NS 2 FRESHWATER PEARL MUSSEL SUB-BASIN MANAGEMENT PLANS

REPORT ON MORPHOLOGICAL MONITORING AND CATCHMENT WALKOVER RISK ASSESSMENTS IN THE MOUNTAIN CATCHMENT

September 2009

TABLE OF CONTENTS

1.0 INTRODUCTION

In order to assess the hydromorphological alterations within the Mountain catchment the EPA WFD classification tool called the River Hydromorphology Assessment Technique (RHAT) was utilised by RPS. This tool was developed through the North South Share project, to classify rivers in terms of their morphology. It is a field technique which assigns a channel typology. This influences the rivers physical attributes assessed in the field. The technique assigns a morphological classification directly related to that of the WFD – high, good, moderate, poor and bad.

RHAT surveys were carried out at high risk areas located within pearl mussel populations. The methodology classifies river hydromorphology based on a departure from naturalness, and assigns a morphological classification, based on semi-quantitative criteria. It is designed to be a rapid visual assessment based on information from desktop studies, using GIS data, aerial photography, historical data and data obtained from previous field surveys as well as observations in the field.

A catchment walkover risk assessment survey sheet was also designed by the project team in conjunction with NPWS in order to focus the collation of the pressure data in the field with respect to the Freshwater Pearl Mussel. The risk sheet was divided into eight categories designed to highlight the main pressures within the catchment. The eight categories are as follows:

- Source of erosion
- Diffuse Nutrient
- Diffuse Silt
- Current Riparian Zone
- Field Drainage
- Outfalls
- Abstractions
- Barriers to Migration

Each sub-pressure within the eight categories is analysed and an overall risk assessment of High, Medium or Low is assigned to that category. The “one out all out principle” is then used to assign the river stretch or point an overall risk category. A detailed description, together with a series of photographs outlining the pressures is also taken. The risk assessment sheets will assist the project team in focussing the specific freshwater pearl mussel measures within the catchment.

Location of survey stretches and points are shown in **Figure 3.1**

2.0 METHODOLOGY

Sampling was carried out on the 22nd of April 2009.

2.1 RIVER HYDROMORPHOLOGY ASSESSMENT TECHNIQUE (RHAT)

Classification of hydromorphology can be used to contribute to the status classification of water bodies at high ecological status only. However, RHAT plays a vital role in identifying why a water body might be failing to achieve Good Ecological Status as it is based on the observed impact in the field. It can assist in deciding what indirect and direct efforts are needed to improve status and in helping to prevent further deterioration.

The eight criteria that are scored are:

1. Channel morphology and flow types
2. Channel vegetation
3. Substrate diversity and embeddedness
4. Channel flow status
5. Bank and bank top stability
6. Bank and bank top vegetation
7. Riparian land use
8. Floodplain connectivity

Sheet 1 of the RHAT form contains the Field Health and Safety sheet which is filled on arrival at the site. Before the field survey, a desk study is required this element of the survey was completed as part of the development of the draft sub-basin management plans. The reach identification and physical characterisation sections for each field site are recorded on Sheet 2 (see Appendix 1) with all information available from GIS and aerial photographs, including:

a. expected stream type and the description of various stream types
b. catchment and reach-scale pressures (these may help to identify, confirm or explain field observations);
c. expected riparian vegetation types (for high quality status);
d. the weather conditions on the day of the survey, and those immediately preceding the day of the survey. This information is important to interpret the effects of storm events on the survey results;
e. the estimated stream width and the reach length to be assessed (~ 40 x width).
f. any other notable issues (e.g. from previous surveys).

A score is allocated to each relevant attribute (the number of attributes to be assessed will depend on the stream type). Where the condition departs from the reference condition, note should be made if this condition results from a particular identifiable pressure. Where possible and where relevant, all attributes should be included in the assessment, using the assessment sheet (Sheet 3, see Appendix 1). If an attribute is not assessed, the score-summary table should be amended (cells shaded) and a note made as to why the assessment was not carried out. The WFD status can still be calculated on the basis of other attributes, but with a note that a particular attribute was omitted.

Transfer scores for individual attributes to the summary table on the survey Sheet 2. Finally the overall WFD category can be calculated using the following values:

> 0.8	= high
0.6 – 0.8	= good
0.4 – 0.6	= moderate
0.2 – 0.4	= poor
< 0.2	= bad

For the purposes of the assessment as part of the NS2 project, a high status for morphology is desirable for pearl mussel habitats. Through work carried out by the Shannon IRBD project on the Freshwater Morphology Programme of Measures Study, it was found that an observed relationship exists between biological data and a RHAT score. The study confirmed that morphological pressure can impact biology and therefore ecological status. In general, sites with RHAT scores less than 0.6 also have less than good Q scores. Similarly high levels of siltation affecting macrophyte populations are reflected by less than good RHAT scores.

Grid references were recorded at all sites using a GPS together with site photographs which were taken using a digital camera.

2.2 CATCHMENT WALKOVER RISK ASSESSMENT

During the development of the draft sub-basin management plans throughout 2008 a complete desk study was conducted of all relevant biological, water quality and pressure source data within the Mountain catchment. Best use was made of all available datasets such as the pressure source data collated by the River Basin District Projects for the Article V Characterisation and Programme of Measures Studies. This work allowed the NS 2 project team to assess the catchment through the combined availability of aerial imagery and digitised pressure information. Where gaps in this data existed together with areas that required ground truthing such as physical barriers to migration, catchment walkover risk assessments were focussed throughout the 2009 field survey season.

The catchment walkover risk assessment sheet (See Appendix 3) covers eight main categories or pressures which are subsequently sub-divided into the various sources. Each source is ticked if present and an overall risk assessment for each pressure assigned from High to Medium to Low over the survey length or point. All eight pressures are combined to give an overall risk assessment to the catchment based on the “one out all out principle”.

3.0 RESULTS

Figure 3.1 indicates where the Mountain RHAT assessments were carried out throughout the catchment.

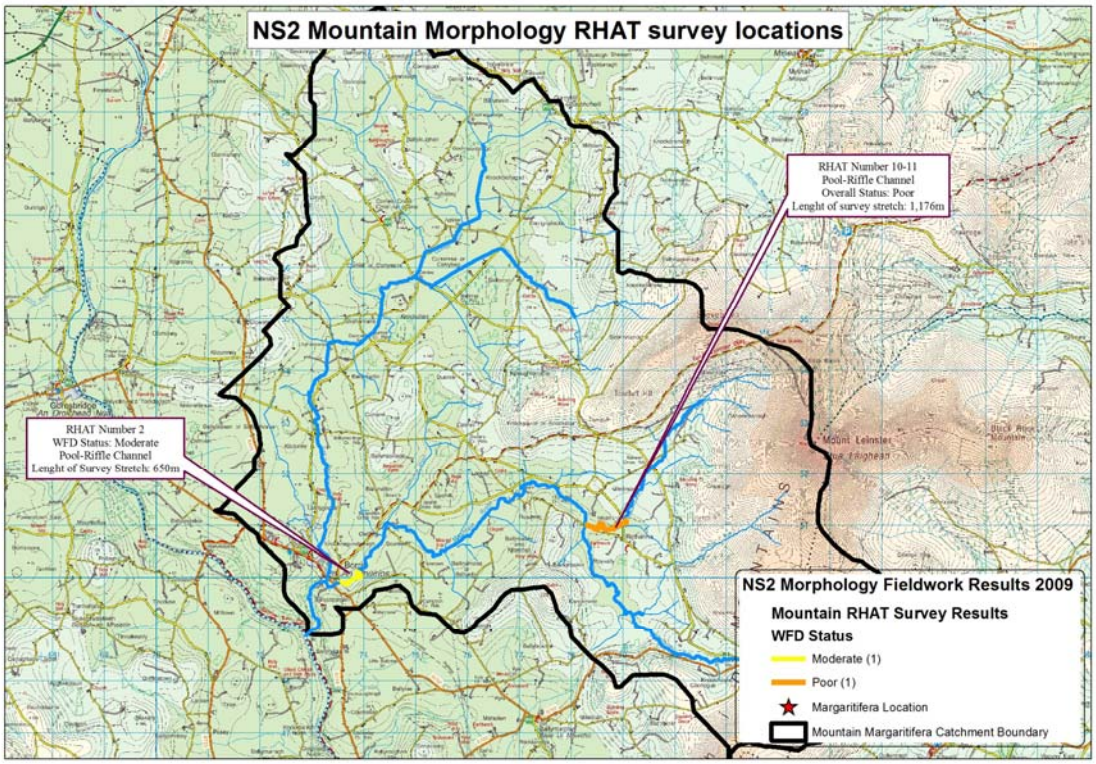


Figure 3.1 Morphology RHAT Assessment Locations

(The RHAT numbering system corresponds to the site code which may mean they are not sequential where a RHAT was not carried out at a particular site)

3.1 RHAT Survey Results

Two RHAT surveys were carried out throughout the Mountain catchment. The results of these surveys can be found in the electronic appendix. The first survey stretch commenced at the viaduct and moved upstream along a 650m survey stretch. The entire channel is subject to excessive bank erosion. The surrounding landuse is improved grassland with sheep grazing. This has led to a complete lack of buffer zone and direct access to the channel by the sheep which is causing erosion and leading to slumping and exposure of the bankside. An electric fence has been installed recently approximately 1 metre back from the bank however this is insufficient as it is not stock proof and too high for the sheep. Mid-channel bars, exposed tree roots and extensive sheep poaching was recorded throughout. The bank structure and stability, bank vegetation and riparian landcover all only scored one out of four. Overall this stretch was classified as moderate

status. While a number of salmonids were recorded along the survey stretch no live mussels were noted but a number of dead mussels were found. This stretch is in very poor condition with considerable pressure acting on the channel.

The second RHAT survey was carried out from site 10 to site 11. Resectioning, reinforcement and embankments were recorded on both the left and right banks. All attributes scored very low due to the many morphological alterations which have been carried out along the survey stretch. Bankside vegetation has been removed, animal poaching and direct vehicle access to the channel was recorded. The first section of the survey stretch contained extremely high levels of sand which has led to an almost choked channel. *Ranunculus* and *Apium sp.* were found across the entire width and in some parts altering the flow of the channel. Towards the end of the survey stretch the trees on the bankside have been totally removed and two ford crossings were recorded one of which has vehicular access and could cause additional silt to be released into the channel. Also towards the end of the survey stretch sheep were found to have access directly to the channel while fencing was in place it was insufficient to prevent direct animal access to the channel.

Plate 3.1 Representative photographs from reach:

RHAT 1 Site 2 Photo 4	**RHAT 1 Site 2 Photo 8**
	

RHAT 2 Site 10 Photo 2	RHAT 2 Site 10 Photo 6
	

Details in relation to photographs are tabulated in Appendix 2.

3.2 Catchment Walkover Risk Assessment Results

A total of sixteen sites were surveyed in the Mountain sub-basin catchment, with a risk assessment carried out at fourteen of these sites (two stopping points). **Figure 3.2** outlines the stopping point locations in addition to the High to Low Risk Assessment from the Catchment Walkover Risk Assessments. Five high risk sites were recorded out of the four that were assessed. A further eight sites were recorded as medium risk, meaning only one low risk sites was recorded within this catchment. **Figure 3.3** outlines the percentage of sites classified at high, medium and low risk together with the number of stopping points throughout the catchment.

The most common high risk categories identified were:

- Erosion – evident at 60% of high risk sites,

The Current Riparian Zone category of the Catchment Walkover Risk Assessment slightly varies from the seven other categories or pressures. The Current Riparian Zone is not a pressure in itself; however the aspects listed in this category are the interceptors to the pressure and convey the extent or lack of buffer provided by the riparian zone. A high risk riparian zone indicates that the pressures acting on the river are more likely to have significant impact. For example the lack of fencing along a river stretch can lead to excessive trampling and/or poaching which in turn may lead to siltation within a pearl mussel habitat. The various categories and pressures listed in the Catchment Walkover Risk Assessment sheet were designed to assist the project in focussing the measures which will be needed to combat the pressure along its pathway, rather than removing a source which may not always be possible such as intensive agriculture. Recording the Riparian Zone in terms of its current performance as a buffer is important in this regard.

Current Riparian Zone has ten aspects as follows:

- Fencing
- Buffer

- Tree line at bank
- Tree line buffer
- Plantation with no buffer
- Urbanisation
- Flood Protection
- Marshy Land
- Landuse at bank
- Other Sources

Where one or any of these aspects is found to be the cause of significant impact to the riparian zone, or the channel along the stretch then this category may be assigned a high risk score. Locations where pressures were evident in the field which were not highlighted through the desk based assessment were also noted as stopping points. These points were not selected prior to fieldwork, they were opportunistic as the catchment drive through was taking place. The pie chart in **Figure 3.3** indicates the percentage of stopping points also.

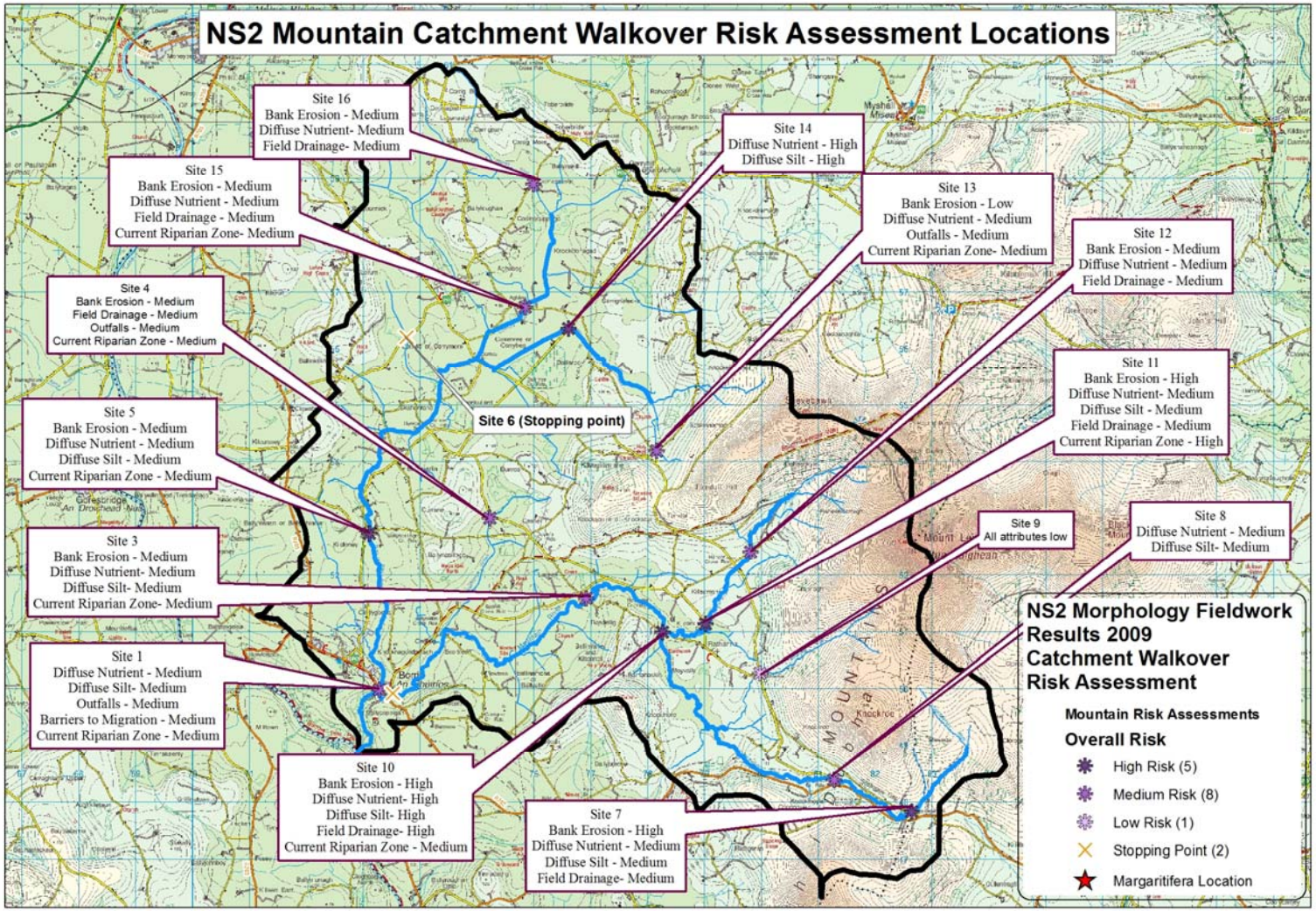
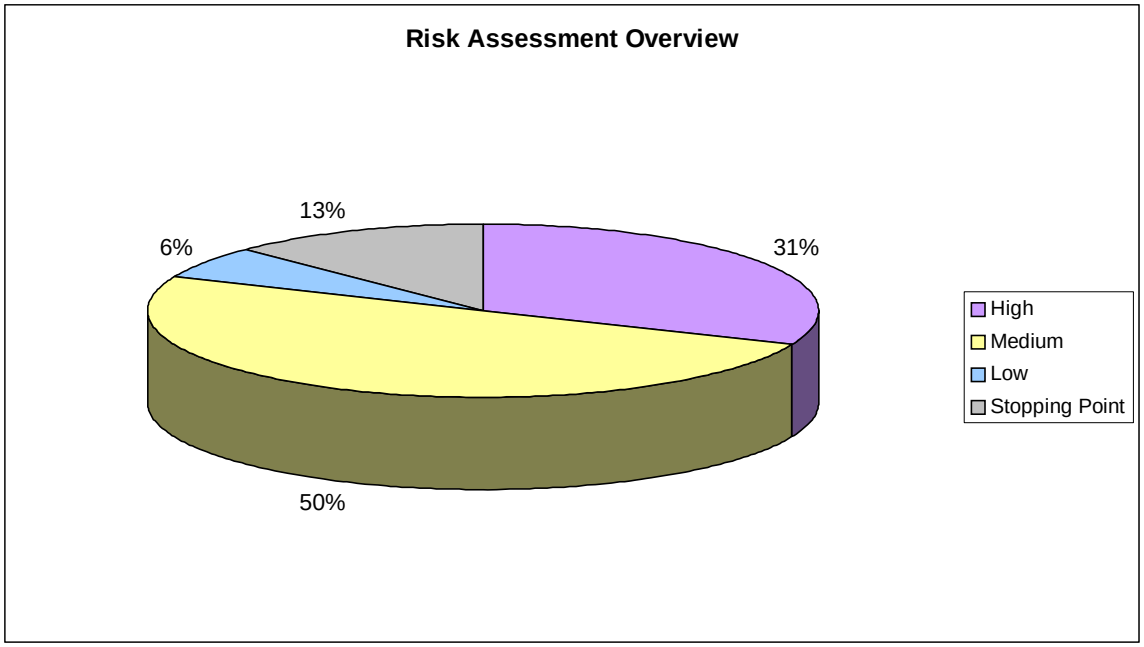


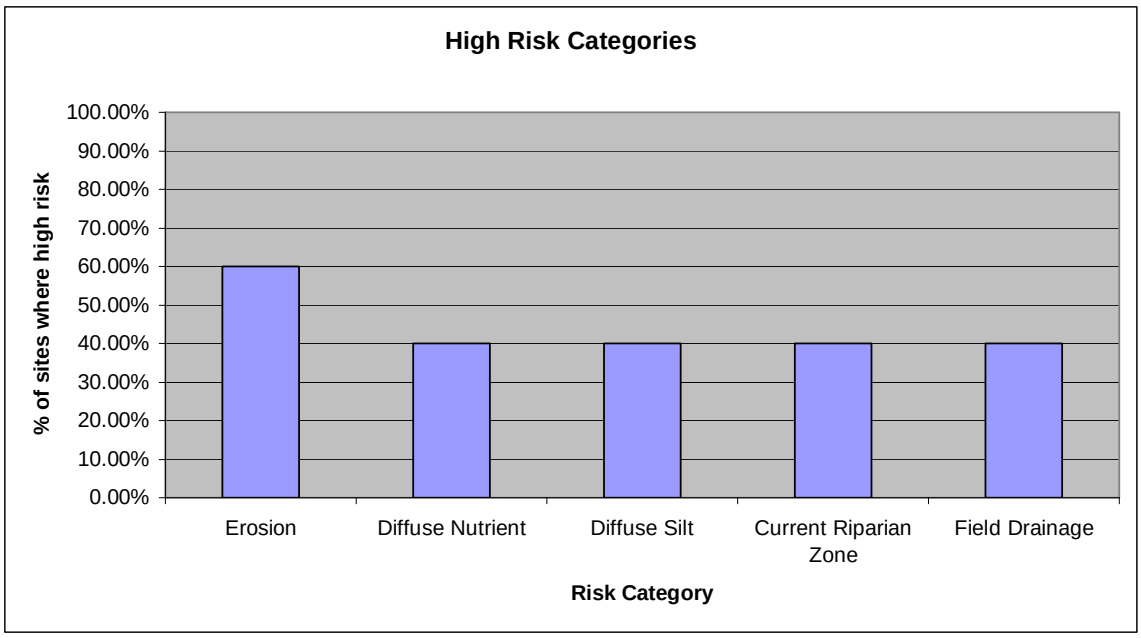
Figure 3.2 Location of Stopping points and Catchment Walkover Risk Assessments

Figure 3.3 Risk Assessment Overview



The break-down of pressure categories identified as high risk are outlined in **Figure 3.4**

Figure 3.4 Breakdown of High Risk Categories



The most common sources of erosion are in river clearance, animal trampling and hard bank protection measures. The remaining sources are shown below.

Figure 3.5 Sources of Erosion at High Risk Sites

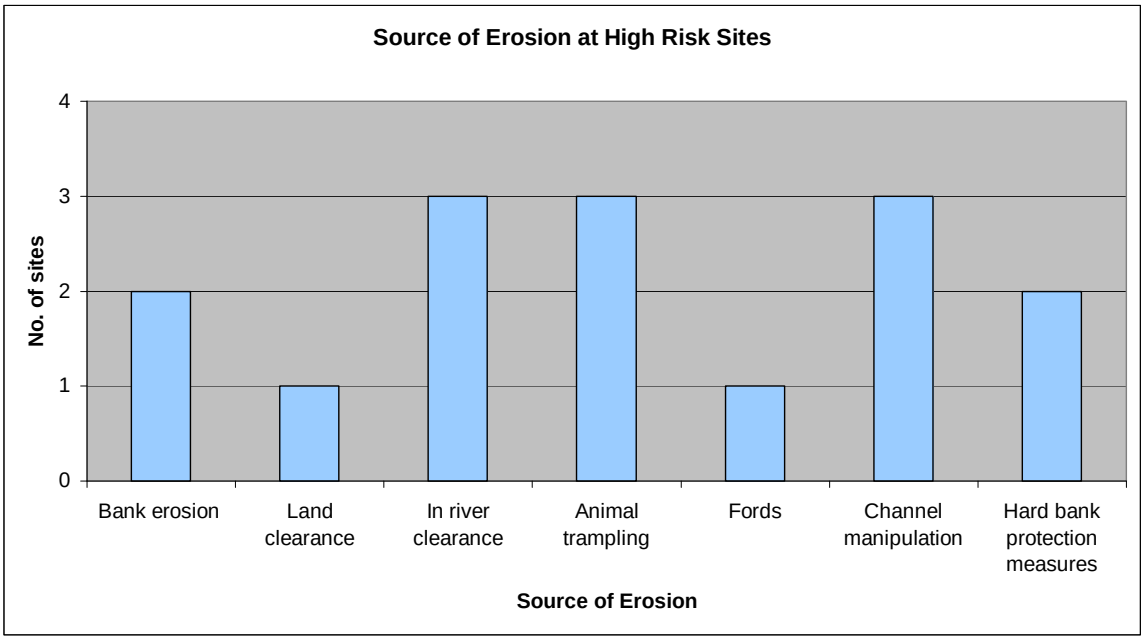


Plate 3.2 & **3.3** are sites which were surveyed as part of the catchment walkover risk assessments. These images provide an indication of the in channel clearance works, animal trampling/poaching and channel manipulation which has taken place along stretches of the Mountain.

Plate 3.2 Upstream of Borris – Scortreen River

Plate 3.3 In-Channel and bank clearance works on the Glasheroge Stream

The intensive agriculture practised in some parts of the catchment coupled with the lack of a sufficient buffer strip and bank side removal works has led to increased levels of silt in the channel. This was particularly evident at site 7 (**See Figure 3.2**) in the upper reaches of the Aughnabrisky.

Plate 3.4 Site 7 Photo 10 removal of in-channel material

Plate 3.5 Increased levels of silt in-channel downstream of works

Fords

Three significant fords were observed within the catchment during the catchment walkover risk assessments. Both vehicular and animal, causing sediment loss from the vehicles/animals and the access roads, leading to excessive siltation in the river. These fords were located at site 6 and site 11 (See **Figure 3.2** above).

Usage of the fords to stop immediately and alternative access also needs to be investigated.

Plate 3.6 Most significant ford crossing in the Catchment as it is both vehicular and animal

Plate 3.7 Third ford or access point to the river channel

Regulation of Future Engineering Activities

The River Basin Management Plans outline all of the required (or basic) measures currently in place in Ireland (Table 6.1 of the Mountain Sub-Basin Management Plan). These measures are required by law and apply to all waters. Many required measures are under existing EU Directives, but the WFD stipulates extra required measures which must also be implemented. *'Control on physical modifications to surface waters'* is one of these extra required measures. The RBMP Programmes of Measures for Morphology recognised the need for a prior authorisation or registration based system to manage future engineering activities near rivers and lakes (Shannon IRBD 2008, Freshwater Morphology POMS Study, Final Report).

National technical studies on the impact of physical modifications on fresh and marine waters (www.wfdireland.ie/docs) identified apparent gaps in existing authorisation systems. A Ministerial decision on the need for new regulations creating a registration and authorisation system is required.

These controls will account for the assessment requirements of the Habitats Directive within the decision making process. If permission is granted, stringent binding rules or conditions will be attached to the license, in accordance with the Freshwater Morphology Code of Practice and Protected Areas requirements. The potential for impeding fish migration will also be a key factor in impact assessment.

A Freshwater Morphology Web Based tool has been developed which is driven by a Morphology Database. This tool supports decision making in authorisation systems by assessing pressure extent and risk to water body status. Damage to mussel populations, in combination with other impacts both during construction and operation will be considered in the assessment. Currently this web based tool is held and operated by the EPA. If an authorisation process is rolled out Local Authorities should be given access to this tool. Therefore structures within rivers may be subject to controls in future.

4.0 CONCLUSIONS

Three risk assessments were undertaken in areas where Freshwater Pearl Mussel Populations are know to exist. Out of the three two were recorded as high risk and one as medium risk. There are significant pressures within this catchment including areas in the upper reaches at the source where high and medium risk assessments were found. Erosion is the greatest issues within this sub-basin catchment however there are pressures from diffuse nutrient, silt, the current riparian zone as well as field drainage.

APPENDIX A

RHAT Field Sheet

Field Health and Safety sheet

River Name_____ Site Code_____ Date_____

1 = Low risk 5 = High risk

Please circle applicable number

PARKING	1	2	3	4	5
FENCES/BARRIERS	1	2	3	4	5
GROUND STABILITY	1	2	3	4	5
DENSE VEGETATION	1	2	3	4	5
BANK STEEPNESS OR STABILITY	1	2	3	4	5
RISK FROM ANIMALS	1	2	3	4	5
PHONE COVERAGE	1	2	3	4	5

Previous RHS/RAT/RHAT surveys - year and code _____

Details of access _____

RHAT (VERSION 2)

TRIBUTARY / MAIN CHANNEL*

Site Identification

River Name _____ Site Code _____

Nearest WFD site FF10 _____

Water Body ID _____ Start U / S or D / S*

First IGR _____ Last IGR _____

Bank surveyed from L / R / Both / in-Channel*

Desk-study notes		Field Notes
ACTION TO TAKE PRIOR TO FIELDWORK General overall shape of river Check weirs, impoundments etc. on catchment		River type Date
Floodplain connectivity and land use Expected river type Rain last week Estimated river width Estimated survey length Riparian land cover(s) River Agency designated? Other comments including geology - limestone / siliceous / peat*		Time Surveyors Weather conditions now Estimated river width (m) (average 3 readings) Estimated survey length (m) (40 X wetted width) Estimated river depth (m) Channel characteristics (e.g. different stream types on the reach)
RESULTS		Pressures
Hydromorph score WFD class		*Circle as appropriate

Photograph details include IGR or approximate location

_____

_____

_____

_____

N.B. The survey length should be 40x the wetted width with a minimal stretch of 160m but not exceeding 1km.

NS RHAT

Anthropogenic Impacts

River Name _____ Site Code _____ Date _____

Feature		Tick if present, record as E if > 30%		
Resectioning		None ☐	Left bank ☐	Right bank ☐
Reinforcement		None ☐	Left bank ☐	Right bank ☐
Embankments	NO*	LB ☐	RB ☐	Set back LB ☐ SB RB ☐
Culverts**		Y / N / Unknown*		
Over deepening		Y / N / Unknown*		
Wver widened		Y / N / Unknown*		
Narrowing		Y / N / Unknown*		
Fords**		Y / N*		
		Major	Intermediate	Minor
Bridges**	NO*			
Weirs**	NO*			
Fish Pass**	NO*			

Physical features or resource use if applicable. *

Deflectors / Jetties / Arterial drainage / Side channels / Mid channel bar / Field Drains / Mill Race

Navigation / Fishing / Recreation / Forestry/ Urban / Industry / HEP

Trashline present (height __ m) above water / Buffer zone (LBm / RBm back from water edge)

Other observations - Invasives - Trees - Birds - Pollution indicators - Invertebrates*

Rhododendron / Himalayan Balsam / Japanese Knotweed / Giant hogweed / Snowberry / Cherry-Laurel/ Gunnera

Sycamore / Beech / Conifers / Oak / Ash / Alder / Willow / Birch / Hazel / Hawthorn / Blackthorn / Holly

Heron / Sand martin / Grey wagtail / Dippers / Kingfishers /

Sewage fungus / Diatomaceous algae / Oil / Cladophora / Vaucheria / Dumping / Silt on Substrate

Other comments:

_____

** Circle as appropriate E - extensive. ** Tally as appropriate. LB - left bank / RB - right bank*

RHAT RIVER HYDROMORPHOLOGY ASSESSMENT TECHNIQUE

Field Assessment of Morphological Condition

River Name _____ Site Code _____ Date _____

If river in spate ignore 3 and 4 but deduct individual scores from overall if either feature not visible. Greyed boxes may be scored but note why in Comments/Notes.

	Bedrock	Cascade / Step-pool	Pool-riffle-glide	Lowland Meandering
1. Channel form and flow types	4	4	4	4
2. Channel vegetation	4	4	4	4
3. Substrate condition	4	4	4	4
4. Barriers to continuity	4	4	4	4
5. Bank structure & stability L+R	4	4	4	4
6. Bank vegetation L+R	4	4	4	4
7. Riparian land cover L+R	4	4	4	4
8. Floodplain connectivity L+R	4	4	4	4
TOTAL	32	32	32	32
Hydromorph Score *				
WFD class **				

* Hydromorph score - Assessment score = Maximum Possible score

** WFD Class
> 0.8 = high
>0.6 – 0.8 = good
>0.4 – 0.6 = moderate
>0.2 - 0.4 = poor
< 0.2 = bad.

SHEET 5

NOTES

APPENDIX 2

PHOTOGRAPHS

Photographs of site locations and catchment pressures on the Mountain River and tributaries 2009. All field work photographs can be found in the accompanying electronic appendix.

Overall Risk * uses the “one out all out” principle

Site No.	Catchment Name	Location	X	Y	Photo No.	Bank Erosion	Diffuse Nutrient	Diffuse Silt	Field Drainage	Outfalls	Abstraction	Barriers to Migration	Current Riparian Zone	Risk Overall*	Pressures
Site 1	Mountain	Site at Borris on R702	273288	149985	Photos 1-10	Low	Medium	Medium	Low	Medium	Low	Medium	Medium	Medium	WWTP, old diverted channel, blocked sluice gates.
Site 2	Mountain	Site at Borris	273531	149919	Photos 1-8										Dead pearl mussels, poaching, debris in channel, outfalls, field clearance, bank erosion.
Site 3	Mountain	Site near Lackeen Crossroads	276926	151590	Photos 1-4	Medium	Medium	Medium	Low	Low	Low	Low	Medium	Medium	In channel Island, cleared fields
Site 4	Mountain	Site near Cashel	275225	153012	Photos 1-5	Medium	Low	Low	Medium	Medium	Low	Low	Medium	Medium	Poaching and diffuse run-off
Site 5	Mountain	Site near Kilcloney	273109	152744	Photos 1-5	Medium	Medium	Medium	High	Low	Low	Low	Medium	High	Cattle poaching, land drains, animal access
Site 6	Mountain	Site at Corries	273773	156203	Photos 1-3										
Site 7	Mountain	Site at Scullogue Bridge	282643	147830	Photos 1-10	High	Medium	Medium	Medium	Low	Low	Low	High	High	Improved grassland, erosion, deposition, felling, lack of riparian zone
Site 8	Mountain	Site near Spearpoint Crossroads	281284	148394	Photos 1-6	Low	Medium	Medium	Low	Low	Low	Low	Low	Medium	Siltation, dumping, bankside erosion.
Site 9	Mountain	Site at Rathanna	279979	150282	Photos 1-6	Low	Low	Low	Low	Low	Low	Low	Low	Low	Land clearance,

		Bridge													forestry upstream
Site 10	Mountain	Site near Moyvally	278267	150994	Photos 1-12	High	High	High	High	Low	Low	Low	Medium	High	Drainage, fording, poaching, dumping, excessive macrophyte growth, animal access
Site 11	Mountain	Site at Killedmond Bridge	279018	151133	Photos 1-12	High	Medium	Medium	Medium	Low	Low	Low	High	High	Poaching, improved grassland
Site 12	Mountain	Site near Raheen Crossroads	279814	152413	Photos 1-6	Medium	Medium	Low	Medium	Low	Low	Low	Low	Medium	Poaching
Site 13	Mountain	Site near Killoughternane	278162	154193	Photos 1-6	Low	Medium	Low	Low	Medium	Low	Low	Medium	Medium	Lack of Riparian zone
Site 14	Mountain	Site near Ballinree	276610	156356	Photos 1-3	Low	High	High	Low	Low	Low	Low	Low	High	Siltation, intensive landuse
Site 15	Mountain	Site near Labanasigh (farm)	275848	156737	Photos 1-7	Medium	Medium	Low	Medium	Low	Low	Low	Medium	Medium	Improved grassland, forestry, sheep grazing
Site 16	Mountain	Site at Coolnacuppoge Bridge	275997	158897	Photos 1-5	Medium	Medium	Low	Medium	Low	Low	Low	Low	Medium	Land drains, lack of buffer zone.

Appendix 3 – Catchment Walkover Risk Assessment Survey Sheet

Sheet 1: Catchment Walkovers	Version 1. 07/04/2009
Tributary/Main Channel*	
Site Identification	
River Name	Site Code
Water Body ID	Start U/S or D/S*
First site IGR	Last site IGR
Bank surveyed from L/R/In-channel*	
Photograph details include IGR or approximate location.	

* Select as appropriate

	Present?					
	Yes	No		Grid Reference of specific pressure	No.of Photographs	Comments
Source of Erosion						
Bank erosion						
Land clearance						
In river clearance						
Arable ploughing						
Animal trampling						
Fords						
Channel manipulation						
Hard bank protection measures						
Other sources						
Overall Risk	High	Medium	Low			
Diffuse Nutrient						
Arable						
Grazing						
Improved grassland						
Silage						
Forestry						
Housing						
Industry and associated works						
Other sources						
Overall Risk	High	Medium	Low			
Diffuse Silt						
Arable						
Grazing						
Over-grazing						
Improved grassland (Re-seeding)						
Forest						
Silage						
Industry						
Construction stages						
Housing						
Infilling						
Peat cutting						
Quarries						
Other sources						
Overall Risk	High	Medium	Low			

	Present?					
	Yes	No		Grid Reference of specific pressure	No.of Photographs	Comments
Current Riparian Zone						
Fencing						
Buffer						
Tree line at bank						
Tree line buffer						
Plantation with no buffer						
Urbanisation						
Flood protection						
Marshy land						
Landuse at bank						
Other sources						
Overall Risk	High	Medium	Low			
Field Drainage						
Ditch managed						
Ditch unmanaged						
Drainage on high slope						
Drainage on low slope						
Land drainage (perforated pipes)						
Other sources						
Overall Risk	High	Medium	Low			
Outfalls						
Industrial discharges						
Storm drains						
Culvert outfalls						
Other sources						
Overall Risk	High	Medium	Low			
Abstractions						
Small						
Large						
Overall Risk	High	Medium	Low			
Barriers to migration						
Culverts						
Bridge aprons						
Weirs						
Stone weirs						
Other sources						
Overall Risk	High	Medium	Low			