

River Beaully Catchment Electro-fishing Results – 2013



1 – Introduction

A total of 18 sites were the subject of fully quantitative surveys (methodologies detailed below) in 2013. In addition, a number of time delineated surveys were executed on the Eskadale and Culburnie Burn.

2 – Electro-fishing Methodology

2.1 – Fully Quantitative Surveys

Both back-pack and bank-side electro-fishing equipment was utilised during the 2013 season. Fully quantitative surveys were carried out and recorded in accordance with the protocols established by the Scottish Fisheries Co-ordination Centre. During each full survey, lengths of river/burn (usually 20-25m) were isolated by placing stop-nets at the upstream and downstream extent of the area to be fished in order to prevent fish from evading capture and escaping from the area. The area was fished through in a methodical and thorough manner with fish being retained in buckets. Captured fish were lightly anaesthetised in order to facilitate accurate fork length measurements (mm) and species identification. In most cases, the area was fished through a second and third time in an attempt to remove the majority of fish from the area and to provide a depletion curve for each fish species. By applying stream dimensions such as wetted width along with numbers of fish captured in successive fishing runs to a statistical formula, an estimate into fish density (number of fish/100m², the Zippin value) was calculated.

3 – Data Analysis

In their treatment of fully quantitative survey data, NBFT have ranked fish densities under the classification scheme described by the Scottish Fisheries Co-Ordination Centre. NBFT now have a sizeable data set in terms of fish densities within the Beaully Catchment. Analysis of these data has enabled NBFT to produce their own classification scheme based purely on data gathered from past fish surveys in the Beaully district (see table 2 below). Fish densities were classified by splitting the results of all fully quantitative surveys since 2006 in to quartiles. The quartiles of a set of values are the three points that enable data sets to be divided in to four groups, in this case: poor, moderate good and excellent. Fish densities with a value of zero were omitted from analysis and were simply classed as absent. Table one below shows the new classification scheme for the Beaully Catchment.

Table 1 - Ness and Beaully Fisheries Trust Juvenile Salmon and Trout Density Classification Scheme

Salmon Fry (No/100m ²)	Classification	Salmon Parr (No/100m ²)	Trout Fry (No/100m ²)	Classification	Trout Parr (No/100m ²)
0	Absent	0	0	Absent	0
0.1 – 14	Poor	0.1 - 10	0.1 - 2	Poor	0.1 - 1
14.1 – 52	Moderate	10.1 - 19	2.1 - 10	Moderate	1.1 - 4
52.1 – 90	Good	19.1 - 37	10.1 - 25	Good	4.1 - 10
90.1 – 398	Excellent	37.1 - 58	25.1 - 219	Excellent	10.1 - 60

4 – Results

4.1 - Strathfarrar

4.1.1 – Culligran Burn

The highest recorded density of salmon fry for the Culligran Burn site was observed in 2010 (see table 2 below). The following two surveys saw a marked decline in fry numbers with the 2012 result being the 2nd lowest since 2000. The most recent survey saw a sharp rise in fry density with the result being the highest recorded at the site. Numbers of salmon parr appear to be more stable with the 2013 density of 29/100m² being well within the historical range and above average density. Salmon fry and parr densities would be classed as excellent and good respectively. Past surveys have consistently shown a lack of juvenile trout. Indeed, the riffle/run flow profile of the burn makes it more attractive to young salmon rather than trout. However, the 2013 result bucked the trend slightly with a record density of fry and good numbers of parr. The results for fry and parr would both be classed as good.

Table 2 – Salmon and trout densities from the Culligran Burn

	Salmon fry/100m ²	Salmon Parr/100m ²	Trout Fry/100m ²	Trout Parr/100m ²
2000	13	8	0	1
2001	83	0	9	0
2002	25	52	10	0
2006	103	31	6	1
2007	55	37	2	0
2009	77	36	6	1
2010	129	10	5	2
2011	37	14	1	2
2012	23	41	1	5
2013	146	29	21	5
Mean	69.1	25.8	6.1	1.7
Range	13 - 129	0 - 52	0 - 21	0 – 5

4.1.2 – Uisge Misgeach

Two sites were the subject of fully quantitative surveys, hereby referred to as upper and lower. As previously reported, the habitat at the upper site is more suited to salmon parr than fry with its faster flows and larger substrate. With the exception of 2009, densities of fry have been typically low (see table 3 below). The 2013 survey was no exception to this with a recorded density of 4/100m², which would be classed as poor. Conversely, parr were observed in excellent numbers. The parr density of 40/100m² is the highest ever recorded at this site. Juvenile trout remain relatively stable in low numbers.

Table 3 - Salmon and trout densities from the upper site on Uisge Misgeach

Year	Salmon fry/100m ²	Salmon Parr/100m ²	Trout Fry/100m ²	Trout Parr/100m ²
2000	0	10	4	4
2005	9	3	1	0
2006	1	30	1	1
2009	51	33	1	2
2010	9	29	1	1
2011	16	35	9	0
2012	15	26	2	2
2013	4	40	3	3
Mean	13.1	25.8	2.8	1.6
Range	0 – 51	3 - 40	1 - 9	0 – 4

Since 2006, it appears that salmon fry density at the lower site has remained quite stable with results often being classed as good/moderate. The 2013 result of 58/100m² is above the average for the site and towards the upper end of its historical range. Numbers of salmon parr increased from the previous two surveys to a density of 17/100m². Salmon fry and parr would be classed as good and moderate respectively.

Table 4 - Salmon and trout densities from the lower site on Uisge Misgeach

Year	Salmon fry/100m²	Salmon Parr/100m²	Trout Fry/100m²	Trout Parr/100m²
2000	16	3	3	0
2003	8	7	3	0
2005	7	15	2	0
2006	52	15	1	1
2007	97	18	4	0
2009	93	9	3	0
2010	63	16	1	0
2011	53	8	2	0
2012	38	7	4	1
2013	58	17	2	1
Mean	48.5	11.5	2.5	0.3
Range	7 – 93	3 - 18	1 - 4	0 – 1

4.1.3 – Allt Choire a’ Mhuillidh

Density of salmon fry remains consistently low on the Allt Choire a’ Mhuillidh site. As previously reported, this can be attributed to the lack of appropriate spawning media in this section of the burn. Salmon parr density of 19/100m² is the second highest recorded for this site. Salmon fry and parr would be classified as poor and moderate respectively. In terms of juvenile trout, there appears to be a overall downward trend in numbers. The reasons behind this are not fully understood, especially given the fact that trout habitat at the routine site is good with excellent instream and bankside cover. NBFT intends to monitor the situation closely.

Table 5 - Salmon and trout densities from Allt Choire a' Mhuillidh

Year	Salmon fry/100m ²	Salmon Parr/100m ²	Trout Fry/100m ²	Trout Parr/100m ²
2000	0	1	0	2
2003	3	0	1	16
2005	0	9	1	0
2006	4	8	4	5
2007	16	17	11	9
2009	7	10	26	0
2010	5	20	13	11
2011	7	20	3	3
2012	4	14	3	2
2013	1	19	2	2
Mean	5.1	11	6.8	5.3
Range	0 – 16	0 - 20	0 – 26	0 – 16

4.1.4 – Allt Innis a' Mhuillt

Like Allt Choire a' Mhuillidh, the available habitat at the Allt Innis a' Mhuillt site is more suited to salmon parr than fry. This has been reflected in the consistently low density of fry during past surveys. Fishings carried out in 2009 in the lower reaches of the burn indicated that spawning is confined to a relatively small area shortly upstream of the burn's confluence with the River Farrar. However, the density of salmon fry in 2013 was the second highest recorded though numbers would still be classed as poor. Salmon parr were captured in abundance. 2013's density of 48/100m² is the highest recorded for the Allt Innis a' Mhuillt site and would be classed as excellent. Trout fry numbers decreased from the 2012 survey whilst parr density increased from 1/100m² in 2012 to 7/100m² in 2013. Fry and parr would be classed as moderate and poor respectively.

Table 6 - Salmon and trout densities from Allt Innis a' Mhuillt

Year	Salmon fry/100m ²	Salmon Parr/100m ²	Trout Fry/100m ²	Trout Parr/100m ²
2000	0	0	0	3
2003	0	0	23	0
2005	1	7	1	5
2007	2	8	2	0
2009	7	20	6	1
2010	3	39	6	0
2011	1	30	3	3
2012	1	20	10	1
2013	6	48	1	7
Mean	2.3	19.1	5.7	2.2
Range	0 - 7	0 - 39	0 – 23	0 – 5

4.1.5 – River Farrar Mainstem

Since 2011, density of salmon fry has continued to drop. During each fully quantitative survey, NBFT have carried out an assessment of habitat at the site. There appears to have been little to no change of the habitat at the mainstem site. It is likely that the drop in fry is not connected to a change in habitat (i.e. washing out of spawning gravels) but rather a lack of spawning adults in that particular section of the river. Further mainstem surveys would shed some light on the productive areas of the mainstem in terms of spawning. Conversely, numbers of salmon parr increased dramatically from a low of 5/100m² in 2012 to the second highest recorded density of 57/100m² in 2013.

Table 7 - Salmon and trout densities from the mainstem site of the River Farrar

Year	Salmon fry/100m ²	Salmon Parr/100m ²	Trout Fry/100m ²	Trout Parr/100m ²
2000	146	49	2	0
2011	29	58	0	0
2012	20	5	1	0
2013	15	57	0	0
Mean	52.5	42.3	0.8	0
Range	15 - 146	5 - 58	0 - 2	NA

4.1.6 – Deanie Burn

In their report to the Beaully District Fishery Board in 1990, AURIS environmental documented acidic water conditions on the Deanie Burn. As detailed in previous NBFT electro-fishing reports, acidic water conditions can have deleterious effects on juvenile salmon during the developmental stage. Invertebrate samples were taken from the Deanie Burn in 2009 and were subsequently analysed by Chaz Eames of Aquaterra Ecology. The primary focus of the investigation was to look for the presence/absence of acid intolerant groups of invertebrates. Most taxonomic groups were present, as were acid intolerant groups. The report recommended water sampling during high flows to investigate if acidic water conditions occurred as infrequent “flushes”. NBFT acted upon the recommendations and found the pH to be neutral or very close to neutral during and after high flows.

With no salmon recorded during the 2013 survey, the question of why salmon do not utilise the available habitat in the Deanie Burn still remains. In their report to the Beaully District salmon Fishery Board, Galloway Fisheries Trust explained that adult salmon may not be attracted to the burn due to the very sluggish water at the burn’s confluence with Loch Beanachrann. An immediate solution to the aforementioned issues is not possible at present. NBFT intend to monitor the situation closely in the coming years.

4.2 - Lower River Beaully Area including: Bruiach Burn, Belladrum Burn, Culburnie Burn.

4.2.1 – Bruiach Burn

Following an extremely high density of salmon fry in 2010 (398/100m²), numbers dropped in the following two surveys. Results from the 2013 survey saw an increase to 86/100m². Previous reports highlighted the fact that parr density had remained very stable. It was therefore slightly disappointing to see numbers of parr fall away to below half of the previous year’s result. Fry and parr densities would be classed as good and moderate respectively. However, the largest change was seen in the numbers of trout fry. Very seldom have NBFT Biologists witnessed trout fry densities in excess of 100/100m². NBFT have speculated that the 2013 result of 184/100m² may be indicative of good numbers of sea trout spawning in the winter of 2012. Trout parr appear to have remained relatively stable and would be classed as good.

Table 8 - Salmon and trout densities from the lower site on the Bruiach Burn

Year	Salmon fry/100m ²	Salmon Parr/100m ²	Trout Fry/100m ²	Trout Parr/100m ²
2000	5	37	15	16
2003	30	35	54	6
2005	85	22	23	8
2009	115	45	80	15
2010	398	45	70	18
2011	132	50	18	7
2012	50	43	13	10
2013	86	18	184	8
Mean	112.6	36.9	57.1	11
Range	5 – 398	22 - 50	15 – 184	6 – 18

A second site, situated in Boblainy Forrest was also the subject of a fully quantitative survey. Following three years of timed surveys to investigate the extent to which adult salmon naturally penetrate the Bruiach Burn, it was found that salmon only periodically reach the Boblainy area (results contained in a separate report). The 2013 survey confirmed previous findings as no juvenile salmon were captured. Conversely, juvenile trout were found in abundance. The fry density of 205/100m² is amongst the highest ever recorded in the Beauly catchment. This result could go some way in reinforcing NBFT's speculation that there were more sea trout in the lower Beauly catchment than in previous years. Parr were recorded at a density of 20/100m². Both fry and parr results would be classed as excellent.

4.2.2 – Belladrum Burn

Since 2009, salmon fry density has remained fairly stable at the lower site on the Belladrum Burn with densities ranging from 74/100m² to 119/100m². The 2013 result of 100/100m² would be classed as excellent. Salmon parr were captured in abundance in 2013 with a generated density of 56/100m² which is the highest ever recorded from this site. Again, the largest change was seen in numbers of trout fry. The fry density of 218/100m² is the highest ever recorded from the Beauly catchment. In terms of trout parr, although the 2013 density was slightly lower than 2012, the result is towards the upper end of the range and well above the average for the site. Both fry and parr densities would be classed as excellent.

Table 9 – Salmon and trout densities from the lower site on the Belladrum Burn

Year	Salmon fry/100m ²	Salmon Parr/100m ²	Trout Fry/100m ²	Trout Parr/100m ²
2000	0	28	6	8
2001	80	0	42	7
2002	12	16	29	16
2006	52	35	43	15
2007	6	38	27	2
2009	89	21	104	8
2010	119	20	39	11
2011	102	46	22	5
2012	74	37	25	19
2013	100	56	218	13
Mean	63.4	29.7	55.5	10.4
Range	0 - 119	0 - 56	6 - 218	2 – 16

Reports previously published by NBFT have identified a potential barrier to salmonid migration in the middle reaches of the Belladrum Burn. Prior to 2011, the upper reaches of the burn was stocked with salmon fry by the Lower Beauly Fishing Syndicate. Since then, salmon fry have not been recorded in any of the surveys. However, the capture of a single parr in 2012 has raised questions over the porosity of the aforementioned barrier. No juvenile salmon were recorded in 2013. In terms of trout fry, results have been very consistent until 2012 where there was a sharp increase in numbers. It was therefore disappointing to see such a drop in the 2013 survey. Trout parr were above average for the site and well within the historical range for the site. Fry and parr would be classed as good and excellent respectively.

Table 10 – Salmon and trout densities from the upper site of the Belladrum Burn

Year	Salmon fry/100m ²	Salmon Parr/100m ²	Trout Fry/100m ²	Trout Parr/100m ²
2000	45	4	26	1
2001	40	0	34	19
2002	68	7	36	26
2006	8	0	22	7
2009	38	1	44	60
2011	0	0	26	29
2012	0	1	92	39
2013	0	0	14	35
Mean	29.6	1.6	36.8	27
Range	0 - 68	0 - 7	14 - 92	1 – 60

4.2.3 – Culburnie Burn

Results from the 2012 survey saw a very sharp dip in salmon fry density. Although numbers increased in 2013, the rise was negligible. The precise reasons for this are not fully understood but NBFT understand that stocking used to take place in the Culburnie Burn. NBFT intend to monitor this situation closely. Salmon parr numbers also fell sharply in 2013. Juvenile trout were well represented in the most recent survey with both fry and parr achieving classifications of excellent.

Table 11 – Salmon and trout densities from the Culburnie Burn

Year	Salmon fry/100m ²	Salmon Parr/100m ²	Trout Fry/100m ²	Trout Parr/100m ²
2000	32	22	30	20
2003	108	19	87	15
2005	77	20	118	13
2009	241	27	73	7
2010	79	17	62	27
2011	99	21	89	12
2012	1	25	51	13
2013	2	7	125	14
Mean	79.9	19.8	79.4	15.1
Range	1 - 241	7 - 27	30 - 125	7 – 27

4.3 – Middle River Beaulay: Breakachy Burn

The Breakachy Burn has always been noted as an important middle river spawning tributary that consistently produces salmon fry densities that would be classed as good/excellent. The 2013 survey was no exception to this with a salmon fry density of 321/100m²: the highest ever recorded from the Beaulay catchment. However, this result should be treated with caution as the upper half of the burn was effectively blocked by flood debris during the winter of 2012 meaning spawning activity was restricted to a relatively small area. River Beaulay ghillies have now resolved this and returning spawners will have now have unimpeded access to the spawning grounds present in the burn. Salmon parr were well represented and would be classed as excellent. Trout fry were captured in good numbers following two years of zero counts whilst parr were present in low numbers, though, as with the salmon fry result, caution should be exercised in the interpretation of these results. Trout fry and parr would be classed as good and moderate respectively.

Table 12 – Salmon and trout densities from the Breakachy Burn

Year	Salmon fry/100m ²	Salmon Parr/100m ²	Trout Fry/100m ²	Trout Parr/100m ²
2000	51	8	0	0
2001	89	22	0	0
2002	90	18	16	0
2006	78	4	28	0
2007	194	13	7	0
2009	43	2	9	0
2010	319	40	19	3
2011	64	14	0	1
2012	125	48	0	0
2013	321	35	24	2
Mean	137.4	20.4	10.3	0.8
Range	43 - 321	2 – 48	0 - 28	0 – 3

4.4 – Upper River Beauly: Eskadale Burn and Erchless Burn

4.4.1 – Eskadale Burn

There has been a marked decline in salmon fry density since 2011. The 2013 result of zero caused NBFT staff to carry out further timed fishings to investigate if there had been spawning activity outside of the routine site. The timed surveys were carried out in ostensibly good fry habitat yet no salmon fry were encountered whilst parr were well represented (CPUE = 0.9-2.2). A brief look at the lower end of the burn confirmed that access to the habitat was unimpeded therefore the precise reason for the under-utilisation of the burn is not understood. This also raises questions over the origin of the parr captured at the routine monitoring site. It is NBFT's belief that many of the parr have come from the mainstem of the River Beauly. NBFT intend to monitor this situation closely in the coming years. In terms of juvenile trout, there was perceived increase in numbers. Fry and parr density would both be classed as good.

Table 13 – Salmon and trout densities from the Eskadale Burn

Year	Salmon fry/100m ²	Salmon Parr/100m ²	Trout Fry/100m ²	Trout Parr/100m ²
2000	2	14	0	3
2001	27	4	5	2
2002	2	30	4	0
2006	53	19	7	0
2007	20	36	13	3
2009	52	10	38	5
2010	66	36	27	21
2011	0	41	14	2
2012	5	47	4	6
2013	0	32	20	10
Mean	22.7	26.9	13.2	5.2
Range	0 - 66	4 - 47	0 - 38	0 – 21

4.4.2 – Erchless Burn

Following two years of poor salmon fry densities from the upper site of the Erchless Burn, it was encouraging to see an increase in numbers. The 2013 result, although not as high as the 2009 or 2010 survey, would still be classed as good. Salmon parr density has remained more stable in comparison to fry and although slightly below the mean density it is still within the historical range. It was also encouraging to see the resurgence in trout fry numbers whilst parr remain at a moderate density.

The lower site was added to the annual survey list in 2011 to investigate if returning spawners would utilise spawning habitat that was exposed following the removal of large amounts of flood debris in 2010. Fry density has been consistently good since 2011 with the 2013 result achieving a classification of excellent. Salmon parr were recorded in very low numbers, though it should be mentioned that the habitat is far more suited to fry than parr. It would also seem that trout utilise the spawning media present at the lower site. Fry density would be classed as excellent whilst parr were absent from the 2013 survey.

Table 14 – Salmon and trout densities from the upper site of the Erchless Burn

Year	Salmon fry/100m ²	Salmon Parr/100m ²	Trout Fry/100m ²	Trout Parr/100m ²
2009	50	13	18	2
2010	74	16	51	4
2011	5	23	20	3
2012	8	26	5	1
2013	39	15	16	0
Mean	35.2	18.6	22	2
Range	5 - 74	13 - 23	5 - 51	0 – 4

Table 15 – Salmon and trout densities from the lower site on the Erchless Burn

Year	Salmon fry/100m ²	Salmon Parr/100m ²	Trout Fry/100m ²	Trout Parr/100m ²
2011	73	4	19	2
2012	59	3	27	0
2013	121	2	33	0
Mean	84.3	3	26.3	0.6
Range	59-121	2-4	19-33	0-2

4.5 – River Cannich

Timed surveys carried out in 2007 and 2008 revealed low numbers of salmon fry and parr with CPUE values ranging from 0.3 to 0.5. Surveys executed by the Spey Fishery Board in 2000 also revealed low numbers during quantitative sampling with fry and parr densities ranging from 0 – 2/100m² and 0-6/100m² respectively. The 2013 result reflected historical findings with fry absent and parr present at a low density of 4/100m².

4.6 – Abhainn Deabhag

Surveys from 2009 to 2012 consistently revealed good/excellent densities of salmon fry. The 2013 result of 41/100m² may seem disappointing. It is worth explaining that at the time of survey (15/7/13), Abhainn Deabhag was running extremely low with prolific weed growth. The low flows and weed growth made the catching of fry extremely difficult and many evaded capture. The 2013 fry density should be treated with caution as it does not reflect the true numbers actually present. With this said however, the density would still achieve a classification of moderate. Capturing parr proved less problematic due to the

operatives ability to see them amongst the weed growth. Numbers of trout remain stable in low/absent densities.

Table 16 – Salmon and trout densities from Abhainn Deabhag

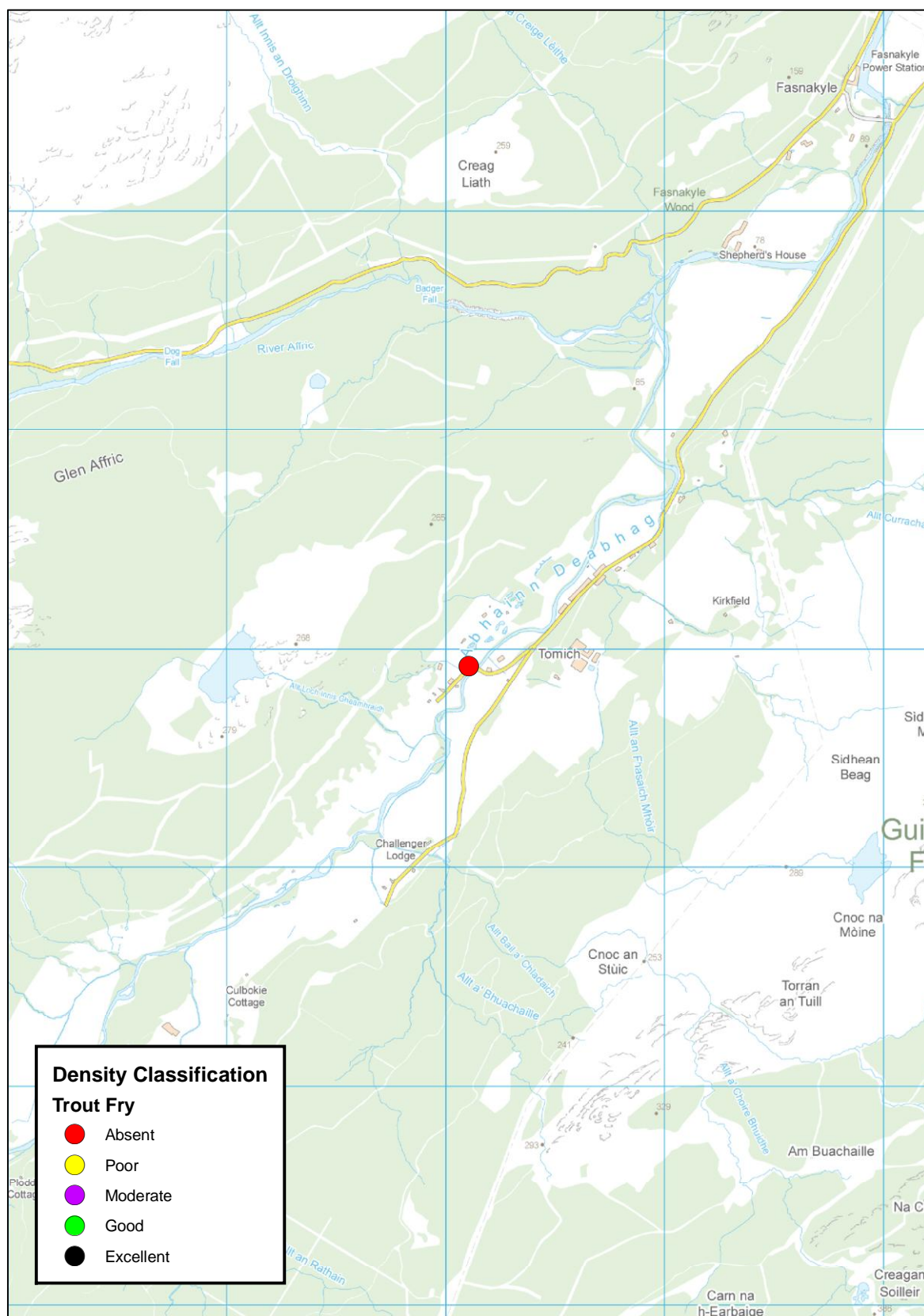
Year	Salmon fry/100m ²	Salmon Parr/100m ²	Trout Fry/100m ²	Trout Parr/100m ²
2000	8	15	2	0
2001	47	14	0	0
2002	71	50	0	1
2009	105	36	2	1
2010	74	37	1	0
2011	107	52	1	1
2012	76	43	1	1
2013	41	46	0	1
Mean	66.1	36.6	0.9	0.6
Range	8 – 107	14 - 52	0 - 2	0 – 1

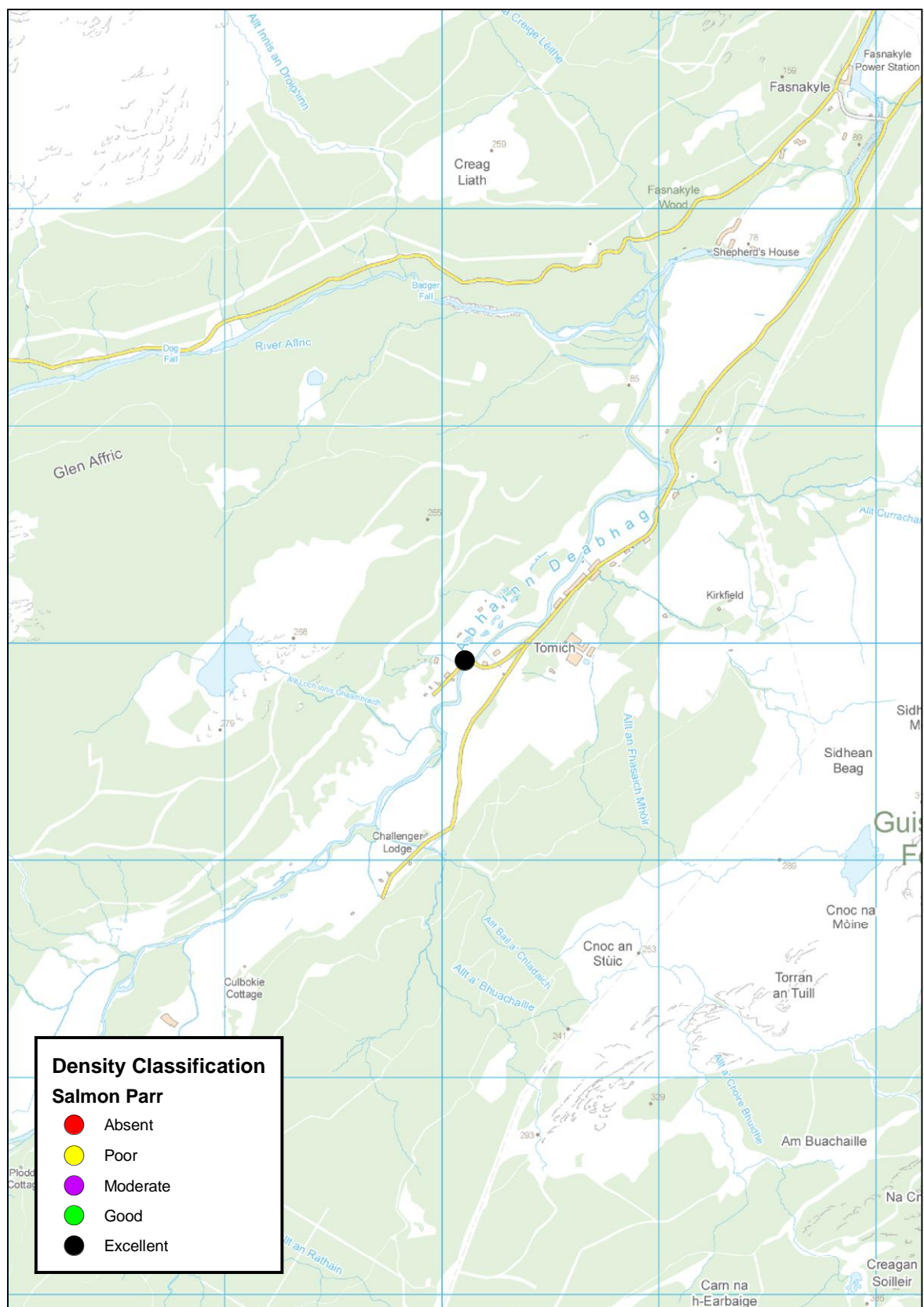
5 – Conclusions

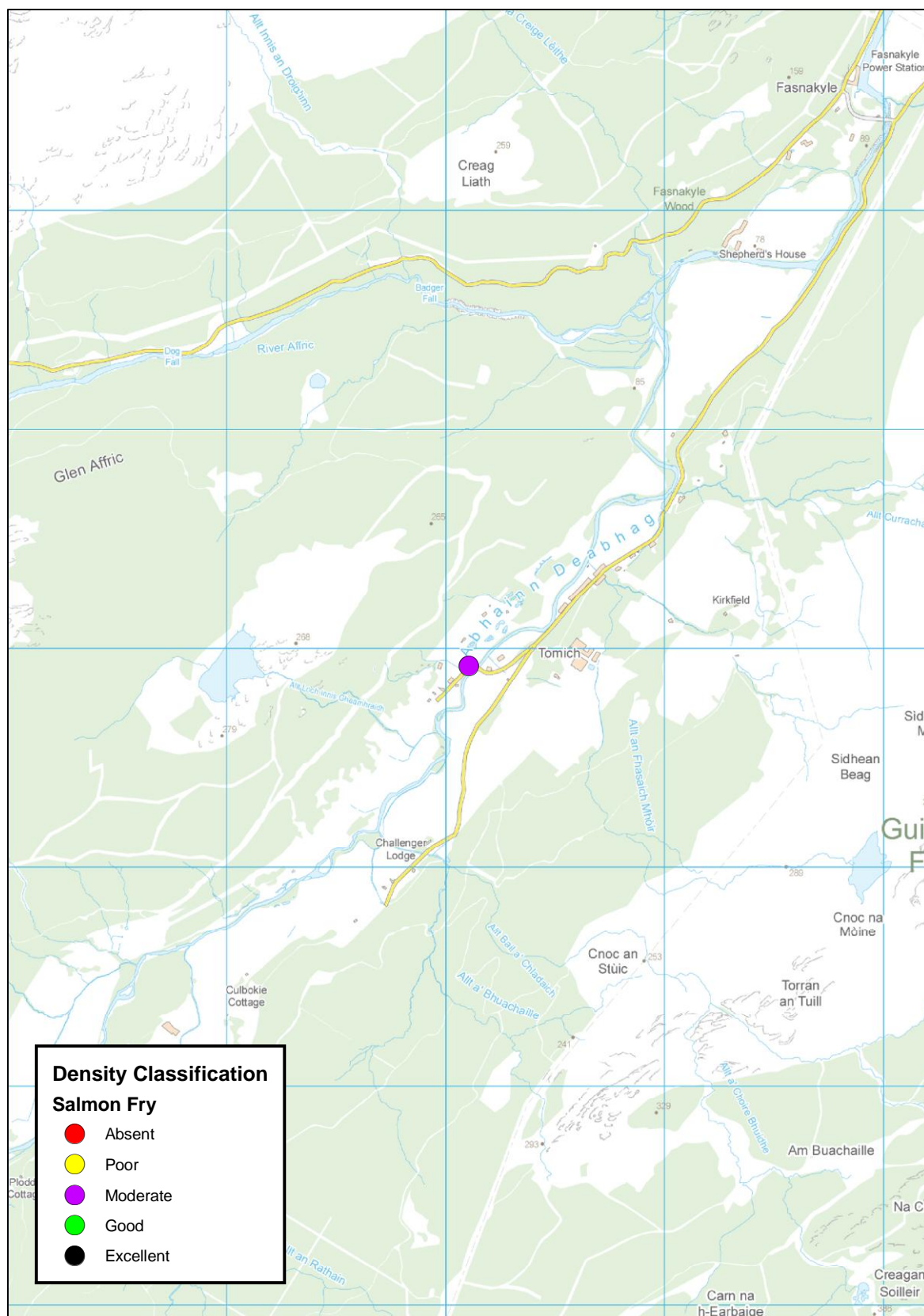
- Results from the Farrar catchment were largely encouraging in 2013. Fry density at the Culligran Burn was the highest ever recorded. Allt Innis a' Mhuillt provided excellent numbers of salmon parr. The mainstem site showed a large reduction in fry numbers yet parr were caught in abundance. To investigate this further, NBFT intend to increase the number of electro-fishing sites on the mainstem of the River Farrar.
- Fry density on the lower Bruiach Burn increased in 2013 yet the result is still below the average for the site. Parr density also fell in 2013. Juvenile salmon were absent from the upper site in Boblainy Forest. Trout fry density was very high on both Bruiach sites. The lower Belladrum Burn site was well populated with juvenile salmon in 2013. Again, trout fry density was exceptionally high. Salmon were not recorded from the upper site on the Belladrum Burn. There has been a rapid decline in juvenile salmon density at the Culburnie Burn. The precise reasons for this are unknown and NBFT intend to monitor the situation closely. Mainstem surveys were not completed in 2013 due to high water conditions during the back end of the season. To effectively survey the lower mainstem, the river must be running at compensation level. NBFT intend to execute mainstem surveys in 2014 should river levels permit.
- Salmon fry density at the Breakachy Burn was exceptionally high in 2013. However, the result may have been skewed due to the presence of a large timber blockage in the upper half of the burn's accessible length. Salmon parr were well represented in 2013.
- It would appear that spawning activity in the Eskadale Burn has been extremely limited in the last three seasons yet parr density remains ostensibly high. The reasons behind the lack of spawning are unknown to NBFT staff. The routine site will be revisited in 2013 along with some timed surveys to confirm if any spawning has taken place.
- Whilst fry density increased at the upper site of the Erchless Burn in 2013, there was a small drop in parr density. The excellent spawning media uncovered through flood debris removal in 2010 continues to act as an important spawning location for returning salmon. The 2013 fry density is the highest recorded for this site.
- Data for the River Cannich is sparse. Although the 2013 survey revealed salmon parr at a low density, fry were absent. NBFT intend to increase their coverage of the River Cannich to gauge juvenile salmon abundance.

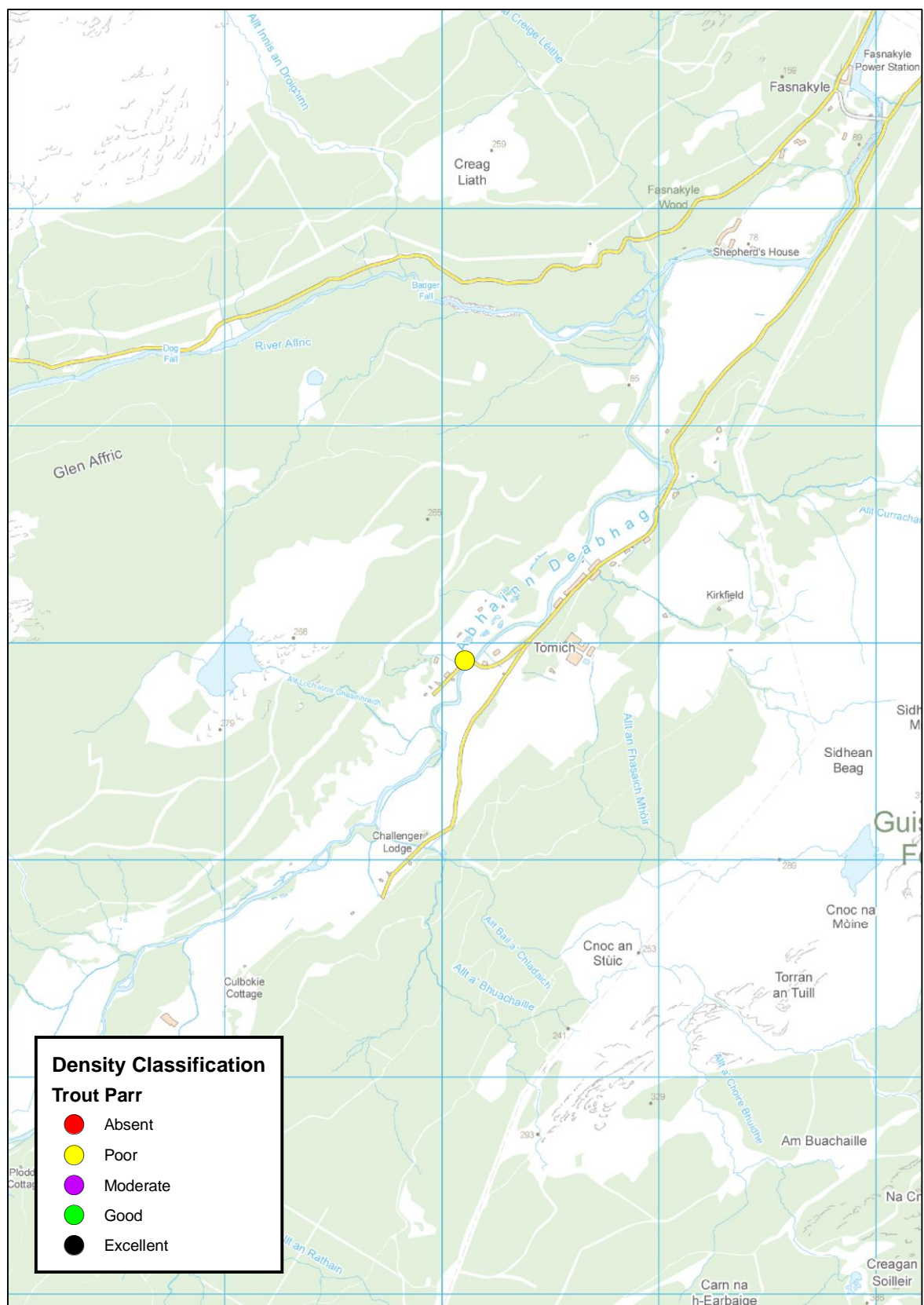
- Salmon fry density on Abhainn Deabhag was low in comparison to previous surveys but still within the historical range. However, capture efficiency was greatly reduced by extremely low water conditions and excessive weed growth. Parr were captured in abundance. Data from other parts of the mainstem is lacking and NBFT intend to increase their coverage of the Glass catchment.

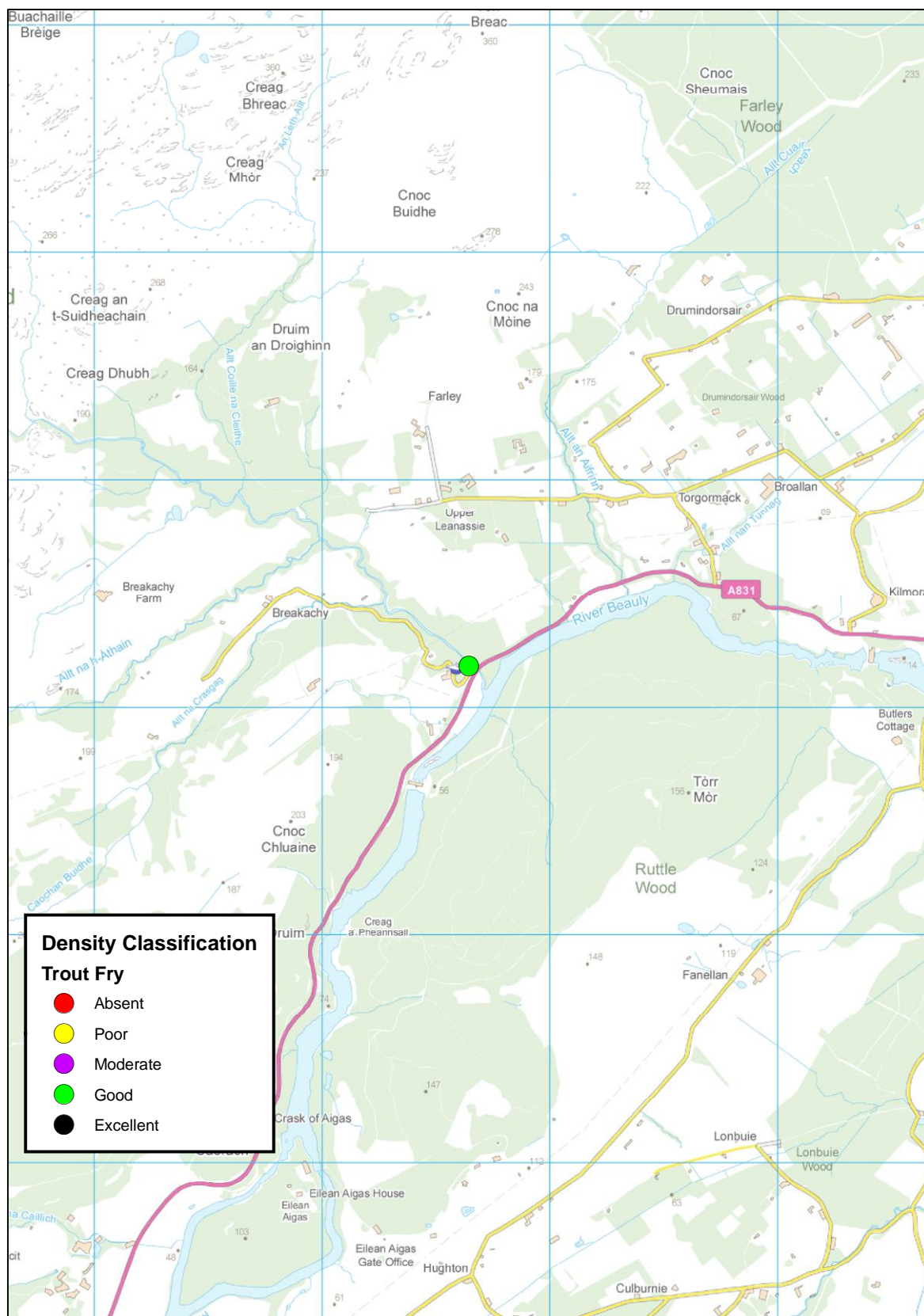
APPENDIX – Visual Representation of Results in Map Format

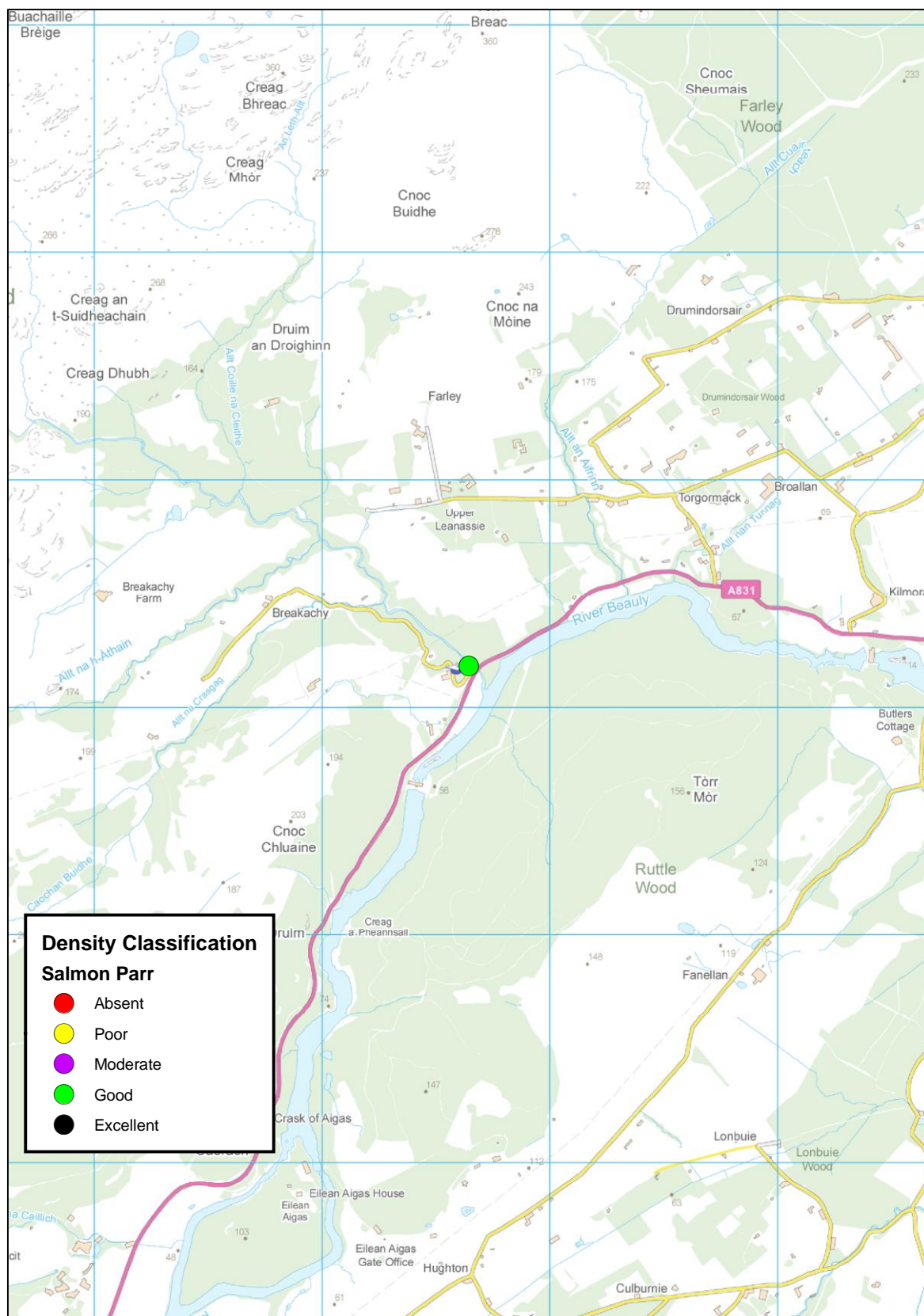


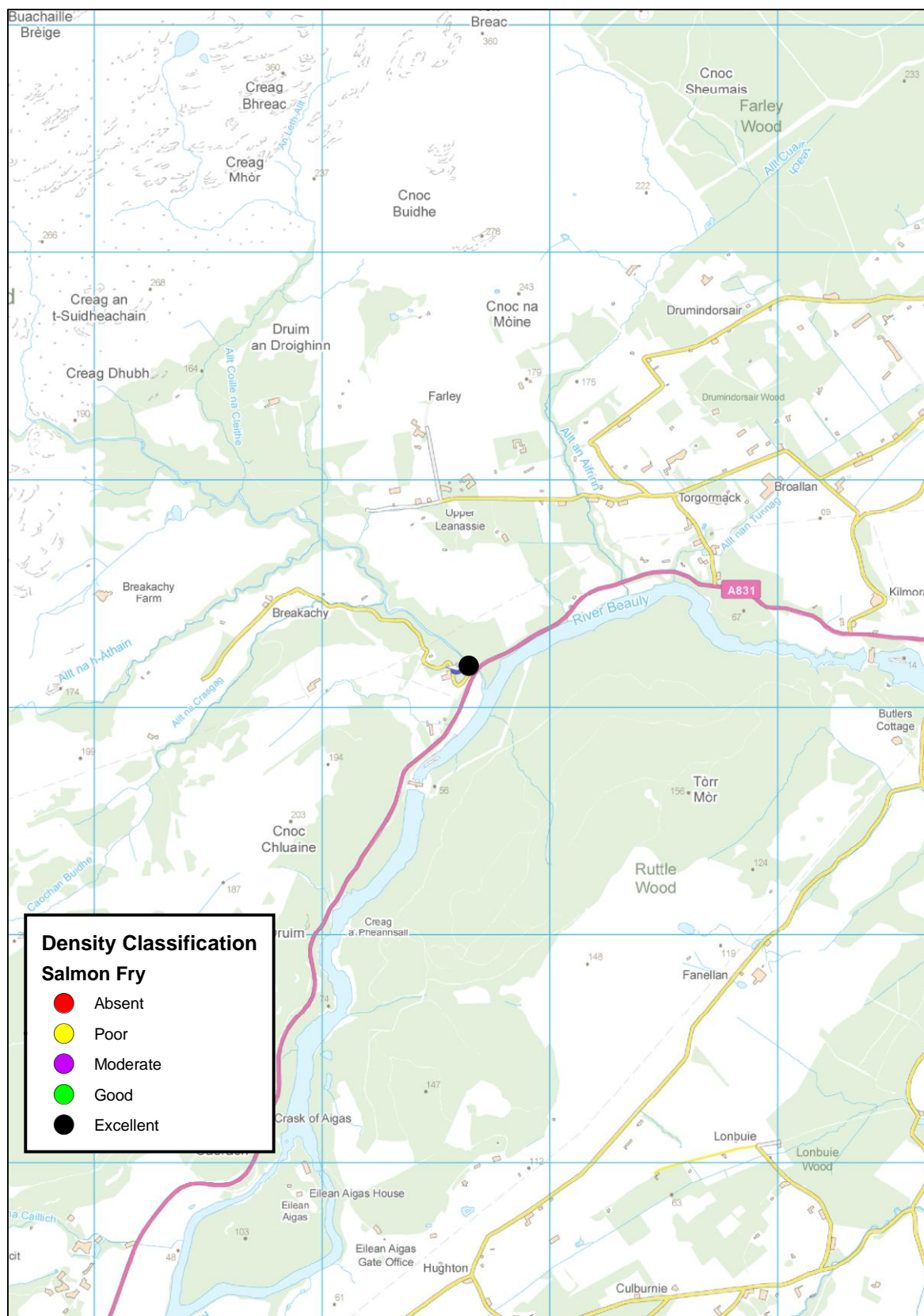


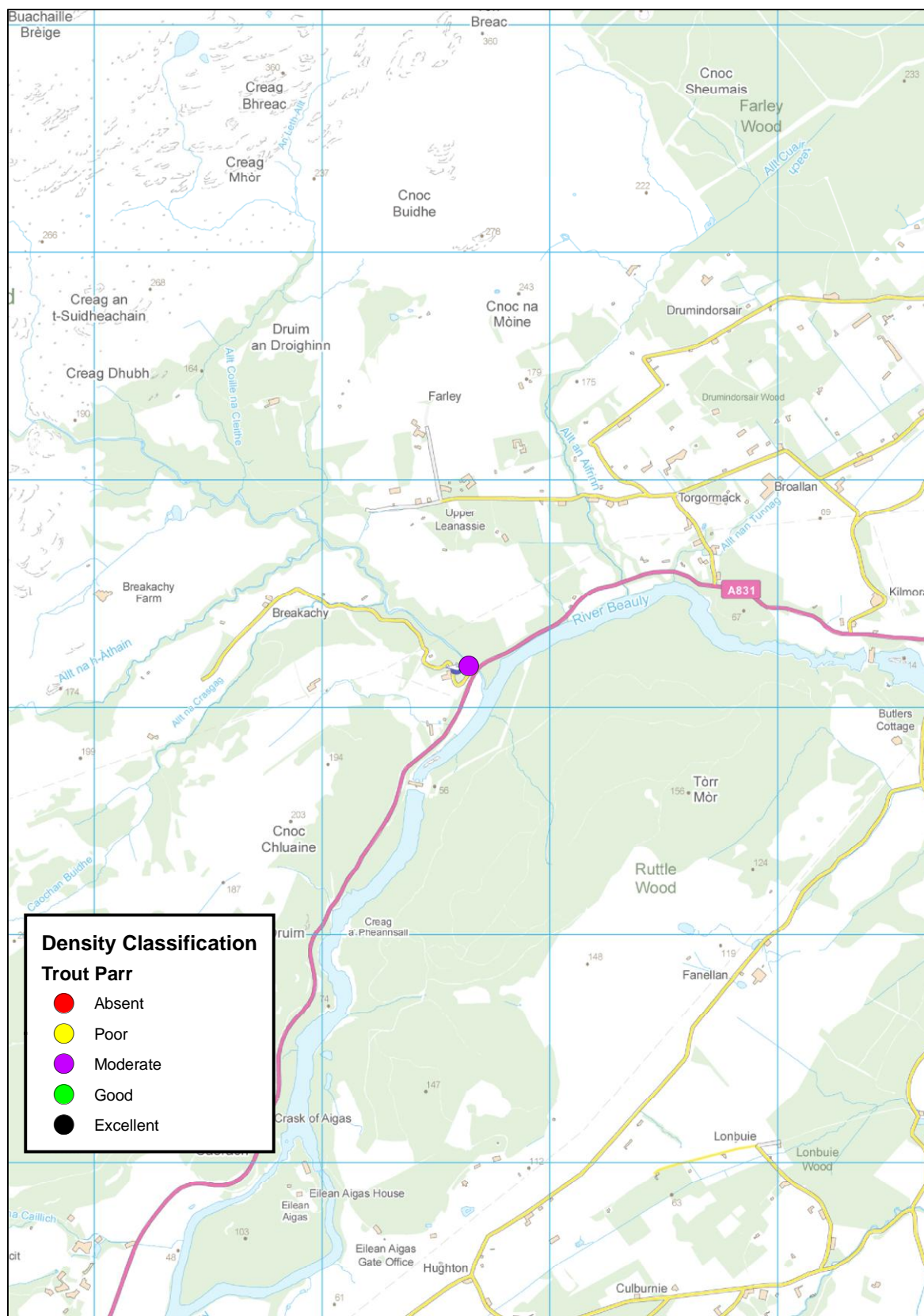


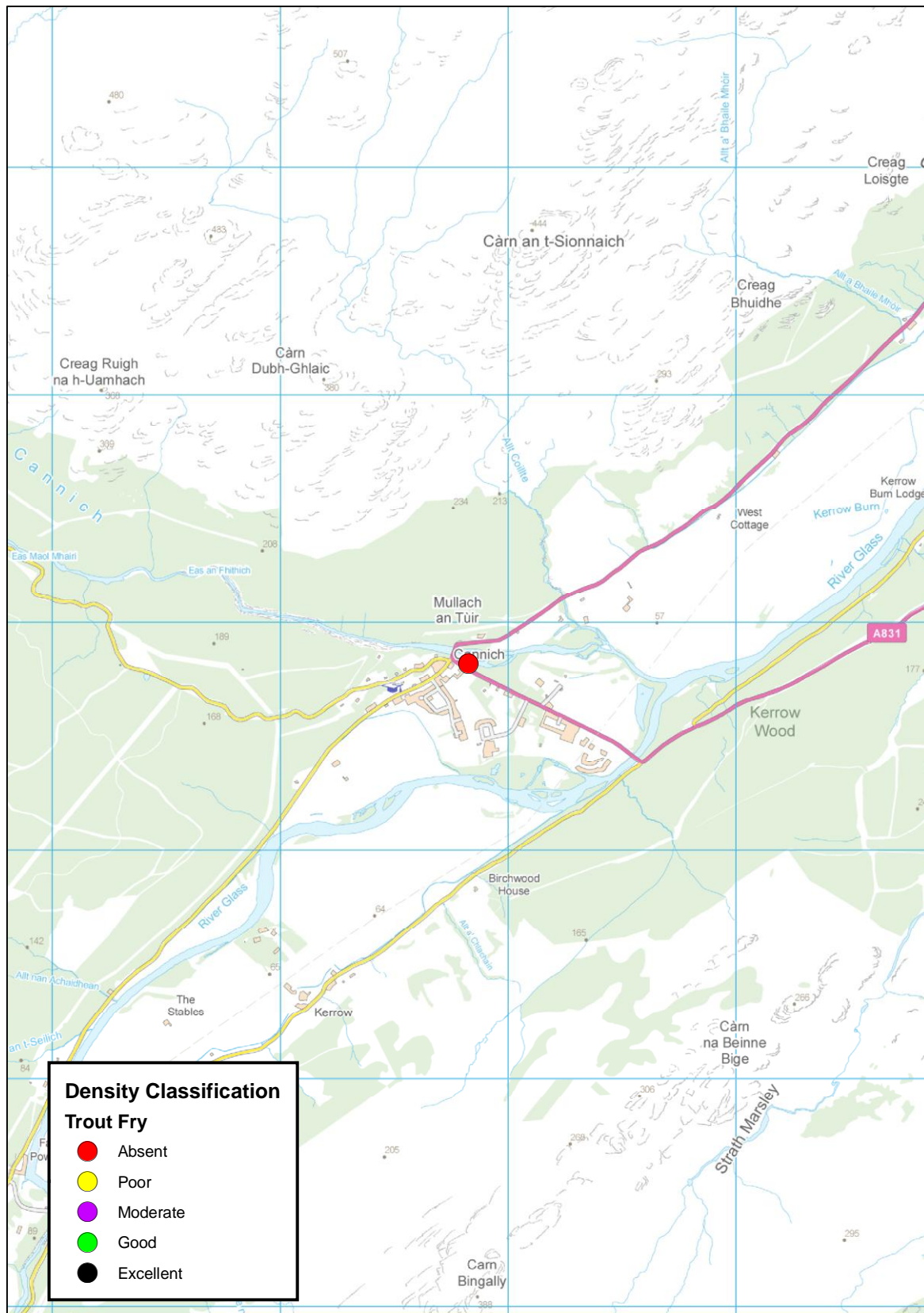


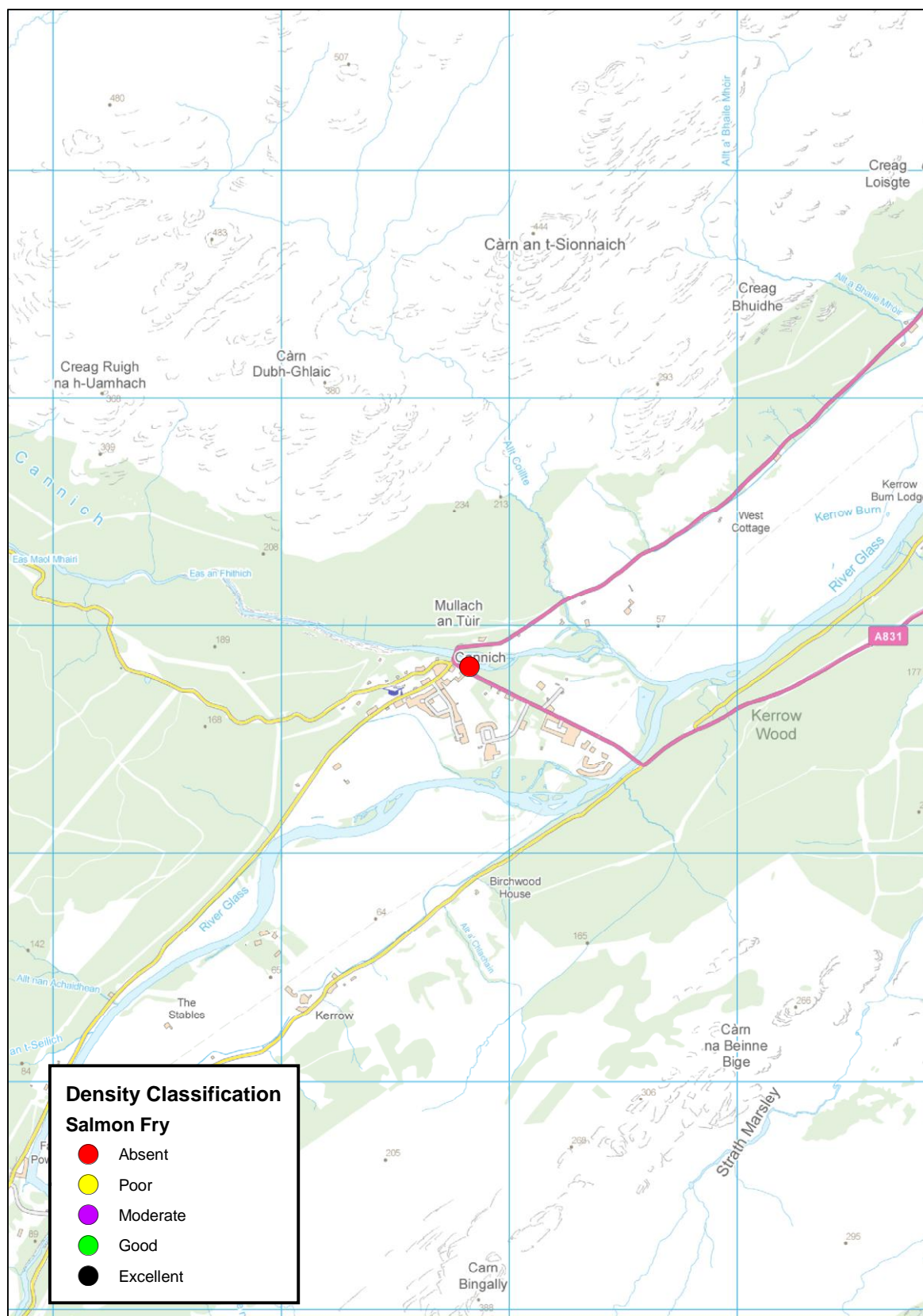


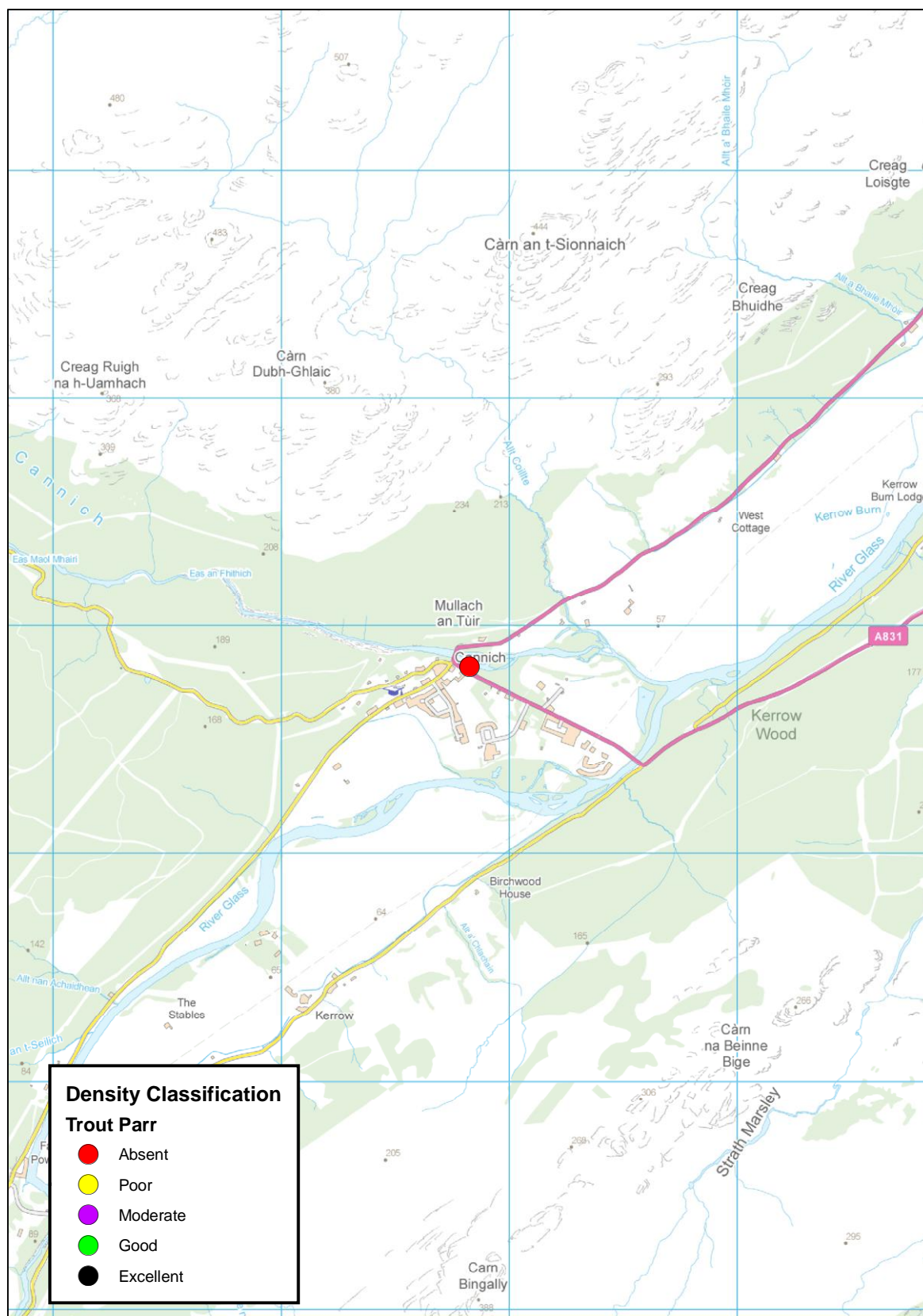


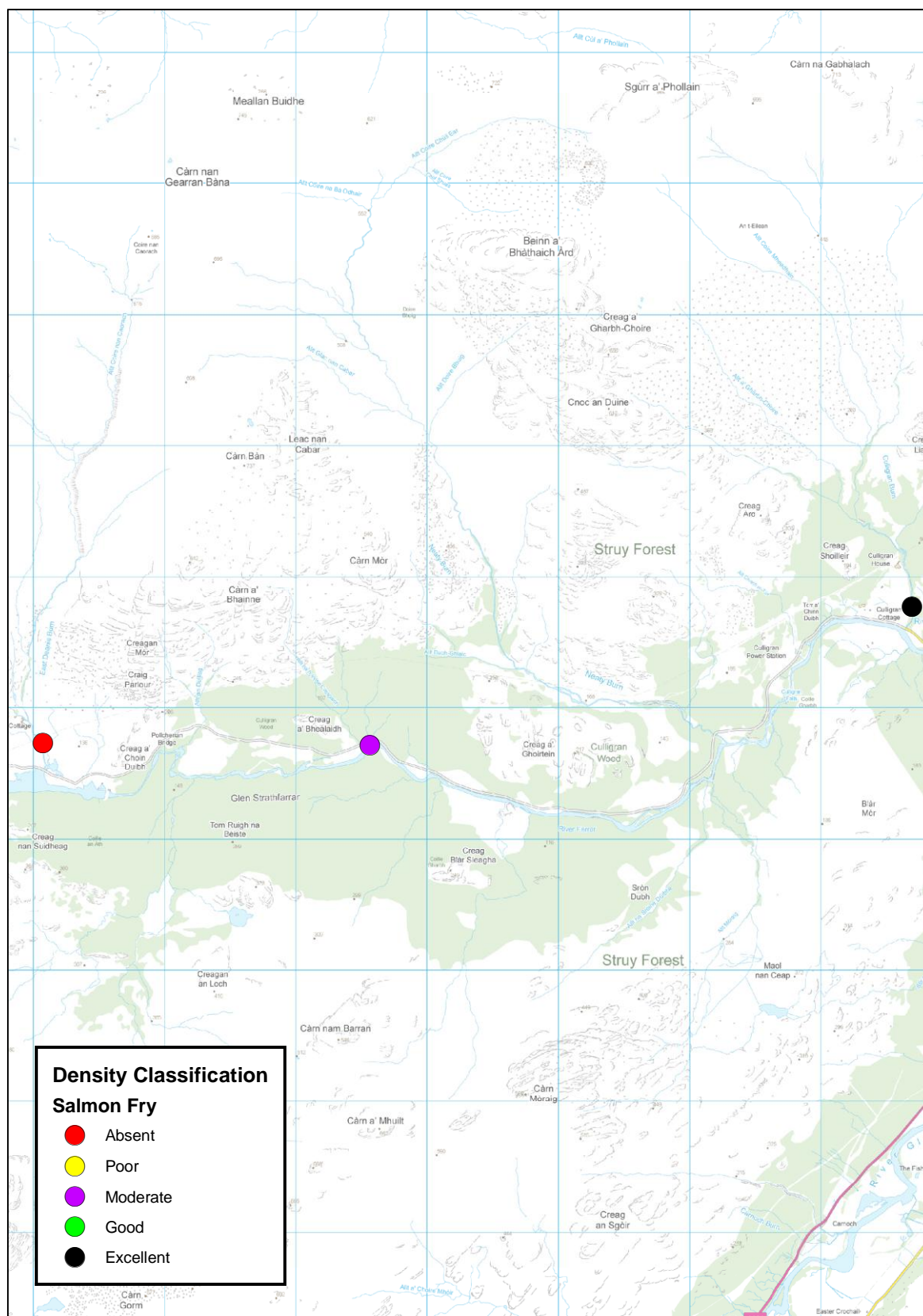


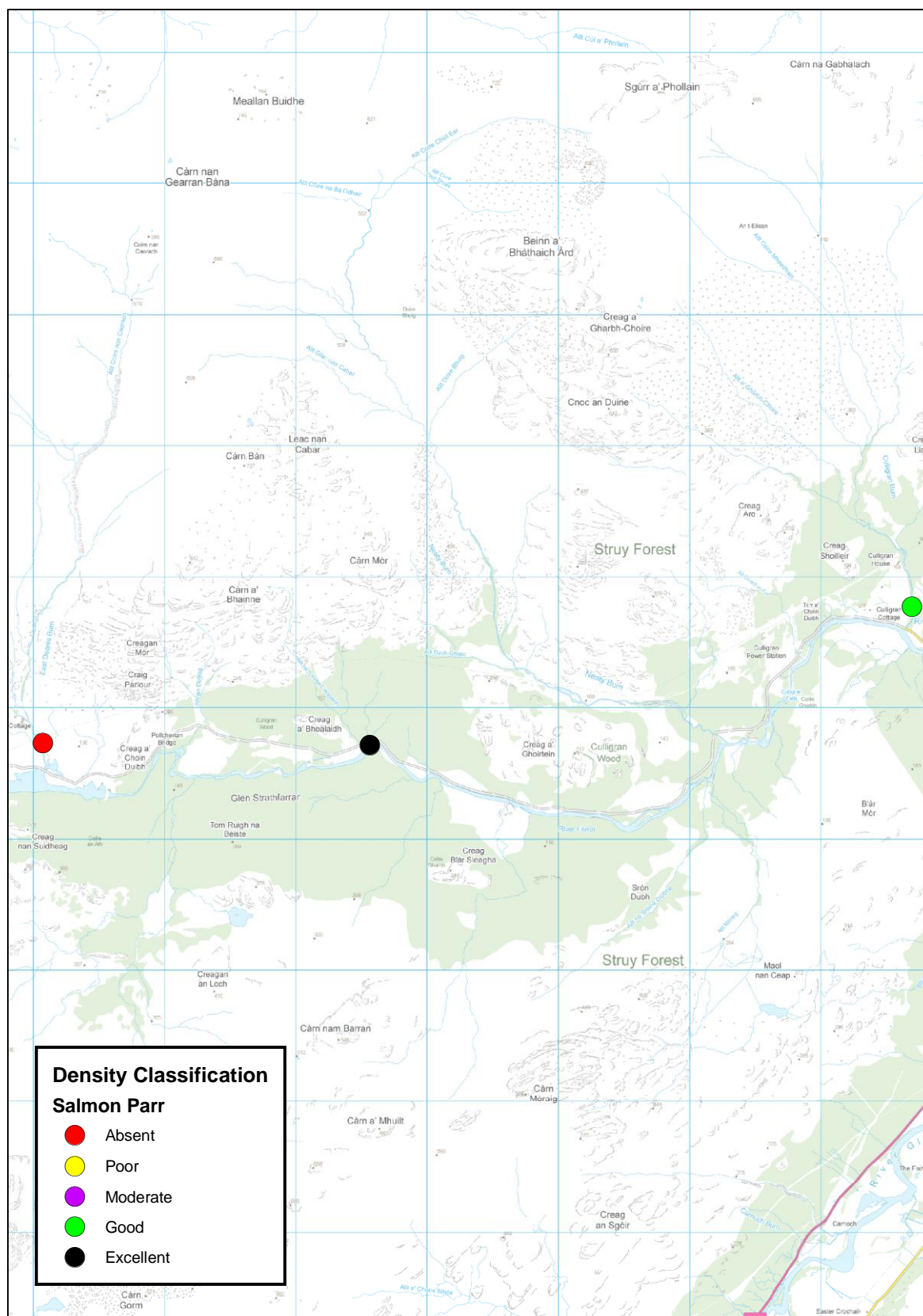














-  Absent
 Poor
 Moderate
 Good
 Excellent

