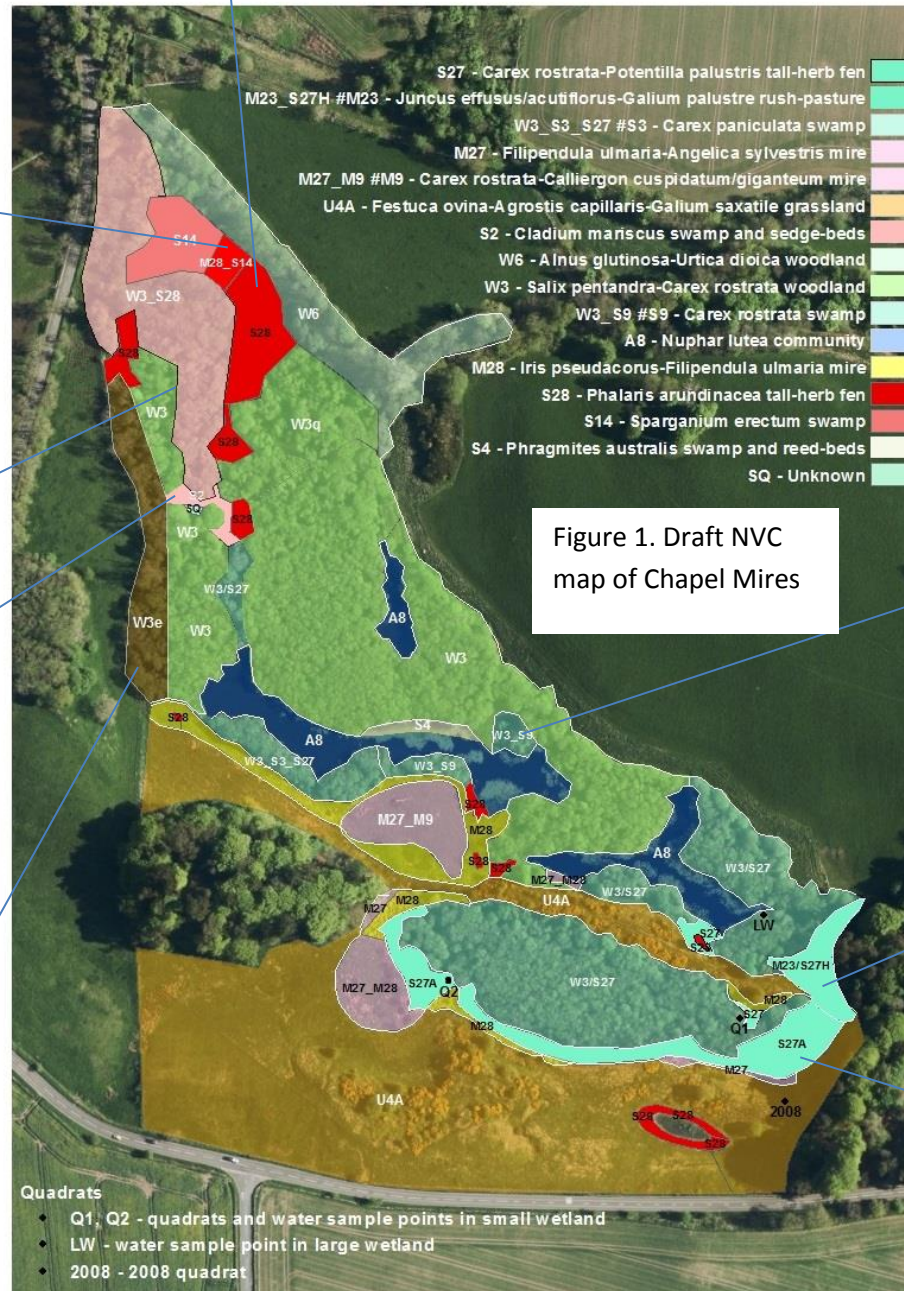


Update on Scottish Government funded “Water for all” project for Balgavies Loch Committee

1. The first steps in this project have provided figures on the potential beneficial consequences of installing a tilting weir between the Common lade and Lunan Water and a penning device at the outlet of Balgavies loch in three main areas: flood risk mitigation, low flows alleviation and improved water quality in the wetlands for biodiversity preservation. This report, along with minutes of Lunan Catchment Group meetings are found on the project website:

[http://www.hutton.ac.uk/research/projects/payments-ecosystem-services-lessons#Water for all](http://www.hutton.ac.uk/research/projects/payments-ecosystem-services-lessons#Water%20for%20all)

2. A detailed map of the National Vegetation Classification habitat codes for the Chapel Mires area is being prepared. A draft version of this is attached, which will form part of a report to SNH. The key thing to note is the presence of invasive species such as Canary Grass (*Phalaris arundinacea*), Burr Reed (*Sparganium erectum*) and Common Reed (*Phragmites australis*), which show evidence of spreading from the northern area close to the river into the more biodiverse sedge-rich southern areas (see Figure 1). Quadrat species lists are in Table 1.
3. A project with an intern student from INGEES, Strasbourg, France, has been looking at the mixing of water from the Lunan with the other sources (groundwater, rainwater, road runoff) which control water quality in the Chapel Mires. This shows that the influence of the Lunan is greater in winter than in summer, and greater close to the river than in the better conserved sedge-rich areas (see Figure 2). It also shows evidence of road salt runoff in some parts of the wetland.
4. The main negative impacts of the Lunan on Chapel Mires are (a) the introduction of sediment (which reduces the micro-topographic characteristic sedge-rich communities) and (b) ingress of nutrients (N in winter months, P in late summer/autumn). Angus Council and James Hutton Institute have submitted for approval a draft consent application (to SEPA) for the installation of two structures and for dredging of the common lade to the riparian owners affected (Mr Tom Sampson of Mains of Balgavies, Mr James Osborne of Balmedies and Mr Rab Potter of SWT) (see Figure 3). The penning structure at Balgavies came slightly later in the overall proposal development, and has not been discussed in as much detail with the Lunan Catchment Group or riparian stakeholders.
5. The purpose of submitting for all works at this time is: (a) to achieve maximum flexibility of management of high and low water conditions, in accord with constraints to be agreed among the various stakeholders (eg maintaining a minimum Loch water level of 59.35m; not increasing the frequency of flows below Q95 at Guthrie; not increasing the frequency of flows above Q10 at Kirkton; ensuring availability of water for irrigation and cattle drinking for riparian owners at Milldens) (b) to ensure that funding streams for implementation are in place, as these are available this financial year, but are subject to annual review by Angus Council and Scottish Government.
6. A small number of pre-survey interviews has been implemented with farmers from the catchment area. In order to maintain confidentiality of individual responses, we cannot provide this as a detailed report. However, we can state that on the whole, the interviewees were not opposed to the proposal. Doubts were expressed regarding the relevance of pursuing all 3 objectives (see point 1) equally; respondents felt that more emphasis should be put on the flood mitigation potential, as the benefit arising from low flow alleviation might not be sufficient on its own. There was recognition of the ecological needs, as long as this was balanced by other interests. Respondents also expressed their concern about the management of this scheme in the long term once the research project ends and when the management responsibilities are transferred to a local structure.
7. Following completion of ethical approvals, both by SG and internal committee, a socio-economic survey has been launched <https://lunan.limequery.com/914241>. This aims at: (a) measuring and discussing whether the benefits are perceived to be worth the costs of the project by local stakeholders and residents; (b) proposing a governance strategy that would enable the sustainability of this scheme in the long term.
8. We have commissioned detailed drawings for two rural sustainable drainage systems (SUDS) at two sites on the fringes of Fonah Bog. These are being prepared by Stewart Moir of Moir Environmental, the lead author in the recently published rural SUDS manual. One of these systems will take the form of a wetland, the other will be a combination of wetland and sediment fence, to ensure ease of maintenance. We understand that the approval of these structures will be dependent on the development of sediment management plans by land users contributing to the runoff. SNH have a funding stream to develop these plans with land users.



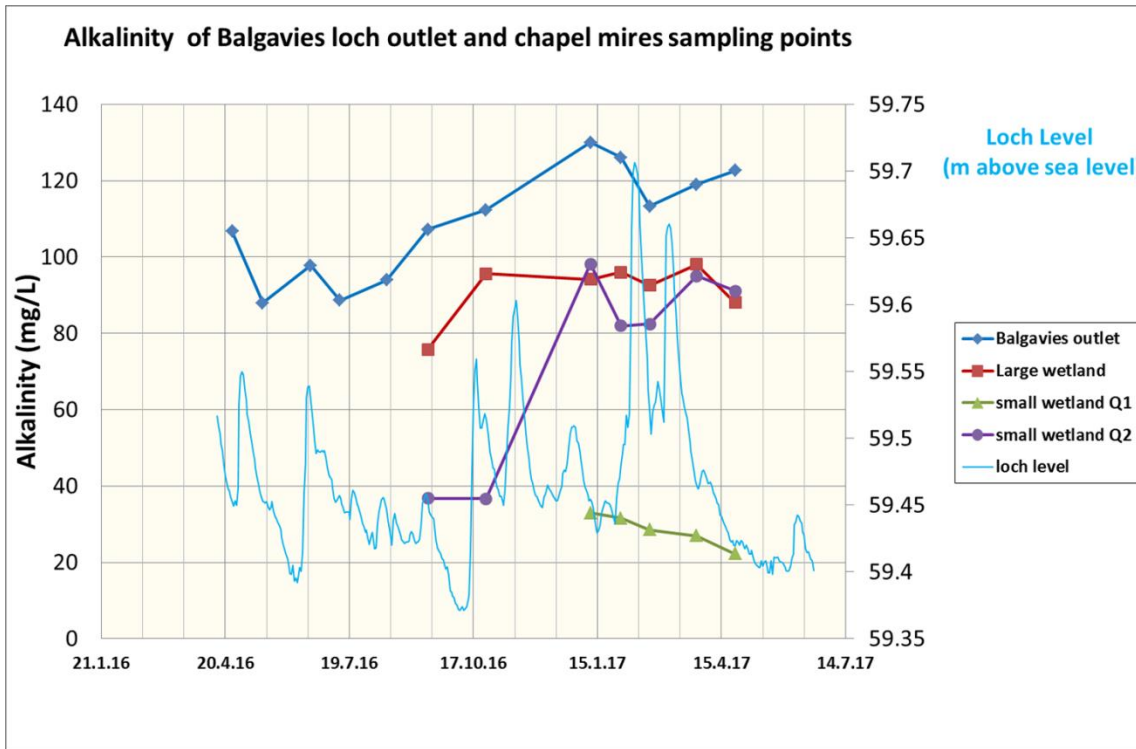


Figure 2. Alkalinity of water in Lunan Water at outlet to Balgavies Loch compared with large central open water wetland and eastern (Q1) and western (Q2) areas of small, sedge-rich wetland in southern section Chapel Mires. Note the decrease in influence of river water from large wetland to Q2 to Q1 and the increasing influence of river water in winter compared with late summer.

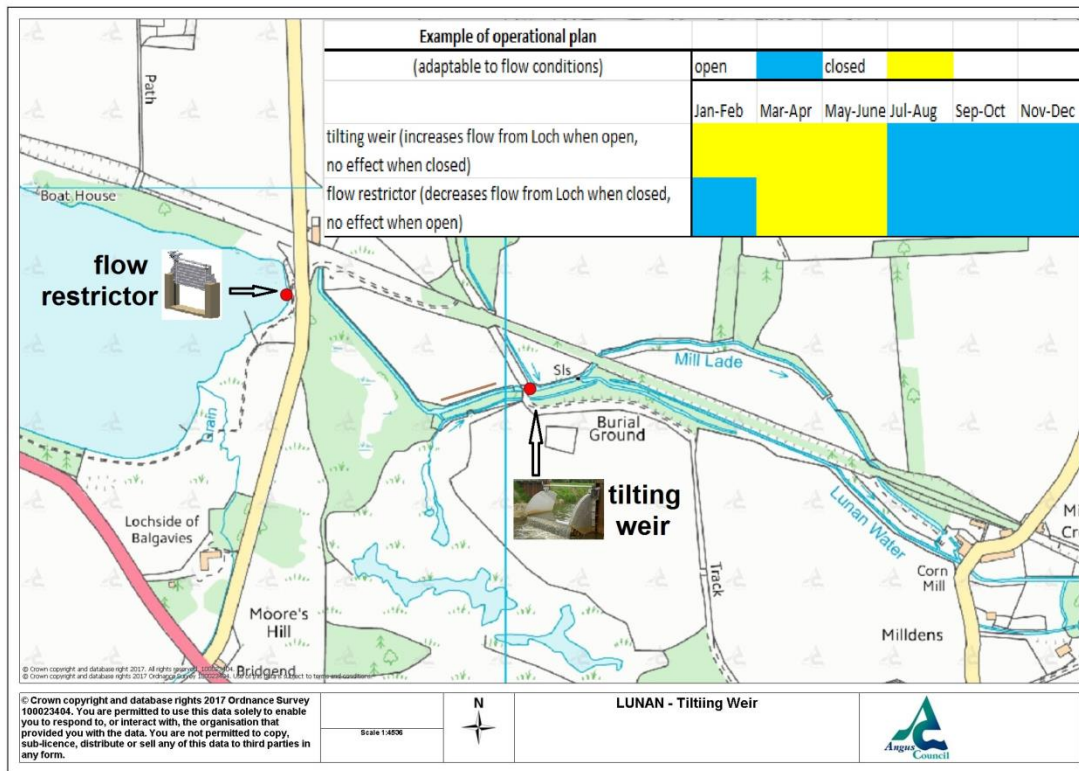


Figure 3. Positions of potential water management structures at outlet to Balgavies Loch, with example of possible management regime to deliver improvements across flood mitigation, low flow mitigation and wetland water quality objectives.

Grid reference	NO5410350403			NO5395350420			
	Quadrat	Q1	Q1	Q1	Q2	Q2	Q2
Date	May-15	Jul-15	Jun-17	May-15	Jul-15	Jun-17	
Agrostis stolonifera	<1		0				
Carex disticha		<1	1				
Carex rostrata	<1	<1	1	5	20	8	
Carex sp.	<1						
Juncus articulatus	1	<1	3	<1	1	2	
Cicuta virosa	3	15	1	<1	2	1	
Comarum palustre	<1	3	<1	<1	<1	<1	
Epilobium ciliatum				4	4	4	
Epilobium palustre	2		2	4	10	0	
Galium palustre				3		8	
Iris sp.	4	5	10	25	40	30	
Lemna minor	3	1	<1	1	<1	<1	
Lysimachia thysiflora	20	20	30		1		
Menyanthes trifoliata	25	50	40	5	10	5	
Myosotis sp.				<1		<1	
Myosotis scorpioides				1	1	2	
Myrica gale	<1	1	<1				
Potamogeton polygonifolius	8	10	3				
Equisetum fluviatile	<1	<1	3	<1	2	<1	
Calliergon cordifolium				30		40	
Calliergonella cuspidata				<1		<1	
Plagiomnium elatum				25		10	
Utricularia sp.	<1	<1	0				
Alnus glutinosa							
Betula pubescens							
Salix cinerea				+	2	2	
Salix sp.							
Open water %		5					1
Vascular plant cover		100			>90		
Height vegetation cm		50	51		140	70	
Height trees cm					450	370	

Table 1. Species lists for 4x4m quadrats taken in Chapel Mires in 2015 and 2017.