

RESTORING RAISED BOG IN IRELAND
Project Reference: LIFE04 NAT/IE/000121

A REPORT ON THE RESTORATION OF PROJECT SITE No. 12

CROSSWOOD BOG, Co. WESTMEATH



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Project Site No. 12 - Crosswood Bog, Co. Westmeath

1. Introduction

Grid Reference IN0882 3953	Elevation (m) 55	Bedrock Geology Carboniferous Limestone
SAC Name and Number Crosswood Bog cSAC (2337) SAC Area (ha) 152	Project Site Area (ha) 42.7	Main Restoration Methods Clear-fell mature conifer crop Block drains with peat dams Control natural regeneration
Area of Conifer Cover (ha) 39.1	Area of Open Bog (ha) 0	Area of Birch Woodland (ha) 3.6
Noteworthy habitats/plant/animal species present <i>Sphagnum pulchrum</i> occurs on the adjacent intact high bog, which is owned by the NPWS.		

General Site Description

Crosswood bog is a medium-sized raised bog located a few kilometres east of Athlone, Co. Westmeath. A disused railway line delimits the northern boundary of the site while a band of coniferous forestry forms the southern boundary. A bog track separates the forestry from cutover bog. The unplanted raised bog surface can be divided into an intact northern and central portion while much of the south-eastern portion is subject to peat-cutting at present. The uncut high bog itself is of high quality with numerous pool areas present. This intact area contains a large population of the nationally rare moss *Sphagnum pulchrum* and most of the intact bog surface within the site is owned by National Parks and Wildlife Service.

Project Site Description (Pre-restoration)

The project site consists of 42.7 hectares of conifer plantation and birch woodland on cutover bog at the southern margin of the site. The site was surveyed in 2003, prior to restoration, which found that most of the planted areas consisted of either Lodgepole Pine (*Pinus contorta*) or Sitka Spruce (*Picea sitchensis*) which is about 25 years old (Conaghan, 2003). Typically these trees were between 8 and 12 metres tall and were near commercial quality with a fell year of between 2014 and 2025. In the east of the site there was an extensive area which was planted with a mixture of Sitka Spruce and Downy Birch (*Betula pubescens*) for approximately 18 years. The Sitka Spruce in this area was not of commercial quality as yet (Conaghan, 2003).



Crosswood Bog Closed Canopy Conifer Plantation, 2005

Description of bog vegetation adjoining planted areas

Most of the bog vegetation adjoining the planted areas comprises active cutover with peat-cutting of a rather intensive nature. In the eastern end of the site much of this cutover is old, has not been utilised for some considerable time, and thus there is ongoing development of birch scrub. Towards the western end of the site there are areas of drained high bog adjacent to the forestry and this drainage has resulted in modified, species-poor bog vegetation dominated by Ling Heather (*Calluna vulgaris*) with frequent Hare's-tail Cotton-grass (*Eriophorum vaginatum*) and the lichen *Cladonia portentosa* (Conaghan, 2003).

Most of the afforestation at this site is well-developed and occurs along the dry southern margin of the bog. Ordnance Survey maps of the area indicate that most of this area has had a history of afforestation for at least 100 years. Due to this generally dry nature of the afforested area it will be difficult to re-wet the entire area. There will be localized re-wetting along the margins of large internal drains however will probably only be effective within 10 or 20 metres of the drains. It is considered likely that, in the future, this area will revert to Birch woodland with local patches of marsh vegetation or wet woodland along the drains. Although this habitat will not constitute active raised bog it is nevertheless an important habitat ecologically and will add to the overall biodiversity of the site (Conaghan, 2003).

Restoration Actions

At this site the main restoration measures undertaken were the clear-felling and removal of the mature conifer crop, wind-rowing of the remaining brash and blocking of drains, where possible with peat dams. Follow-up work included the control of the natural regeneration of conifer seedlings. Birch woodland will be allowed to establish on the drier sections of cutover.

In general the afforested areas are quite dry and apart from the main drains there are few active drains within the forestry areas. The main drains to the north of the forestry track and along the southern boundaries of the forestry area could not be blocked due to the possible interference with drainage patterns on adjoining private land. It will be difficult to remove the young Sitka Spruce without damaging much of the Birch also however it is likely that the Birch in this area will regenerate profusely even after any disturbance caused by the felling of the conifers.

2. Methods

Prior to the start of restoration activities at the site, the habitats and vegetation occurring were surveyed and described (Conaghan, 2003). During the initial restoration work of 2005, permanent quadrats were established on each of the vegetation types within the project site.

During the field survey, particular attention was paid to the possible occurrence of plant and animal species which are considered to be rare in both a national and local context with particular emphasis on animal species listed in Annex II of the E.U. Habitats Directive and plant species listed in the Irish Red Data Book for vascular plants (Curtis and McGough, 1988), the 1999 Flora Protection Order and Annex II of the E.U. Habitats Directive.

3. Site Photographs

During the initial fieldwork a number of colour photographs of the site and vegetation encountered were taken with a digital camera and a selection of these are presented in this report. These include photographs taken by the Project Ecologist in order to illustrate the vegetation descriptions and changes in the habitats/vegetation present over time.

4. Vegetation of Project Site

The vegetation of the project site was previously dominated by tall, closed-canopy coniferous plantation. There was little or no ground vegetation in these areas apart from occasional tufts of mosses (mainly *Hypnum cupressiforme* and *Thuidium tamariscinum*). A small area in the east of the site was burnt and at present the area was recolonising with a mixture of Birch and Common Gorse (*Ulex europaeus*) scrub, reseeded conifers and Bracken (*Pteridium aquilinum*) (Conaghan, 2003).

5. Changes in Overall Vegetation/Habitat Cover

Much of the site is now cleared of conifers and brash. The brash which remained after clear-felling was wind-rowed to allow bog vegetation to re-colonise the exposed peat surface. However as this bog margin is very dry and drain-blocking was restricted re-colonisation of bog species has been very slow.

6. Vegetation Monitoring Quadrats

The vegetation changes which have taken place within the site over the period of the restoration project are shown by means of observed changes in permanent quadrats. Five permanent quadrats were installed on this site, which were described and photographed to monitor changes in vegetation over time. In order to ensure the future position of quadrats the corners have been marked with short stakes and an 8-figure GPS reading was also recorded. Each 10m x10m quadrat, was photographed annually and vegetation tables are presented below.

Quadrat 1: This quadrat is located towards the eastern margin of the plantation and occurred under wet woodland of Birch and Rowen with an understory of Bramble. The ground flora is dominated by Hypnum moss. This birch woodland is the natural vegetation of raised bog margins and will be allowed to develop further.

Crosswood Quadrat 1

Area: 10 x 10m

Bog Type: Wet woodland

Landuse: Non-intervention

Location: 5m North 21

Ecotope: NA

Management: Non-intervention

Grid Ref: N0914 3966

Slope: Flat

Altitude: 54m

Aspect: NA

Date	17/08/2005	19/07/2006	15/08/2007	22/07/2008
Firmness	Firm	Dry	Firm	Firm
Drains	No	Yes	Yes	Yes
Canopy Cover %	75	90	90	85
Canopy Height	5	5m	5	5
Vegetation Cover %	90	90	85	70
Vegetation Height (cm)	100	150	100	100
Dwarf Shrub Cover %	0	5	0	0
Herb Cover %	60	75	75	65
Bryophyte Cover %	30	40	70	70
Sphagnum cover %	0	0	0	0
Open Water %		0	0	0
Brash cover %		0	5	5
Pine Needle cover %		0	0	0
Pine Needle Depth cm		0	0	0
Leaf Litter	10	0	10	10
Bare Peat %		0	0	0
Species number	11	9	11	12
<i>Betula pubescens</i>	60	60	75	70
<i>Salix</i> spp.			5	
<i>Sorbus</i>	5	5	5	10
<i>Ilex aquillinum</i>	2	5	5	5
<i>Crataegus monogyna</i>				5
<i>Quercus</i> spp			1	
<i>Ulex eurpoeus</i>	7	10	10	5
<i>Rubus</i> spp	20	20	40	30
<i>Hedera helix</i>	3	20	5	10
<i>Taraxicum</i> spp	1			
<i>Rumex acetosella</i>	1			
<i>Lonicaria periclymenum</i>	2	5	5	5
<i>Luzula</i>				2
<i>Pteridium</i> spp	20		20	10
<i>Pteridium</i> spp		30		
<i>Hypnum cupressiforme</i>				20
<i>Hypnum jutlandicum</i>	30	40	70	50



Crosswood Quadrat 1, 2005



Crosswood Quadrat 1, 2008

Quadrat 2: This quadrat is located along the southern margin of the plantation and occurred under closed canopy conifers with a ground cover containing some Hypnum moss, but mainly consisted of pine needles. With the felling of the conifers, it can be seen that Purple Moor-grass, Foxglove and Fireweed are dominating the sparse groundflora. Bog vegetation has not established due to the dry nature of the site. Over time, if conditions become wetter with the blocking of drains, Ling Heather cover and *Sphagnum* cover will increase.

Crosswood Quadrat 2

Area: 10 x 10m

Location: 10m South W6

Grid Ref:N0844 3973

Altitude: 53m

Bog Type: High Bog

Ecotope: NA

Slope: Slight

Aspect: South

Landuse: Forestry

Management: Clearfell

Date	17/08/2005	19/07/2006	15/08/2007	22/07/2008
Firmness	Dry	V Dry	Dry	Firm
Drains	Yes	Yes	Yes/blocked	Yes/blocked
Canopy Cover %	80	0	0	0
Canopy Height		0	0	0
Vegetation Cover %	30	15	30	35
Vegetation Height (cm)		10	50	30
Dwarf Shrub Cover %	0	0	1	2
Herb Cover %	5	5	20	33
Bryophyte Cover %	30	10	30	20
Sphagnum cover %	0	0	0	0
Open Water %	0	0	1	1
Brush cover %	10	30	30	20
Pine Needle cover %	70	50	30	10
Pine Needle Depth cm	5	10	5	1
Bare Peat %	0	5	5	1
Species number	5	7	11	14
<i>Picea sitchensis</i>	80	0	0	0
<i>Betula pubescens</i>				5
<i>Ulex eurpoeus</i>			1	2
<i>Rubus spp</i>		1	1	1
<i>Seneco jacobea</i>	1	1	5	5
<i>Digitalis purpurea</i>		1	5	10
<i>Juncus spp</i>		1	2	3
<i>Luzula</i>				1
<i>Molinia caerulea</i>			5	5
<i>Agrostis spp</i>		1		
<i>Pteridium spp</i>			1	1
<i>Pteridium spp</i>	5	1		
<i>Epiobium spp</i>				5
<i>Calluna vulgaris</i>			1	1
<i>Erica tetralix</i>				1
<i>Carex panicea</i>			1	
<i>Campylopus atroverins</i>			25	10
<i>Hypnum jutlandicum</i>	25	10		
<i>Polytricum commune</i>			5	10
<i>Dicranium spp</i>	5			



Crosswood Quadrat 2, 2005



Crosswood Quadrat 2, 2008

Quadrat 3: This quadrat is located along the southern margin of the project site and occurred under scrub of Pine, Birch and Gorse with an understory of Ling Heather, Purple Moor-grass and Bracken. With the felling of the conifers, it can be seen that Purple Moor-grass cover increased and Ling Heather decreased in the groundflora. Birch and Gorse dominate this scrub. Birch woodland is the natural vegetation of raised bog margins this woodland will be allowed to develop further

Crosswood Quadrat 3

Area: 10 x 10m

Location: 5m South W8 **Grid Ref:**N0809 3984

Altitude: 59m

Bog Type: Scrub

Ecotope: NA

Slope: Flat

Aspect: NA

Landuse: Unplanted

Management: Fell to Waste

Date	17/08/2005	19/07/2006	15/08/2007	22/07/2008
Firmness	Firm	V Dry	Firm	Firm
Drains	Yes	Yes	Yes	Yes
Canopy Cover %	50	10	10	60
Canopy Height		2	2	3
Vegetation Cover %	100	100	90	90
Vegetation Height (cm)		200	100	200
Dwarf Shrub Cover %	60	10	20	20
Herb Cover %	40	80	70	70
Bryophyte Cover %	40	0	20	20
Sphagnum cover %	20	0	10	10
Open Water %		0	0	0
Brash cover %	0	0	10	10
Pine Needle cover %	0	0	0	0
Pine Needle Depth cm		0	0	0
Bare Peat %		0	0	0
Species number	10	13	9	9
<i>Pinus contorta</i>	10	5		
<i>Betula pubescens</i>	10	5	10	20
<i>Ulex eurpoeus</i>	30	40	30	40
<i>Rubus spp</i>	5	1		5
<i>Molinia caerulea</i>	25	10	30	50
<i>Pteridium spp</i>	10	40	30	15
<i>Calluna vulgaris</i>	60	5	20	20
<i>Erica tetralix</i>		5		
<i>Hypnum jutlandicum</i>	20	5	10	10
<i>Sphagnum recurvum</i>	10	1		
<i>S. capillifolium</i>	10	2	5	5
<i>S. subnitens</i>		1		5
<i>S. magellanicum</i>		1	5	



Crosswood Quadrat 3, 2005



Crosswood Quadrat 3, 2008

Quadrat 4: This quadrat is located to the south-west of the plantation and occurred under closed canopy Sitka Spruce with a ground cover containing some Hypnum moss, but mainly consisted of pine needles. With the felling of the conifers, it can be seen that Bramble, and Ragwort are dominating the sparse groundflora. Bog vegetation has not established due to the dry nature of the site. Drains remain un-blocked in this area due to the close proximity of peat-cutting and will not be blocked until peat-cutting has ceased.

Crosswood Quadrat 4

Area: 10 x 10m

Location: 10m North W5 **Grid Ref:**N0867 3969

Altitude: 42m

Bog Type: Cutaway

Ecotope: NA

Slope: Flat

Aspect: NA

Landuse: Forestry

Management: Clearfell

Date	17/08/2005	19/07/2006	15/08/2007	22/07/2008
Firmness	Dry	V Dry	Firm	Firm
Drains	Yes	Yes	Yes/unblocked	Yes/ reopened
Canopy Cover %	90	0	0	0
Canopy Height	15	0	0	0
Vegetation Cover %	30	10	20	50
Vegetation Height (cm)		10	50	50
Dwarf Shrub Cover %	0	0	0	0
Herb Cover %	15	10	20	50
Bryophyte Cover %	15	1	20	15
Sphagnum cover %	0	0	0	0
Open Water %		0	0	0
Brash cover %	10	50	25	15
Pine Needle cover %	70	35	20	5
Pine Needle Depth cm	10	10	1	1
Bare Peat %		5	30	30
Species number	6	5	10	11
<i>Picea sitchensis</i>	80	0	0	0
<i>Betula pubescens</i>	10		1	5
<i>Ulex eurpoeus</i>			1	5
<i>Rubus spp</i>			5	10
<i>Hedera helix</i>	5	1		
<i>Seneco jacobea</i>		1	5	10
<i>Taraxicum spp</i>				2
<i>Digitalis purpurea</i>		2	5	5
<i>Juncus spp</i>			1	5
<i>Luzula</i>				3
<i>Pteridium spp</i>	10	5	1	2
<i>Epiolobium spp</i>				3
<i>Carex panicea</i>			1	
<i>Campylopus atroverins</i>			20	15
<i>Hypnum cupressiforme</i>	10			
<i>Hypnum jutlandicum</i>			5	
<i>Polytricum commune</i>		1		
<i>Dicranium spp</i>	5			



Crosswood Quadrat 4, 2005



Crosswood Quadrat 4, 2008

Quadrat 5: This quadrat is located at the south-western margin of the plantation and occurred under closed canopy Sitka Spruce with a ground cover containing some *Hypnum* moss, but mainly consisted of pine needles. With the felling of the conifers, it can be seen that Fireweed and Bramble are dominating the sparse groundflora. Bog vegetation has not established due to the dry nature of the site. Drains remain un-blocked in this area due to the close proximity of peat-cutting and will not be blocked until peat-cutting has ceased.

Crosswood Quadrat 5

Area: 10 x 10m

Location: 10m South W1

Grid Ref:N0779 4011

Altitude: 47m

Bog Type: Cutaway

Ecotope: NA

Slope: Slight

Aspect: South

Landuse: Forestry

Management: Clearfell

Date	17/08/2005	19/07/2006	15/08/2007	22/07/2008
Firmness	V Dry	V Dry	V Dry	Firm
Drains	Yes	Yes	Yes/blocked	Yes/blocked
Canopy Cover %	75	10	0	0
Canopy Height	15		0	0
Vegetation Cover %	50	20	25	60
Vegetation Height (cm)		30	50	50
Dwarf Shrub Cover %	0	0	0	0
Herb Cover %	28	10	25	60
Bryophyte Cover %	22	5	20	30
Sphagnum cover %	0	0	0	0
Open Water %		0	0	0
Brash cover %	20	40	40	30
Pine Needle cover %	50	40	25	5
Pine Needle Depth cm	10	10	2	5
Bare Peat %		0	5	5
Species number	7	5		8
<i>Pinus contorta</i>			1	
<i>Picea sitchensis</i>	75	0	0	0
<i>Betula pubescens</i>		10	5	
<i>Ulex eurpoeus</i>			2	3
<i>Rubus spp</i>	20	2		10
<i>Hedera helix</i>	2			
<i>Seneco jacobea</i>		5	10	5
<i>Digitalis purpurea</i>				5
<i>Pteridium spp</i>			5	2
<i>Pteridium spp</i>	5	3		
<i>Epiolobium spp</i>	1		10	35
<i>Carex panicea</i>			1	
<i>Hypnum cupressiforme</i>		5		
<i>Hypnum jutlandicum</i>	20			
<i>Polytricum commune</i>	2			10



Crosswood Quadrat 5, 2005



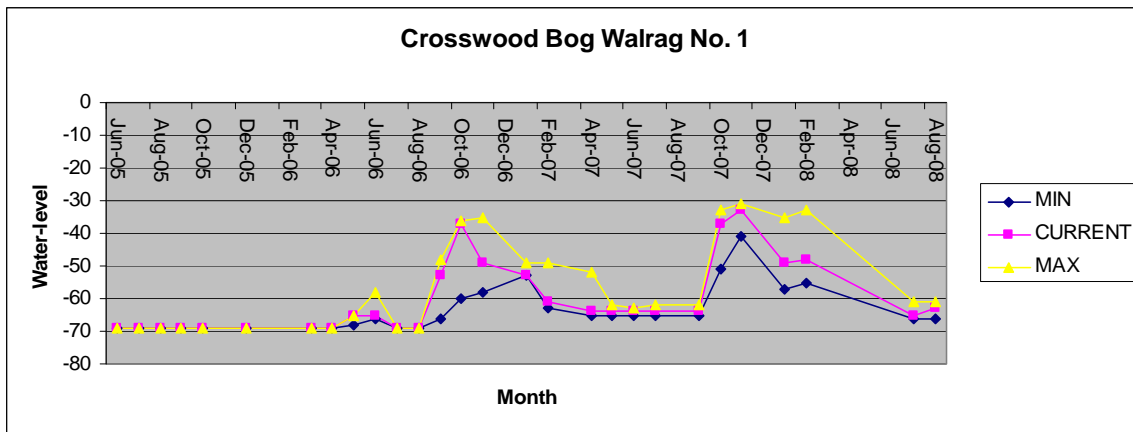
Crosswood Quadrat 5, 2008

7. Changes in Water-levels

Prior to restoration, Walrags were installed in the conifer plantation to record any changes in water-levels, due to tree removal and drain blocking. Water-levels were found to be up over **70cm** below the surface. With the removal of conifers and blocking of drains, there was a distinct rise in the water-table within the project site. However with the restrictions on drain-blocking and reopening of main drains at this site, there is limited possibility of maintaining high water-levels in the short-term.

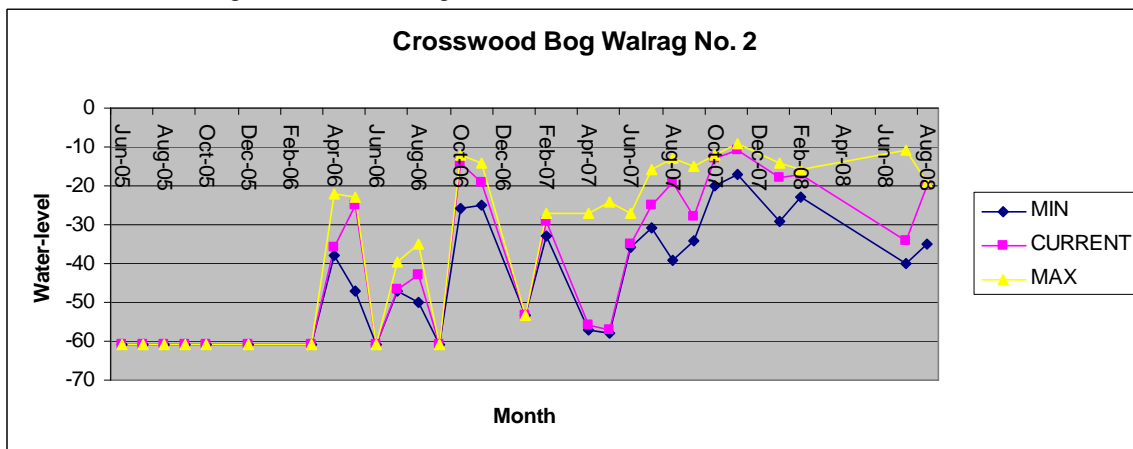
8. Hydrological Monitoring (Walrag) Graphs

Crosswood Bog Walrag 1: Closed Canopy Conifer Plantation on Cutover Bog. (Water-levels were raised after tree-felling and drain-blocking* but declined again once drains were reopened)



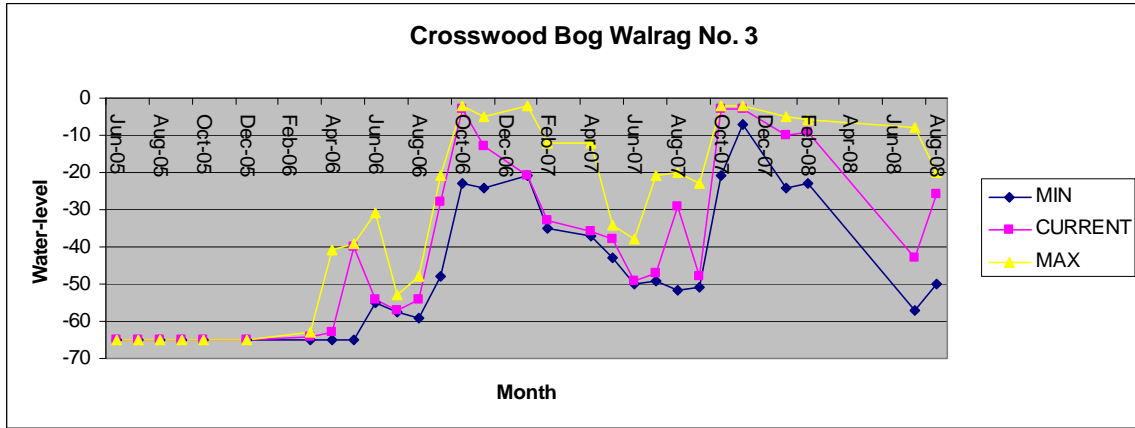
Jun 2005 *Clearfell Jun 2006 *Drain-blocking Jun 2007 Drains Reopened Aug 2008

Crosswood Bog Walrag 2: Closed Canopy Conifer Plantation on Cutover Bog. (Water-levels were raised after tree-felling and drain-blocking*)



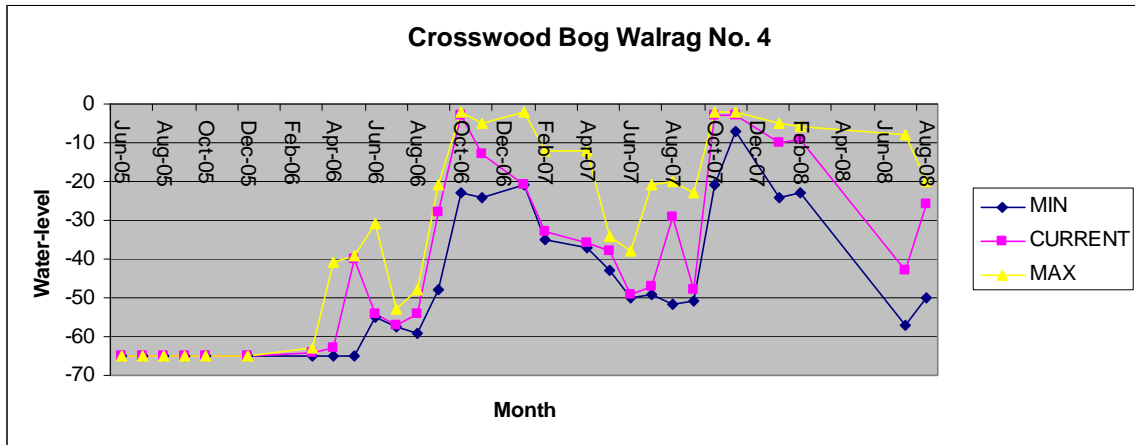
Jun 2005 *Clearfell Jun 2006 *Drain-blocking Jun 2007 Drains Reopened Aug 2008

Crosswood Bog Walrag 3: Closed Canopy Conifer Plantation on High Bog. (Water-levels were raised after tree-felling and drain-blocking* but declined again once drains were reopened)



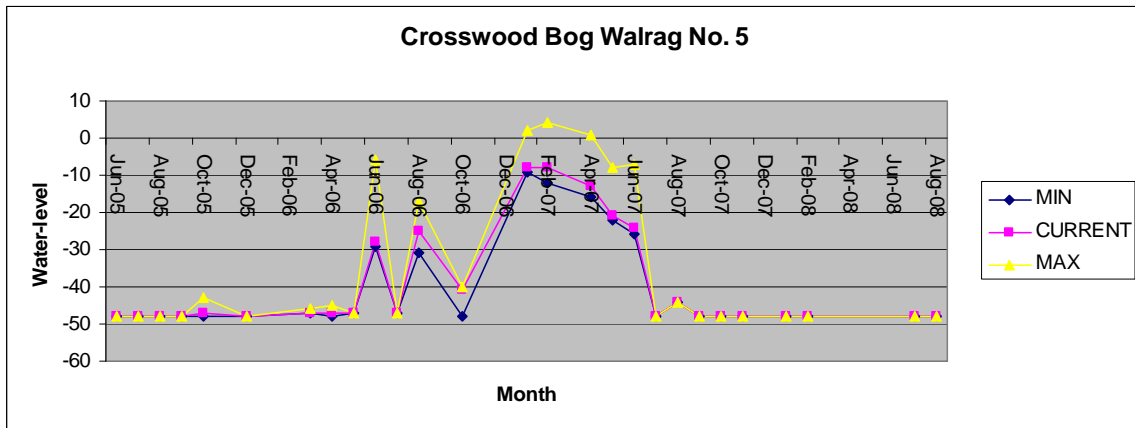
Jun 2005 *Clearfell Jun 2006 *Drain-blocking Jun 2007 Drains Reopened Aug 2008

Crosswood Bog Walrag 4: Birch woodland on Cutover Bog. (Water-levels have been raised post restoration* on adjacent conifer plantations. However water-levels still decline during summer months.)



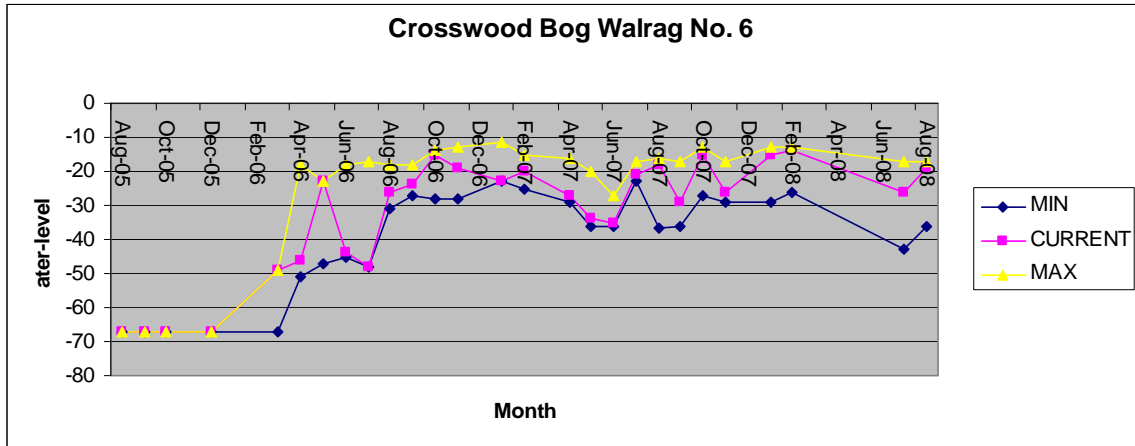
Jun 2005 *Clearfell Jun 2006 *Drain-blocking Jun 2007 Drains Reopened Aug 2008

Crosswood Bog Walrag 5: Closed Canopy Conifer Plantation on High Bog. (Water-levels were raised after tree-felling and drain-blocking* but declined again once drains were reopened)



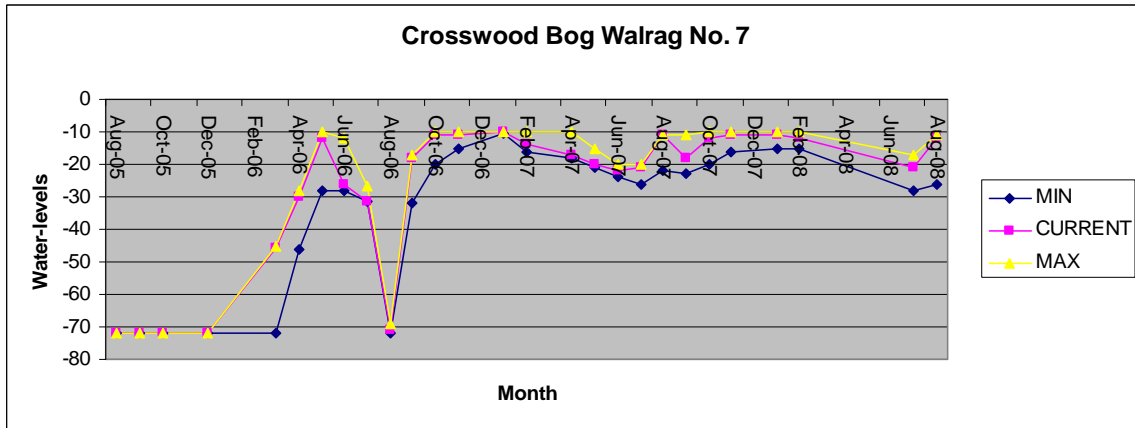
Jun 2005 *Clearfell Jun 2006 *Drain-blocking Jun 2007 Drains Reopened Aug 2008

Crosswood Bog Walrag 6: Closed Canopy Conifer Plantation on High Bog. (Water-levels were raised after tree-felling and drain-blocking* and remain high despite reopening of main drains)



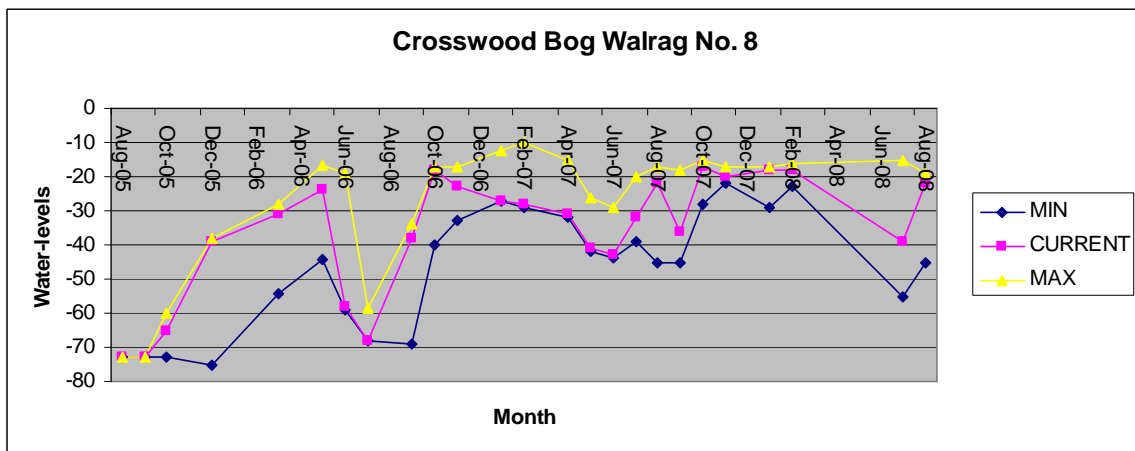
Jun 2005 *Clearfell Jun 2006 *Drain-blocking Jun 2007 Drains Reopened Aug 2008

Crosswood Bog Walrag 7: Closed Canopy Conifer Plantation on High Bog. (Water-levels were raised after tree-felling and drain-blocking* and remain high despite reopening of main drains)



Jun 2005 *Clearfell Jun 2006 *Drain-blocking Jun 2007 Drains Reopened Aug 2008

Crosswood Bog Walrag 8: Scrub woodland on Cutover Bog. (Water-levels have been raised post restoration* on adjacent conifer plantations. However water-levels still decline slightly during summer months.)



Jun 2005 *Clearfell Jun 2006 *Drain-blocking Jun 2007 Drains Reopened Aug 2008

9. Conclusions

Restoration work on this site is limited by the marginal nature of the restoration areas and the proximity of active turbury. Water-levels rose after the clear-felling of conifers and blocking of drains. However water-levels dropped sharply with the reopening of main drains, due to concerns of turbury rights holders. Without further blocking of drains the restoration areas will revert to wet woodland, which is already established on the bog margins. This site should be reassessed after peat-cutting has ceased, with the intention of further drain blocking.

10. References

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