Corrasillagh Commonage

2020 Ecological Survey



Final Report

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Corrasillagh Commonage

2020 Ecological Survey

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Corrasillagh Commonage

2020 Ecological Survey

1. Introduction

A baseline habitat condition and ecological survey and habitat management plan was prepared for the Corrasillagh Commonage in 2019¹ and the measures within same underwent screening for Appropriate Assessment².

A Commonage Management group was established for the commonage and the implementation of the management prescriptions in the plan began in 2020.

The management prescriptions in the SUAS plan for the commonage set out to address the impacts highlighted in that report so progress is made towards attaining **Favourable status** for the Annex I habitats present on the site – principally **4010 Northern Atlantic Wet Heaths with** *Erica tetralix*, **4030 Dry Heath**, **4060 Alpine and Boreal Heath** and **7130 Blanket Bog**.

The major impacts arise from a legacy of inappropriate grazing (from sheep and also from deer), erosion of peat along the summits and ridges (impacting on upland blanket bog and montane heath), with subsequent severe landslides and damage and losses to acid grassland/dry heath/blanket bog habitat below, invasion of grassland by dense bracken, and localised trampling impacts from walkers and illegal quad activity. Overgrazing is also contributing to erosion, not only on the ridges and summits and the cliffs behind Kelly's Lough but also on the slopes of the commonage above the Carrawaystick Stream. These impacts, coupled with natural exposure, increased rainfall and storm events and clear felling in the uplands pose a serious risk of flooding to the houses, farms and inhabitants of the Glenmalure valley below.

The management prescriptions in the SUAS plan for the commonage also need to ensure that **Favourable status** is achieved for the Annex I bird species, which form the Special Conservation Interests for this SPA:

- Peregrine falcon (*Falco peregrinus*),
- Merlin (Falco columbarius).

The extent of habitats present within the commonage and their affinities to either Fossitt (Level 3) or Annex I habitats on the Corrasillagh Commonage were mapped as presented on **Figures 1** and **2 (See Appendix 1)** and their conservation status was assessed and mapped as shown on **Figure 3 (See Appendix 1)**. A series of management prescriptions were drawn up for the commonage as detailed in **Table 1** below and mapped on **Figure 4 (See Appendix 1)**.

¹ Wilson, F. (2019). Ecological Baseline Survey prepared for Slievemweel Commonage as part of the Commonage Management Plan for SUAS. 5th December 2019. Unpublished report for SUAS EIP.

² Wilson, F. (2019). Report for Screening for Appropriate Assessment for a Commonage Management Plan at Corrasillagh Commonage, Co. Wicklow in accordance with the requirements of Article 6(3) of the EU Habitats Directive. 15th November 2019. Unpublished report for SUAS EIP.

2. SUAS Vegetation Management Measures

The proposed management measures for the Corrasillagh commonage in 2020 under SUAS were as follows:

Year 1 (2020)

- 1. Carry out necessary repairs to the Zig Zags roadway to allow improved access by quads for management purposes. Gateway out through the fence to be levelled up to allow easier access and prevent erosion.
- 2. Spray bracken alongside the track in area 2 for sheep gathering, as existing track is closing in and it is hard to move sheep along it. Spray approx. 2-3m wide either side of the track using quad with handlance.
- 3. Spray bracken in areas 4, 6, 9 & 10 (approx. 2ha in total) with Asulox to control Bracken. This may be done by quad with hand lance or with knapsack sprayers as it is inaccessible for tractors.
- 4. Remove self-seeded Sitka spruce trees in area 2.
- 5. Reduce sheep grazing numbers in area above Kelly's Lake by hunting out neighbouring sheep and using feed buckets and active shepherding to encourage own sheep to graze other non-damaged areas of the hill
- 6. Put in small sheep pen (approx. 3m X 3m) near the gateway in the fence across the hill for holding sheep for treatment, etc.
- 7. Fence off at least 2 enclosure areas to see what recovery rates are like in areas 1 & 17.

Year 2 (2021)

- 1. Spray bracken in areas 4, 6, 9 & 10 (approx. 2ha in total) with Asulox to control Bracken. This may be done by quad with hand lance or with knapsack sprayer.
- 2. Cut/pull more of the self-seeded Sitka spruce trees in area 2.
- 3. Reduce sheep grazing numbers in area above Kelly's Lake by hunting out neighbouring sheep and using feed buckets to encourage own sheep to graze other non-damaged areas of the hill
- 4. Discuss repairs to walking track above the zig-zags up with NPWS to see what is possible or practical.
- 5. Plant some native trees along Kelly's Brook to help prevent erosion and provide some protection from flooding and creating small areas of gully woodland.
- 6. Look at trialling some peatland restoration measures in at least one area of bare peat.

Year 3 (2022)

1. To be reviewed at the end of year 2.

Shepherding

Average time per shepherding: 6 Hours

No of times sheep are to be shepherded: 2-3 Times per week from 1st May to 30th November.

Identified objective of the shepherding;

- Move off sheep from neighbouring commonages.
- Sheep to be moved off area 1 and along ridges regularly to reduce grazing pressure there and allow vegetation to recover. Move sheep into the taller vegetation regularly to get them to graze these areas.
- Monitor sheep health for signs of ticks or other diseases.
- Count numbers of deer grazing the commonage and areas they are grazing.

Other works to be carried out for entire commonage

Use feed buckets to encourage more sheep grazing the commonage in the Jan/Feb and April/May period. Graze more of them in plot 2, especially over the winter months.

Put a herd of cattle on plot 2 to help control bracken. Leave cattle on the hill for as long as possible and especially over the winter if possible. Can use supplementary feeding to keep them there over the winter.

Set up a number of exclosure sites for deer & sheep in the bare peat areas to see if natural regeneration will take place. May carry out some peat restoration work following discussion with NPWS.

Details of sheep stocking rates proposed

In 2019, there were approx. 600 ewes on the hill, at various times of the year. There were high losses of hoggets and so they were took down early and didn't go back.

The plan is for to have 400 to 450 sheep (ewes & hoggets) on the hill for 9-10 months of the year, which will happen over the next 2 to 3 years and will involve a change in breeding for Pat and Patrick. Numbers will be recorded accurately in 2020 and if amendments need to be made to this plan, it will be done at the end of 2020.

Pat Dunne is also proposing to keep 6-7 cattle on the area below the fence to help bracken control. It is planned to keep these cattle out all year round and will need a small pen and crush at the bottom of the hill for routine works and testing. This will be incorporated into the existing sheep pen that is already there and the SUAS project will fund it.

Ecological Assessment

The commonage was surveyed in October 2020 by Faith Wilson to examine and review the implementation of the proposed measures and make any recommendations regarding same. The observations and recommendations from this visit are set out below.

3. 2020 Walkover Survey

The following observations, comments on same and recommendations on the works completed in 2020 are presented.

3.1 Bracken Control

Bracken control was implemented in 2020 along the edges of the zig zags track. The effect of this was noticeable in that bracken here had begun to die back. Unfortunately some native ferns which are not invasive and provide an important role is stabilising the slope were also sprayed – if possible these should be avoided in any future treatments.



Plate 1. Bracken treatment adjoining the zig zags track.



Plate 2. Bracken treatment adjoining the zig zags track.



Plate 3. Native ferns were inadvertently sprayed adjoining the track – avoid in future if possible.

3.2 Upland Gully Woodland Restoration/Native Woodland Establishment

The establishment of gully woodland along the Carrawaystick Stream and it's tributaries in the commonage through a variety of techniques is to be conducted in early 2021.

Small areas of native woodland could also be established in Area 2 in areas of outcropping rock/scree where bracken treatment will be difficult to implement – this could be done through the use of fencing/exclosures (covering several square meters) should also be erected around existing isolated trees to allow natural regeneration to occur.



Plate 4. Restoration of native woodland habitat along the watercourses in the site will be completed in 2021.



Plate 5. Fencing around trees such as this which are rich with seed will allow us to see if natural regeneration from this seed source can become established in the absence of grazing pressure.

3.3 Track Works

Extensive track repairs and drainage works have been conducted along the zig zags track. This work has been sensitively done and may require some small finishing off/guidance on stone pitching techniques in some areas.



Plate 6. Localised repairs on the zig zag track.



Plate 7. Some areas may benefit from some stone pitching techniques.



Plate 8. Drainage works adjoining the zig zag track.



Plate 9. Stone could be reutilised along track edges as low walls honouring the built heritage of the zig zag track.

3.4 Cattle Grazing

A most welcome addition to the hill is that of a small herd of Black Galloway cattle to Area 2. As reported on the SUAS project Facebook Page on 18th August:

'An exciting new arrival to Corrasillagh commonage last week! A healthy Black Galloway heifer calf was calved on the mountain close to Kelly's Lake. Cow and calf are doing great.

Reintroducing mixed grazing was one of the measures for Corrasillagh to help manage *Molinia* grass and Bracken. *Molinia* grass grows in dense tufts and excludes other species such as heather and bilberry while Bracken is notorious for spreading and becoming invasive.

Both are very difficult to manage. However grazing and trampling by cattle has been found effective to break up the heavier vegetation and will hopefully encourage more diversity.

The farmer bought 7 Black Galloway cows in January and the herd have continuously grazed the hillside since. They have free roam of a large area. Supplementary feeding was given till April on a Molinia dominated area and they happily continued to graze the same area throughout the summer.

The Black Galloway breed was chosen as they are extremely hardy having a double layer of hair, and are known as easy calvers.

The cow made a break for a higher part of the mountain to calve but she is back with the others now. It is the first time in living memory that a cow calved on the mountain and great to see both doing well. 3 more are due later in the Autumn.

Extensive agricultural plays an important role in managing our natural heritage and the activities of upland farmers an important part of our cultural heritage. Great to see the reintroduction of cattle and the positive impact it is having'.



SUAS Pilot Project

Published by Conor Hipwell 🙆 · 18 August · 🔇

An exciting new arrival to Corrasillagh commonage last week! A healthy Black Galloway heifer calf was calved on the mountain close to Kellys Lake. Cow and calf are doing great.

Reintroducing mixed grazing was one of the measures for Corrasillagh to help manage Molina grass and Bracken. Molina grass grows in dense tufts and excludes other species such as heather and bilberry while Bracken is notorious for spreading and becoming invasive.

Both are very difficult to manage. H... See more



Plate 10. Facebook post celebrating the new arrival.

The grazing impact of the cattle on *Molinia* could be clearly seen during the site visit – a complete contrast to the browsing pattern of sheep. Their dung was also evident on the zig zags track where it was being utilised by a variety of coprophilic (dung loving) invertebrates, which were then fed on by birds – increasing biodiversity on the hill.

It would be interesting to trial the use of radio tracking collars on the cattle, which could allow them to be released onto the open hillside above Area 2 and their locations monitored. Some systems notify you if animals leave a designated area so they can be rounded up.

https://smartertechnologies.com/smarter-products/gps-cattle-collar/

Use of GPS tracking collars and accelerometers for rangeland livestock production research – available at <u>https://academic.oup.com/tas/article/2/1/81/4824982</u>

Monitoring cattle behaviour and pasture use with GPS and GIS - available at $\underline{\rm https://cdnsciencepub.com/doi/pdf/10.4141/A99-093}$

Other options include the use of a 'virtual fence'

https://www.independent.ie/business/farming/gps-technology-offers-alternative-to-paddock-fences-31356001.html

https://cdnsciencepub.com/doi/pdf/10.4141/A99-093

https://www.farmprogress.com/livestock/can-cattle-be-confined-virtual-fence

https://www.frontiersin.org/articles/10.3389/fvets.2019.00445/full



Plate 11. Purple moor grass being favoured by the Belted Galloways on the hill.



Plate 12. Various invertebrates rely on cow pats to complete their lifecycle.



Plate 13. A Black Galloway and her young calf at the base of the hill.

3.5 Sitka Spruce Removal

Sitka spruce has been removed from Area 2.



Plate 14. Felling of Sitka spruce in Area 2.

3.6 Faunal Observations

Fresh badger tracks were noted on the commonage.



Plate 15. Fresh badger track.

3.7 Management for 2021

A review of the works which were proposed for 2020 in the plan, coupled with the outcomes from the 2020 walkover was conducted. Items highlighted in red have not been completed. This has informed the proposed works for 2021.

2020

- 1. Carry out necessary repairs to the Zig Zags roadway to allow improved access by quads for management purposes. Gateway out through the fence to be levelled up to allow easier access and prevent erosion.
- 2. Spray bracken alongside the track in area 2 for sheep gathering, as existing track is closing in and it is hard to move sheep along it. Spray approx. 2-3m wide either side of the track using quad with handlance.
- 3. Spray bracken in areas 4, 6, 9 & 10 (approx. 2ha in total) with Asulox to control Bracken. This may be done by quad with hand lance or with knapsack sprayers as it is inaccessible for tractors.
- 4. Remove self-seeded sitka spruce trees in area 2.
- 5. Reduce sheep grazing numbers in area above Kelly's Lake by hunting out neighbouring sheep and using feed buckets and active shepherding to encourage own sheep to graze other non-damaged areas of the hill
- 6. Put in small sheep pen (approx. 3m X 3m) near the gateway in the fence across the hill for holding sheep for treatment, etc.
- 7. Fence off at least 2 enclosure areas to see what recovery rates are like in areas 1 & 17

Items highlighted in red have not been completed.

2021

- 1. Spray bracken in areas 4, 6, 9 & 10 (approx. 3ha in total) with Asulox to control Bracken. This may be done by quad with hand lance or with knapsack sprayer. Care will be taken to avoid any non-invasive native ferns present as these are not the target species.
- 2. Cut/pull any remaining self-seeded sitka spruce trees in area 2.
- 3. Reduce sheep grazing numbers in area above Kelly's Lake by hunting out neighbouring sheep and using feed buckets to encourage own sheep to graze other non-damaged areas of the hill (where possible)
- 4. Discuss repairs to walking track above the zig-zags up with NPWS to see what is possible or practical.
- 5. Plant at least 150 native trees along Kelly's Brook to help prevent erosion and provide some protection from flooding and creating small areas of gully woodland.
- 6. Keep the cattle grazing on the hill and trial the use of GPS fencing to allow more controlled grazing activity, particularly in *Molina* dominated areas.

Other works to be carried out for entire commonage

Use feed buckets to encourage more sheep grazing the commonage in the Jan/Feb and April/May period. Graze more of them in plot 2, especially over the winter months.

4. Appendix 1. Maps & Management Recommendations



Figure 1. Habitats mapped to Level Three (Fossitt, 2000) within the Corrasillagh commonage.



Figure 2. Habitats mapped according to their correspondence with Annex I habitats within the Corrasillagh commonage.



Figure 3. Habitat Condition Assessment for Corrasillagh Commonage.



Figure 4. Management measures for Corrasillagh.

Id	Annex I Code	Fossitt Code	Area (m2)	Area (Ha)	Conservation Status Assessment	Management Prescription
1	6230/4030/8220	GS3/HH1/ER1	152973	15.30	Unfavourable - Bad	Reduce stocking density in key areas
						Shepherd out trespassing sheep and deer
						Allow vegetation to recover and slopes to stabilise
						Peat restoration works higher on the ridge should also assist in reducing landslip risk
2		HD1/ER1/GS3	486222	48.62		Bracken Control
						Several options – see what impact sheep have, graze with cattle, spray bracken
						Remove self-seeded Sitka spruce
						Could enter into the Native Woodland Scheme as a Protection Forest for the farm and valley
						Minor repairs to Zig Zags track - ongoing
3	4010	HH3	274357	27.44	Unfavourable - Inadequate	Reduction in deer numbers
						Reduction in grazing pressure
4		HD1	6798	0.68		Control bracken
5		GS4/HH3	2461	0.25		
6		HD1	19268	1.93		Control bracken
7		HH3/PF2	59515	5.95		Reduction of browsing pressure from deer and sheep will aid this area
8		HH3	2139	0.21		Reduction of browsing pressure from deer and sheep will aid this area

Table 1. Habitats present on Corrasillagh Commonage and Management Recommendations.

9	4030	HH1/HD1/ER1	58978	5.90	Unfavourable - Inadequate	Control bracken
	1000		00000	0.50	officiourable fillacquate	control blacken
						Track repair works
						1
10	4030	HH1/HD1/ER1	25951	2.60	Unfavourable - Inadequate	Control bracken
11		GS4/HH3	32833	3.28		
12	4030	HH1	196186	19.62	Favourable	Track repair works
13	4060	HH4	36452	3.65	Unfavourable - Inadequate	Track repair works
						Peatland Restoration Works
						Destock/reduce grazing pressure to allow vegetation to recover
						Desider, reduce grazing pressure to anow vegetation to recover
14		PB5	59836	5.98	Unfavourable - Bad	Peatland Restoration Works
		120	0,000	0.00		
						Destock/reduce grazing pressure to allow vegetation to recover
						, 0 01 0
15		PB5	19399	1.94	Unfavourable - Inadequate	Peatland Restoration Works
					_	
						Destock/reduce grazing pressure to allow vegetation to recover
16	4060	HH4/GS3	46484	4.65	Unfavourable - Inadequate	Track repair works
						Desting d Destage the state
						Peatland Restoration Works
						Destock/reduce grazing pressure to allow vegetation to recover
						Desident reduce grazing pressure to anow vegetation to recover
17	4030	HH1	163751	16.38	Favourable	Track repair works
						1
						Destock/reduce grazing pressure to allow vegetation to continue
						to recover
18	4010	HH3/PF2	26464	2.65	Favourable	
19	4010	HH3	48288	4.83	Favourable	
20	4030	HH1/ER1/GS3	489178	48.92	Unfavourable - Inadequate	Reduction of browsing pressure from deer and sheep will aid this

						area
21	7130	PB2	77712	7.77	Unfavourable - Inadequate	Track repair works
22		PB5	12504	1.25	Unfavourable - Bad	Track repair works
						Peatland Restoration Works
						Destock/reduce grazing pressure to allow vegetation to recover
23	4060	HH4	35534	3.55	Unfavourable - Inadequate	Track repair works
						Peatland Restoration Works
						Destock/reduce grazing pressure to allow vegetation to recover
24	4030	HH1/ER1	79394	7.94	Favourable	
25		GS3/HH1	260561	26.06	Unfavourable - Inadequate	Destock/reduce grazing pressure to allow heath vegetation to recover
26	4030	HH1/GS3	269969	27.00	Unfavourable - Inadequate	Destock/reduce grazing pressure to allow heath vegetation to recover
27	4030/6230	GS3/HH1	327416	32.74	Unfavourable - Inadequate	Destock/reduce grazing pressure to allow heath vegetation to recover
						Quad Damage
28	7130	PB2	30909	3.09	Unfavourable - Inadequate	Quad Damage
29	4030	HH1/ER1	19914	1.99	Favourable	
30	7130	PB2	137842	13.78	Unfavourable - Inadequate	Quad Damage
31	4030/6230	GS3/HH1	111777	11.18	Unfavourable - Inadequate	Destock/reduce grazing pressure to allow vegetation to recover
32		PB5	38178	3.82	Unfavourable - Bad	Track repair works
						Peatland Restoration Works

						Destock/reduce grazing pressure to allow vegetation to recover
33	7130	PB2	57105	5.71	Unfavourable - Inadequate	Track repair works
						Peatland Restoration Works
						Destock/reduce grazing pressure to allow vegetation to recover
34	4030	HH1/HD1/ER1	12580	1.26	Unfavourable - Inadequate	Control bracken
35		ER1	4906	0.49		
36		PF2	5549	0.55		
37		ER1	3128	0.31		
38		ER1	3352	0.34		
39		PF2	7525	0.75	Unfavourable - Inadequate	
40	4010	HH3/PF2	7766	0.78	Favourable	
41	4030	GS3/HH1/ER1	9264	0.93	Unfavourable - Inadequate	

5. Appendix 2. Water Quality

The Carrawaystick Stream or Kelly's Brook rises within the commonage and Lough Brook flows from Kelly's Lough to join this watercourse within the boundaries of the commonage. The stream then falls as the spectacular Carrawaystick Waterfall over the hanging valley of Glenmalure before joining Avonbeg River, which is a tributary of the Avoca River.

Water samples were taken from three sampling locations on the Carrawaystick Stream within the commonage as shown on **Figure 5** below.

The water samples were assessed by Carl Dixon and one of the headwater streams (CO1) was assessed as a stream 'At Risk' of not achieving 'Good' water quality status, whereas (CO2 and CO3) were assessed 'Indeterminate' (a stream that may be 'At Risk') of not achieving 'Good' water quality status.

The Small Streams Risk Score (SSRS) is a biological risk assessment system for identifying rivers that are definitely 'at risk' of failing to achieve the 'good' water quality status goals of the Water Framework Directive (WFD). It was developed by the Environmental Protection Agency (EPA) in association with the Western River Basin District (WRBD) in 2006. The main aim of the SSRS is to support the programme of measures for the WFD which has its main objective to achieve 'good' water quality status in all water bodies by 2020.



Figure 5. Water quality sample locations at Corrasillagh.

SUAS Water Quality Sampling

River:	Code:	Date:	Sample Taken By:
Clonkeen Stream	IE_EA_10A040400	29.07.2019	Faith Wilson
(Carrawaystick River)			
· · · ·			
Sample Number:	Location:	Stream Order:	Grid Reference:
CO 1	Clonkeen Stream	1 st order	T 07160 91377
	above the confluence		
	with Carrawaystick		
	River within the		
	Corrasillagh upland		
	farm		
Velocity:	Clarity:	Colour:	Discharge:
Torrential	Very clear	None	Flood
Fast	Clear	Slight	Normal
Moderate	Slightly turbid	Moderate	Low
Slow	Highly turbid	High	Very low
Very Slow			Dry
			Recent flood
Modifications: N	Dominant Types:	Slope:	Geology:
Canalised	Bedrock	Low	Calcareous
Widened	Boulder (>128mm)	Medium	Siliceous
Bank erosion	Cobble (32 - 128mm)	High	Mixed
Arterial drainage	Gravel (8 – 32mm)	Very high	
	Fine gravel (2 - 8mm)		
	Sand (0.25mm – 2mm)		
	Silt (<0.25mm)		
0.1			
Substratum	Substratum:	Degree of Siltation:	Depth of Mud:
Condition:		01	N
Compacted	Stoney bottom	Clean	None
Loose	Muddy bottom	Slight	<1cm
Normal	Mud over stones	Moderate	1-5cm
		Heavy	5-10cm
			>10cm
Tittom	Filamentous Algae:	Chrome Element	Chading
Litter: None	None	Stream Flow: Riffle	Shading:
Present			High Moderate
	Present Moderate	Riffle/glide Slow flow	
Moderate		Slow flow	Low None
Abundant	Abundant		INOILE
Stock Access:	Sewage Fungus:	Sample Type (Mins):	Main Land Use
	Serrage a miguor		Adjacent/Upstream:
Deer	None	Kick sample – 4 mins	Pasture
Sheep	Present	Stone washing	Bog
- T	Moderate	Weed sweep	Forestry
	Abundant		Tillage
			Urban
			Other



Plate 1. Photographic record of sampling location.

CONNASIllagh 1

River:		Code:		ate:		Time:			
Station no.		Location:			Grid	(6 figure):			
		Stream Orde	r:			am flow:			
Field Ch	and others	He difference V	A Chanling	ad-widened-bank erosio	Riffle				
DO%	emistry	arterial drainage	/N Canalise	du-widereu-dahk erosik	Slow	/Glide			
DO ma/l		Dominant Types			2000				
Temp (°C)		- Bedrock							
Conductivity		Boulder (>128mm Cobble (32-128mm			-				
oH		Gravel (8-32mm)	n)		-		-		
Bank width (cm)		Fine Gravel (2-8m	m)						-
Wet width (cm)		_ Sand (0.25-2mm)			-				
Avg.Depth (cm)									
Staff gauge		- Slope: Low - Med	dium – High	h – Very High	Chad	ling: High - Mod	darate	low Nor	
Velocity	Colour	Geology: Calcare	ous-Sliceo	us-Mixed	Snau	ing: ngn-mot	Jerave		-
Torrential	None	Cubetustum Can	dition ()	Icareous-Compacted-	Catt	e access Y: upst	tream	-downstrea	mor
Fast	Slight	Loose - Normal		icareous-compacieu-					
Moderate	Moderate	Substratum:							
Slow	High	Stoney bottom-Mu	uddy botton	m-Mud over stones	Pho	to:Y/N			
Very slow Clarity	Discharge	Degree of siltati	ion: Clean-	Slight-Moderate-Heavy					
Very clear	Flood	_		n: 1-5cm: 5-10cm: >10	-				
Clear	Normal	Litter: None - Pre		derate - Abundant					
Slightly turbid	Low	Filamentous Alg			Sewa	age Fungus:			
		None – Present – I Main land use u		Sample	None	- Present - Mod	erate	- Abundant	
Highly turbid	Very Low Dry	Pasture	/s: Urb			net x	56		
	Recent Flood	Bog	Tilla			e wash x			
	Recent Plood	Forestry	Oth	er					
The macroinverteb	n ts: rates are divided in	Forestry Macroinverteb to the following 5 spec	rate Co	mposition	Weed	d sweep x		Relative	
The macroinverteb Group 1 = E Group 2 = E Group 3 = J Group 4 = C	rates are divided in phemeroptera (3- lecoptera (2-tails) inchoptera . OLD (Gastroppod	Forestry Macroinverteb to the following 5 spec	rate Co cific groups may be dan be damage	mposition smagedduring sampling	Weed			Abundar 1-5 6-20 21-50 51-100	nce
The macroinverteb Group 1 = E Group 2 = E Group 3 = J Group 4 = C Group 5 = A	nts: rates are divided in phemeroptera (3- lecoptera (2-tails) cichoptera S.OL.D (Gastropod tsellus	Forestry Macroinverteb to the following 5 spe tails) – note that tails - note that tails may b a Olgochesta, and Dip	rate Co cific groups may be dar be darnage otera)	mposition smagedduring sampling	Weed	d sweep x		Abundar 1-5 6-20 21-50	nce
The macroinverteb Group 1 = E Group 2 = E Group 3 = J Group 4 = C Group 5 = J Calculate th	nts: rates are divided in phemorptera (3- lecoptera (2-tails) cichoptera S.OL.D (Gastropod tsellus	Forestry Macroinverteb to the following 5 spe- talis) – note thattails - note that tails may l a. Oligochesta, and Dip taxa and relative abun Estlyconus: Ab	orate Co cific groups may be dar be darnage otera) dance of ea	mposition s maged during sampling dduring sampling	Weed	d sweep x	Ab)	Abundan 1-5 6-20 21-50 51-100 101+ Leuctra Ab	nce
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NOTE Bactis is an Ephemeropteran and is the most commonly occurring invertebrate genus in streams in Ireland. It is vital that Bactis is not counted in SSRS. See Appendix B for more details on how to identify Bactis.

Connasillash Step.1. Calculate the Index Score by circling the appropriate box representing the total number of taxa and the total abundance calculated from *each macroinvertebrate group* calculated from page 1 of the recording sheet and enter in to the boxes in Step 2. Group 1 - 3 Tails Ephemeroptera Group 2 - 2 Tails Plecoptera T No. of taxa No. of taxa 0 1 0 2+ 3+ 1-2 1-2 3+ 3+ 2 2 3+ A 4 6 4 6 0 Group 4 G.OL.D Group 3 Trichoptera т No. of tax No. of taxa B 3+ 0 1-2 0 3+ 3-6 1-2 3-6 7+ 7+ Relative Relative Abundance 3+ 3+ 4 4 0 0 0 2 4 4 0 Score Step 2 Group 5 Asellus a) Index Score Group 1 b) Index Score Group 2 T r No. of taxa c) Index Score Group 3 d) Index Score Group 4 Commo (>20) 0 Abser Few (1-20) e) Index Score Group 5 (4) 2 0 Step.3. Calculate the Total Index Score, the Average Index Score and the SSR Score using the boxes below Total Index Score (TIS) 14 Average Index Score (AIS) TIS/5 (5 for 5 groups) (AIS x 2) 5.6 Step.4. Assess the stream by comparing the final SSR score with the categories below and tick the appropriate box > 6.5 - 7.25 Indeterminate n may be at risk > 7.25 <6.5 Stream at risk Probably not at ris Name (print): CACINGEN Date: Surveyor (signed): _ (1

SUAS Water Quality Sampling

River:	Code:	Date:	Sample Taken By:
Carrawaystick River	IE_EA_10A040400	29.07.2019	Faith Wilson
Callawaystick River		29.07.2019	
Sample Number:	Location:	Stream Order:	Grid Reference:
CO 2	Carrawaystick River	2 nd order	T 06147 91158
02	just below the		1 00147 51150
	confluence with stream		
	from Kelly's Lake		
	within the Corrasillagh		
	upland farm		
Velocity:	Clarity:	Colour:	Discharge:
Torrential	Very clear	None	Flood
Fast	Clear	Slight	Normal
Moderate	Slightly turbid	Moderate	Low
Slow	Highly turbid	High	Very low
Very Slow			Dry
			Recent flood
Modifications: N	Dominant Types:	Slope:	Geology:
Canalised	Bedrock	Low	Calcareous
Widened	Boulder (>128mm)	Medium	Siliceous
Bank erosion	Cobble (32 - 128mm)	High	Mixed
Arterial drainage	Gravel (8 – 32mm)	Very high	
<u> </u>	Fine gravel (2 - 8mm)		
	Sand (0.25mm – 2mm)		
	Silt (<0.25mm)		
Substratum	Substratum:	Degree of Siltation:	Depth of Mud:
Condition:	Substratum:	Degree of Sination:	Depth of Mud:
Compacted	Stoney bottom	Clean	None
Loose	Muddy bottom	Slight	<1cm
Normal	Mud over stones	Moderate	1-5cm
ivorinai		Heavy	5-10cm
		Ticuvy	>10cm
Litter:	Filamentous Algae:	Stream Flow:	Shading:
None	None	Riffle	High
Present	Present	Riffle/glide	Moderate
Moderate	Moderate	Slow flow	Low
Abundant	Abundant		None
Stock Access:	Sewage Fungus:	Sample Type (Mins):	Main Land Use
			Adjacent/Upstream:
Deer	None	Kick sample – 4 mins	Pasture
Sheep	Present	Stone washing	Bog
	Moderate	Weed sweep	Forestry
	Abundant		Tillage
			Urban
			Other



Plate 1. Photographic record of sampling location.

Contosillash 2

Stream Order: Stream Bow: Rifle Stream Bow: Rifle Stream Bow: Rifle Stream Bow: Rifle Stream Bow: Rifle Rifle	Station no.		Location:	(1999) (1997) (1997)	Date:		Grid (6 figure):		
Field Chemistry Brille Brile Brille Brille B									
20% arterial drainage Sow How 20% Dominant Types: Bedrock Boundar (1) Steps: Low Boundar (1) Steps: Low Sow How 20% Gravel (8,232mm) Gravel (8,232mm) 381 Stops: Low Media 381 Stops: Low Media Velocity Colour Geology: Clareous-Silecous-Mond Torrential None Substratum: Stow High Substratum: Store Photo: Y / N Photo: Y / N Non= Store Non= None Store Photo: Y / N Store Store Store Store Photo: Y / N Store Store Photo: Y / N Store Stor	A STATE OF A STATE OF A STATE								
20 mg1 Dominant Types: Badrock Semp (*C) Bouldar (> 128 mm) Cobble (2-228 mm) San (C228 mm) 341 Gravel (8-22 mm) San (C228 mm) 351 Gauge (2-28 mm) San (C228 mm) 351 Cobble (2-228 mm) 351 Geology: Calcureux-Silocour-Moid 100 method Silope: Low - Medium - High - Very High Geology: Calcureux-Silocour-Moid 101 method Substratum Condition: Calcareoux-Silocour-Moid 102 method Substratum Condition: Calcareoux-Compacted- Low Frommethod 103 method Storey bostom-Muddy bostom-Mudd overstores 104 method Degree of silatation: Clean-Silgit-Moderate -Heavy Clearity 104 method Litter: None - Present - Moderate - Abundant 113 methods Algaer None - Present - Moderate - Abundant 114 methods Algaer None - Present - Moderate - Abundant 114 methods Algaer None - Present - Moderate - Abundant 114 methods Algaer None - Present - Moderate - Abundant 115 method Sample - Moderate - Abundant 114 methods Algaer None - Present - Moderate - Abundant 114 methods Algaer None - Present - Moderate - Abundant 115 methods Sample - Moderate - Abundant 115 m		mistry			lised-widened	-bank erosion-			
Bedrock Bedrock Canductivity Boulde (1:28mm) Canductivity Cabble (2:23mm) Sink width (cm) Fine Gravel (2.8mm) Sank width (cm) Sind (1:2.32mm) Sink width (cm) Silops: Low - Medum - High - Very High Geology: Calcareous-Silceous-Mixed Substratum Condition: Calcareous-Compacted- Storey boards Silops: Low - Medum - High - Very High Substratum Condition: Calcareous-Compacted- Storey boards Moderate Storey board Storey board Storey boards Very dow High Oear Nome - Present - Moderate - Abundant Storey boards Nome - Present - Moderate - Abundant Storey boards Nome - Present - Moderate - Abundant Storey boards Nome - Present - Moderate - Abundant Storey boards Nome - Present - Moderate - Abundant Highly turbid Low Hiam Iand use w/s Recent Plood Bigg Tillage Y/N Storey boards Pool net x Storey boards Storey boards Storey boards Storey boards Storey boards Storey boards							Slow flow		
emp (*G) Bouder (> 128mm) conductivity Gravel (8-32mm) Braik width (nm) Sank (2,52mm) Sank width (nm) Sank (2,52mm) Sink (2,52mm) Sink (2,52mm) Sing Papth (nm) Sing Papth (2,52mm) Sing Papth (2,52mm) Sing Papt	DO mg/l			ypes:					
Conductivity Cobble (22:128mm) Bit Gravel (2-32mm) Sank width (cm) Sand (2.52mm) Sank width (cm) Side (2.52mm) Staff gauge Stope: Low - Medium - High - Very High Geology: Calcareous-Siliceous-Moud Shading: High - Moderate - Low - None Velocity Colour Yelocity Colour Stope: Low - Medium - High - Very High Geology: Calcareous-Siliceous-Moud Store Store is bottom-Muddy bottom-Mud over stores Degree of siltation: Clean-Silgt-Moderate -Haundant Very Sow High Low - Normal Stores Very Clear Flood Degree of siltation: Clean-Silgt-Moderate -Haundant None - Present - Moderate - Abundant Highty turbid Low Hiamantous Algee: None - Present - Moderate - Abundant None - Present - Moderate - Abundant Highty turbid Low Main Tand use u's: None - Present - Moderate - Abundant None - Present - Moderate - Abundant Highty turbid Low Main Tand use u's: None - Present - Moderate - Abundant None - Present - Moderate - Abundant Highty turbid Low Main Tand use u's: None - Present - Moderate - Abundant None - Present - Moderate - Stope Noderate - Abundant	Temp (°C)			01				AND DESCRIPTION OF	
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aller Hand Udin/ Big Depth (cm) Sand (0,25-2mm) Stad (0,25-2mm) Starp auge Velocity Colour Sloper Low – Medium – High – Very High Soper Low – Medium – High – Very High Geology: Calcareous-Siliceous-Mixed Shading: High – Moderate – Low – None Starp auge Velocity Colour Substratum Condition: Calcareous-Compacted- Lose – Normal Substratum: Substratum: Shading: High – Moderate – Abundant Silow High Stoney bottom-Muddy bottom-Mud over stores Photo: Y / N Query Low Degree of siltation: Cean-Silgt-Moderate – Abundant None – Present – Moderate – Abundant Silghtly turbid Low Hilamentous Algge: None – Present – Moderate – Abundant None – Present – Moderate – Abundant Highly turbid Low Hain Iand use u/s: Pasture Sample in Minites: Point Minites: Forestry Sample in Minites: None – Present – Moderate – Abundant Signeral Comments: Macroinvertebrate Composition Main Iand use u/s: Present – Moderate of each macroinvertebrate group below: (Abundance–Ab) Sampled in Minites: Store wash x Secory 1 = Epheremotoptera Group 2 = Epheremotoptera Group 3 = Explorestore (2-taking) – note that tais may be damageduring sampling Group 5 = Axellis Educate the total number of taxa and relative abundance of each macroinvertebrate group below: (Abundance–Ab) Si. 100 101+ Sphemeroptera: Educotate Ab BasoeraAb									
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Cart gauge Slope: Low - Medium - High - Very High Velocity Colour Velocity Colour Fast Sight Sight Substratum Condition: Calcareous-Compacted-Loose - Nomal Substratum: Substratum: Storey Degree of siltation: Calcareous-Compacted-Loose - Nomal Substratum: Substratum: Storey Degree of siltation: Calcareous-Compacted-Loose - Nomal Very Low Degree of siltation: Calcareous-Compacted-Loose - Nomal Storey totion-Muddy bottom-Muddy over stores None - Present - Moderate - Abundant Highy turbid Low Filamentous Algae: None - Present - Moderate - Abundant None - Present - Moderate - Abundant Highy turbid Low Pasture Recent Flood Porsity Other Servage Fungues: Storey totion Group 1 = Epheneroptera (3-tails may be damaged during sampling -5 Group 2 = Stochtera (2-tails - note that tails may be damaged during sampling -5 Group 3 = Aeelits Section bort that tails may be damaged during sampling -5 Group 4 = Colub (Gastropoota, Qisochtera abundance of			Silt (<0.25mr	m)					
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Mone Fast Moderate Substratum Condition: Calcareous-Compacted Loose - Normal Super Normal Cattle access Y: upstream - downstream of Loose - Normal Super Normal Very Slow High Super Notion-Muddy bottom-Muddy over stores Storey Destination: Claar-Slight-Moderate-Heavy Very Claar Very Claar Person - Slight-Moderate-Heavy Depth of mud: None: <1cm: 1-Scm: S-10cm: >10cm Claar Very Claar Pioco Person - Moderate - Abundant Sewage Fungus: None - Present - Moderate - Abundant Slightly turbid Low Him I and use u/s: None - Present - Moderate - Abundant Sample Forestry Sample V/ N Seneral Comments: Person - Composition Macroinvertebrates are divided into the following 5 specific groups Forestry Sample I minutes V/ N Sample I minutes Sone wash x Weed sweep x Seneral Comments: Macroinvertebrate Composition The macroinvertebrates are divided into the following 5 specific groups Group 1 = Epheroptera (2-tails) - note thatalis may be damaged during sampling Group 2 = Lickoptera Group 5 = Acellus Group 5 = Acellus Calculate the total number of taxa and relative abundance of each macroinvertebrate group below: (Abundance - Ab) None - Present - Moderate - Abundance 101+ Sphemeroptera: Excloaous Ab (Abstrangenia Ab (Abstrangenia Ab) Plecoptera: Lewctra Ab (Abstrangenia Ab) Calculate the total number of taxa and relative abundance of each macroinvertebrate agroup below: (Abundance - Ab) (Abstrangenia Ab) Presone(0, Ab) (Abstrangen	staff gauge						Shading: High - Mo	derate - Low - N	None
Fast Slight Moderate Moderate Stor High Stor High Stor High Stor High Stor Bight Very Gow High Stor Depte of sittation: Clan-Sight-Moderate-Heavy Person Photo: Y / N Clarity Depte of mud: None < torn: 1-Scm: 5-10cm: > 10cm Clar Nomal Sightly turbid Low Highly turbid Low None - Present - Moderate - Abundant Sampled in Minutes: Porestry Other Bog Tillage Forestry Other Store wash x Weed sweep x Store y as Arelin - onte that alls may be damaged during sampling Group 1 = Gohemoproteral (2-tails) - one that alls may be damaged during sampling Group 4 = GOLD (Gastopooda Rigoceeta and Diptera) <td< td=""><td></td><td></td><td>Geology: Ca</td><td>icareous-Silio</td><td>eous-Mixed</td><td></td><td></td><td></td><td></td></td<>			Geology: Ca	icareous-Silio	eous-Mixed				
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Story High Story Dottom-Mud y bottom-Mud over stores Very slow High Story bottom-Mud y bottom-Mud over stores Photo: Y / N Clarity Discharge Degree of siltation: Clean-Slight-Moderate-Heavy Photo: Y / N Sighty turbid Low Litter: None – Present – Moderate - Abundant Sewage Fungus: None – Present – Moderate - Abundant Slighty turbid Low Hiamentous Algae: None – Present – Moderate - Abundant Sampled in Minutes: Sampled in Minutes Big Tillage Dry Pasture Uthan Freined: Tillage Sampled in Minutes Group 1 = Ephermeroptera, Data is may be damaged during sampling Group 1 = Ephermeroptera, Data is may be damaged during sampling Store wash x Group 2 = Delecoptera (Clastropoda Oligocheeta and Diptera) Group 5 = Aselia Store wash a Group 5 = Aselia Abithaceeea Ab Beareard Abit Group 5 = Aselia Abithaceeea Abit Beareard Abit Group 5 = Aselia Aceroix Abit Beareard Abit Group 5 = Aselia Aceroix Abit Beareard Abit Abithaceeea Abit Aceroix Abit Beareard Abit Aceroix Abit									
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NOTE Bactis is an Ephemeropteran and is the most commonly occurring invertebrate genus in streams in Ireland. It is vital that Bactis is not counted in SSRS. See Appendix B for more details on how to identify Bactis.

CORRAGSILLash Step.1. Calculate the Index Score by circling the appropriate box representing the total number of taxa and the total abundance calculated from *each macroinvertebrate group* calculated from page 1 of the recording sheet and enter in to the boxes in Step 2. Group 1 - 3 Tails Ephemeroptera Group 2 - 2 Tails Plecoptera T Т No. of taxa No. of taxa 0 0 2+ 0 2+ D 1-2 3+ 2 3+ 3+ 2 3+ 6 (1) 4 6 6 8 Group 4 G.OL.D Group 3 Trichoptera No. of taxa of tax B D 0 3+ 0 3+ 1-2 3-6 7+ 3-6 7+ 1-2 Relative Relative 3+ 4 4 4 0 0 0 2 0 Score Score Step 2 Group 5 Asellus a) Index Score Group 1 Т b) Index Score Group 2 No. of taxa c) Index Score Group 3 d) Index Score Group 4 4 Common (>20) Absen Few (1-20) e) Index Score Group 5 2 0 4 Step.3, Calculate the Total Index Score, the Average Index Score and the SSR Score using the boxes below Total Index Score (TIS) IR Average Index Score (AIS) TIS/5 (5 for 5 groups) 3-6 (AIS x 2) 7.2 Step.4. Assess the stream by comparing the final SSR score with the categories below and tick the appropriate box > 6.5 - 7.25 Indeterminate <6.5 Stream at risk > 7.25 Probably not at risk Indeterminate may be at risk V Name (print): CANC MUmpate: Surveyor (signed):

SUAS Water Quality Sampling

River:	Code:	Date:	Sample Taken By:
Carrawaystick River	IE_EA_10A040400	29.07.2019	Faith Wilson
5			
Sample Number:	Location:	Stream Order:	Grid Reference:
CO 3	Carrawaystick River	2 nd order	T 08656 92000
	just below the waterfall		
	within the Corrasillagh		
	upland farm		
Velocity:	Clarity:	Colour:	Discharge:
Torrential	Very clear	None	Flood
Fast	Clear	Slight	Normal
Moderate	Slightly turbid	Moderate	Low
Slow	Highly turbid	High	Very low
Very Slow			Dry
			Recent flood
Modifications: N	Dominant Types:	Slope:	Geology:
Canalised	Bedrock	Low	Calcareous
Widened	Boulder (>128mm)	Medium	Siliceous
Bank erosion	Cobble (32 - 128mm)	High	Mixed
Arterial drainage	Gravel (8 – 32mm)	Very high	
	Fine gravel (2 - 8mm)		
	Sand (0.25mm – 2mm)		
	Silt (<0.25mm)		
0.1.4.4			
Substratum Condition:	Substratum:	Degree of Siltation:	Depth of Mud:
Compacted	Stoney bottom	Clean	None
Loose	Muddy bottom	Slight	<1cm
Normal	Mud over stones	Moderate	1-5cm
Normai	With over stories		5-10cm
		Heavy	>10cm
			>10Cm
Litter:	Filamentous Algae:	Stream Flow:	Shading:
None	None	Riffle	High
Present	Present	Riffle/glide	Moderate
Moderate	Moderate	Slow flow	Low
Abundant	Abundant		None
110 anaunt			
Stock Access:	Sewage Fungus:	Sample Type (Mins):	Main Land Use
	0 0 0	I JI V	Adjacent/Upstream:
Deer	None	Kick sample – 4 mins	Pasture
Sheep	Present	Stone washing	Bog
k	Moderate	Weed sweep	Forestry
	Abundant	r	Tillage
			Urban
			Other

River:		Code:		Date:			Time:			
Station no.		Location:					Grid (6 figu	re):		
		Stream O	rder:				Stream flow:			
							Riffle			
Field Che	emistry	Modification arterial draina		nalised-wid	ened-banke	rosion-	Riffle/Glide			
DO ma/l		Dominant T					Slow flow			
		Bedrock	1							-
Temp (°C)		Boulder (>128	8mm)			12.24			A A A A A A A A A A A A A A A A A A A	
Conductivity		Cobble (32-12	8mm)							
pН		Gravel (8-32m								
Bank width (cm)		Fine Gravel (2 Sand (0.25-2n	-8mm)				LE SUSSE TRUE	C. Sandal	100000	
Wet width (cm)		Silt (<0.25-20								-
Avg Depth (cm)										
Staff gauge		Slope: Low -		-			Shading: High	- Moderat	te - Low - No	ne
Velocity	Colour	Geology: Ca	careous-S	iliceous-Mix	ed					
Torrential	None	Substratum	Conditio	n: Calcareo	us-Compacte	d-	Cattle access Y	: upstream	m – downstre	am or
Fast Moderate	Slight Moderate	Loose - Norma	al							
Slow	High	Substratum								
Very slow	nign	Stoney botton				100.000	Photo: Y / N			
Clarity	Discharge	Degree of sil	tation: C	lean-Slight-	Moderate-He	Bavy				
Very clear	Flood	Depth of mu	d: None:	<1cm: 1-5c	m: 5-10cm:	>10m				
Clear	Normal	Litter: None				0.000				
Credi	worldi			- moderate	- Abuntuant					
Slightly turbid	Low	Filamentous	Algae:		la at		Sewage Fungu	IS:	Alanda	
Highly turbid	Very Low	None – Preser		ate-Abund	Sample		None - Present - Sampled in Mir		e-Abundant	
migniy curbia	Dry	Pasture	eu/5:	Urban	retained		Pond net x	nutes:		
	Recent Flood	Bog		Tillage	Y/N					
		Forestry		Other			Stone wash x			
		Macroinver	t ebrate specific gr	e Compo	sition		Weed sweep x		Relative	-
The macroinvertebr Group 1 = E Group 2 = E Group 3 = I	ates are divided int obemeroptera (3-tails)- cichoptera OL.D (Gastropoda	o the following5 ails) – note thatt note that tails n	specific g ails may b ay be dar	roups le damaged maged durin	Iduring samp	pling	Weed sweep x		Abunda 1-5 6-20 21-50 51-100	nce
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Step.1. Calculate the Index Score by circling the appropriate box representing the total number of taxa and the total abundance calculated from *each macroinvertebrate group* calculated from page 1 of the recording sheet and enter in to the boxes in Step 2.

