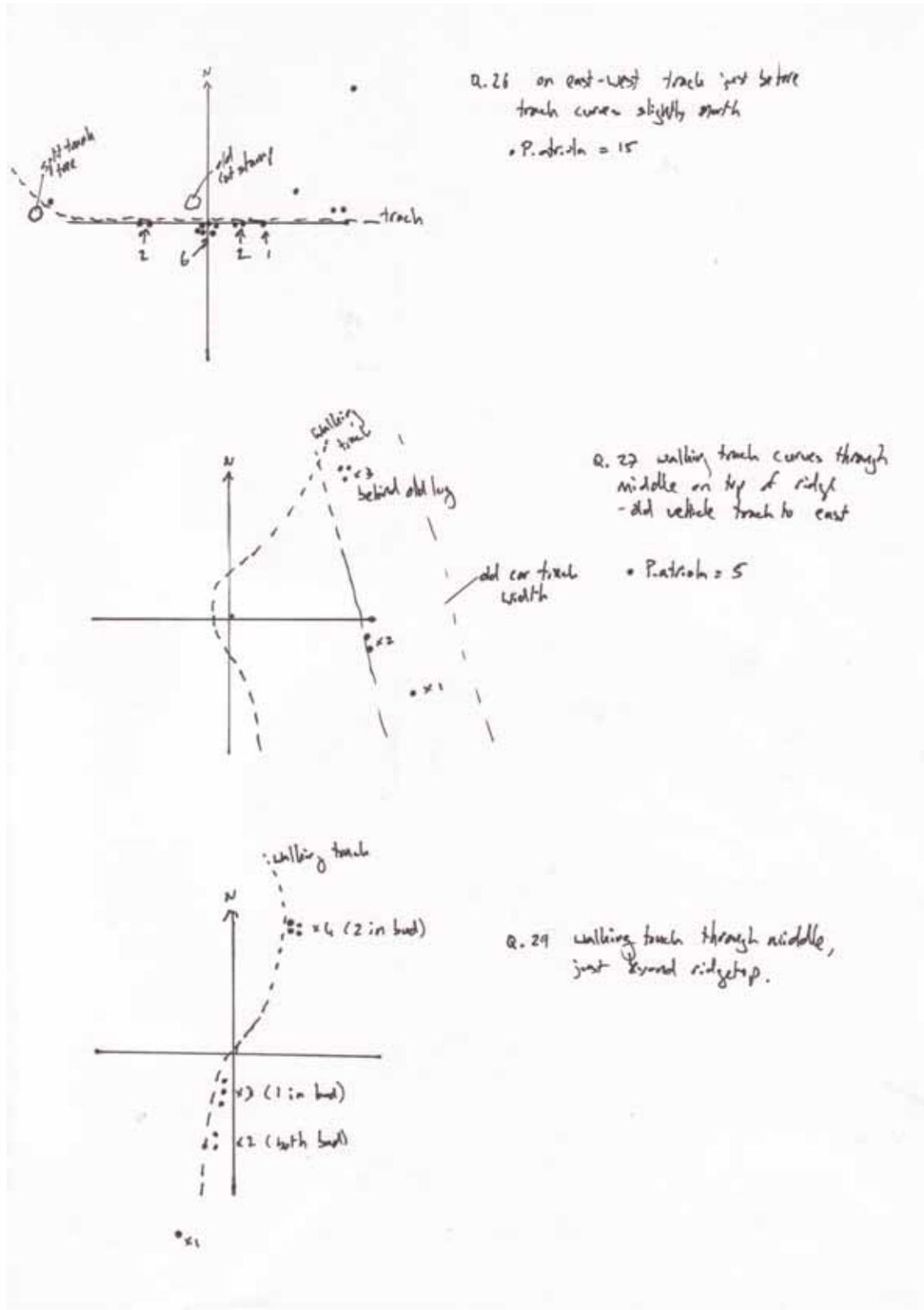
**Figure 1.** Overview of coupe BG034A (base map as supplied by Forestry Tasmania via Fred Duncan) showing location of monitoring quadrats and point locations relative to coupe features.



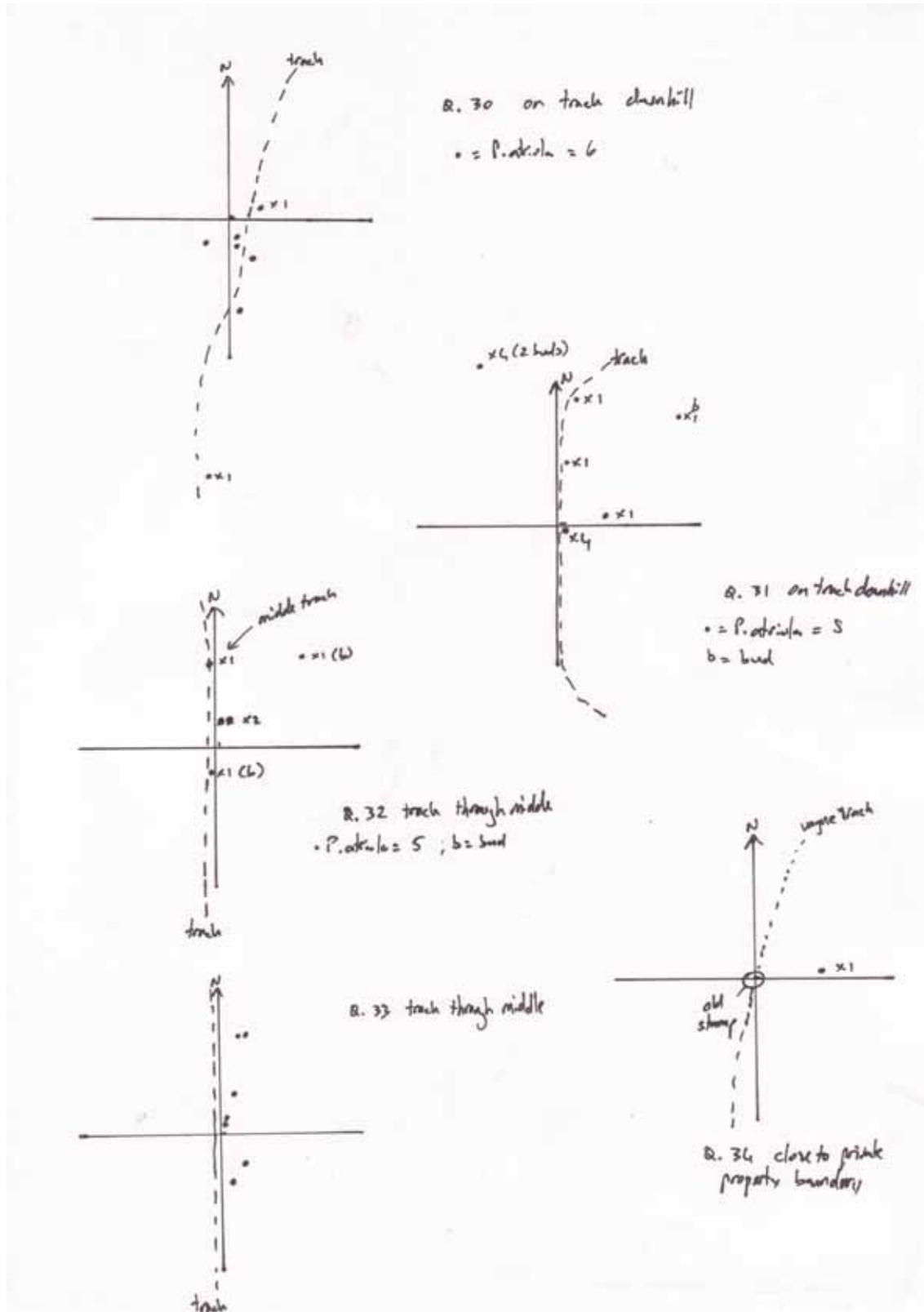
**Figure 2.** Detail of northern section of BG034A showing quadrat and point locations.



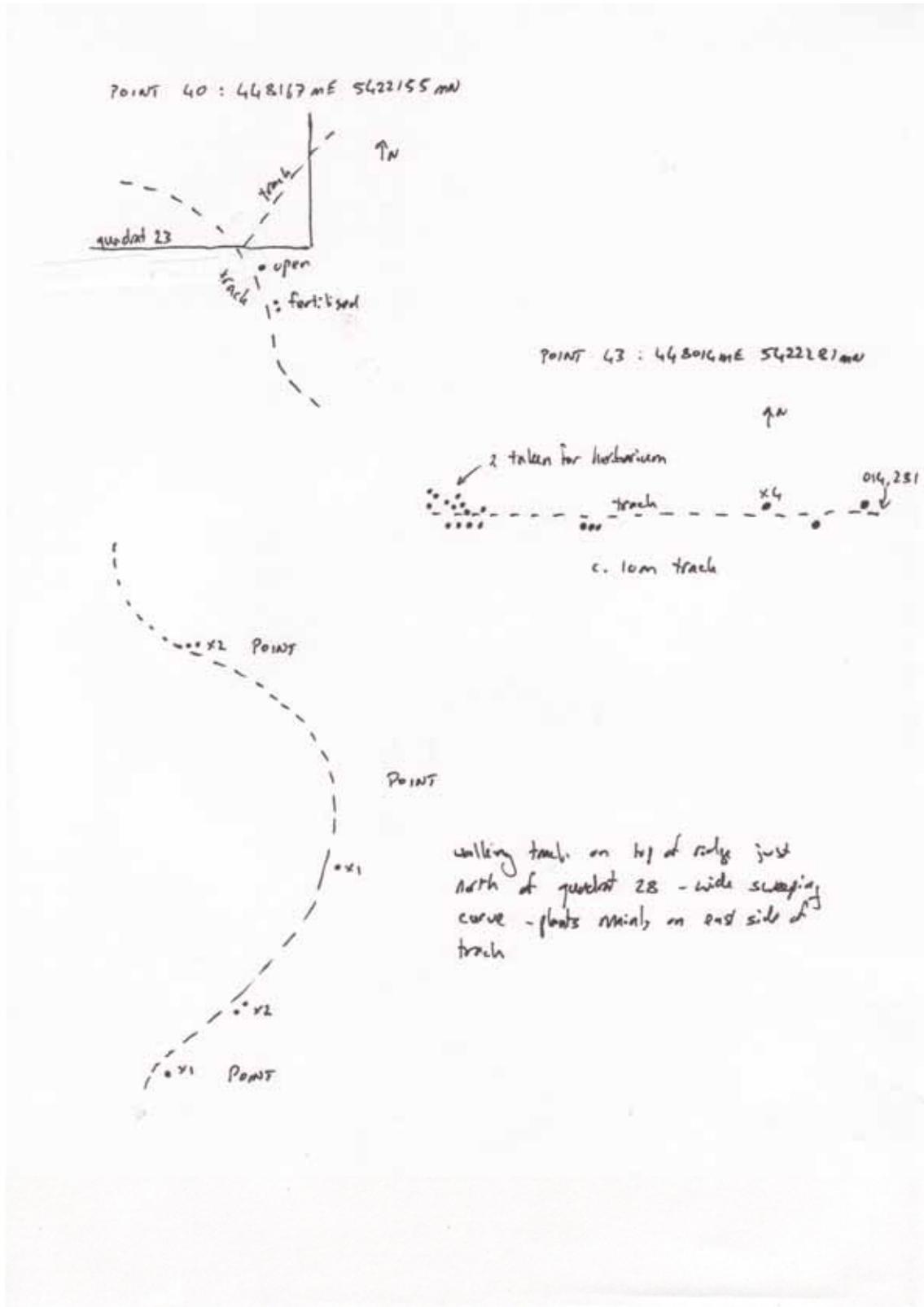
**Figure 3.** "Mud-maps" of locations of individuals of *P. atriola* within and adjacent to quadrats. (originals supplied as .pdf files on CD).



**Figure 3.** "Mud-maps" of locations of individuals of *P. atriola* within and adjacent to quadrats. (originals supplied as .pdf files on CD).



**Figure 3.** "Mud-maps" of locations of individuals of *P. atriola* within and adjacent to quadrats. (originals supplied as .pdf files on CD).



**Figure 4.** Additional "mud-maps" of point locations.  
(originals supplied as .pdf files on CD).