

Professor Rhian Jenkins

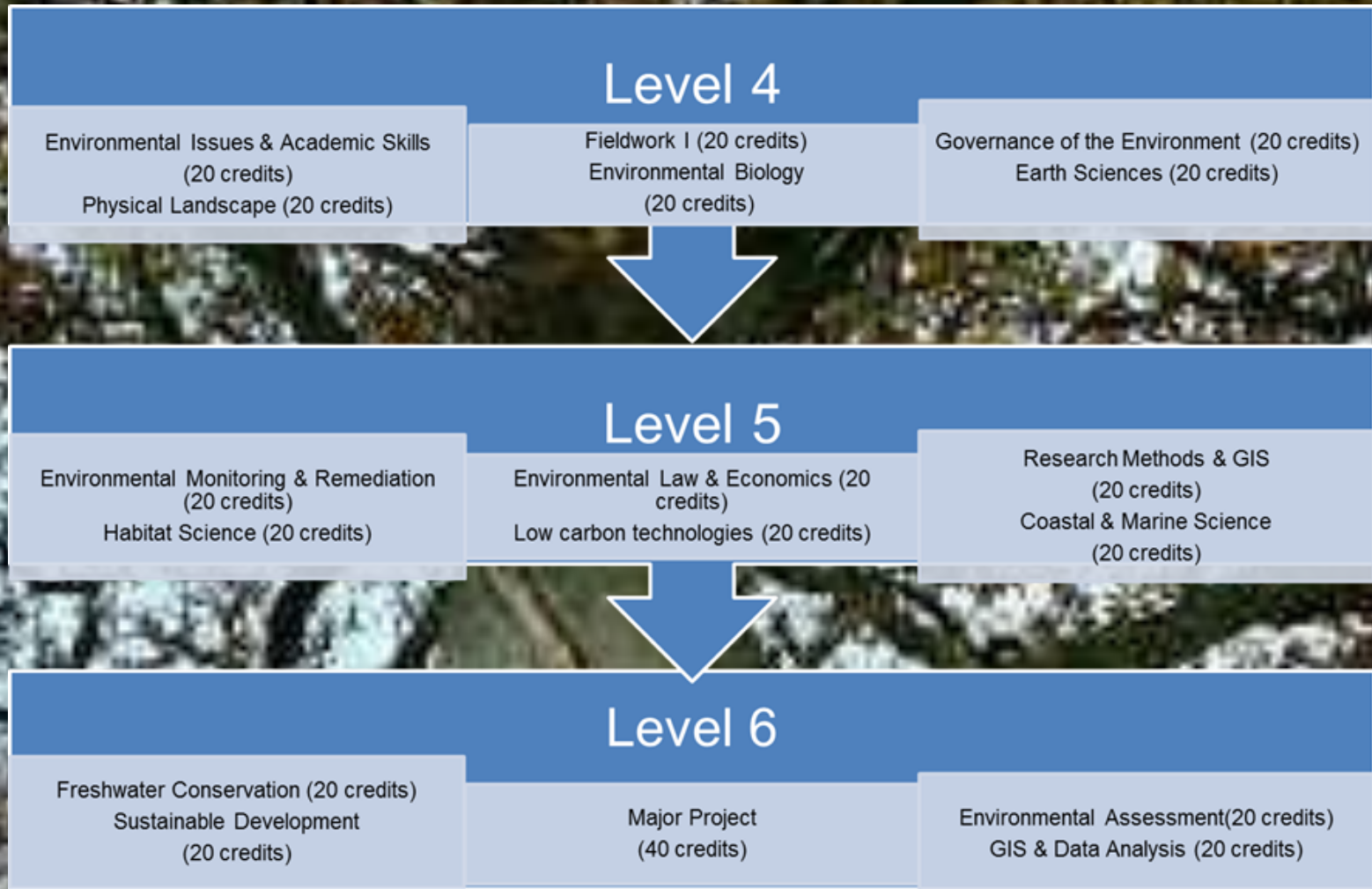
PhD, BSc, BA, MiEnvSci



Acting Head of School of Architecture, Built & Natural Environments. Principal Lecturer in Environmental Sciences

My areas of expertise are marine mammal science and in particular, the ecological implications for marine mammals from offshore renewable devices, as well as habitat management.

Level 4 Module



Environmental Issues & Academic Skills M1X9613

AIM(S)

- To introduce the core academic skills required for undergraduate study through the teaching of various environmental issues.

LEARNING OUTCOMES:

Upon the successful completion of this module, the student should be able to demonstrate the ability to:

1. Formulate an appreciation of environmental issues at differing scales.
2. Recognise the interrelationship of environmental issues and policies.
3. **Display the fundamentals of undergraduate study skills.**

INDICATIVE CONTENT:

Each environmental issue taught will also focus on an academic skill required for undergraduates:

- Biodiversity and sustainability: an introduction to these key issues (note taking – argument formulation)
- Distribution and examples of global terrestrial environmental issues (planning and preparation)
- Tropical Rain Forests and deforestation (sourcing information)
- Polar regions and environmental politics (Harvard referencing)
- **Energy – coal & extractive consequences (data analysis & poster presentations)**
- Renewable energy – tidal lagoon (seminar contributions)
- Air Pollution (journal article appraisal):
- Marine - overfishing and bycatch (field note books/procedures)
- Soil (research design)

Contaminated Land

- Industrial heritage
- Substantial legacy of land contamination
- Blight on communities
- Risks to human health and the environment

(NRW, 2016)



Contaminants

- Inorganic compounds
 - heavy metals
- Ubiquity and unknown effects on wildlife
- Pb concentration can cause loss of vegetation and genotoxic effects

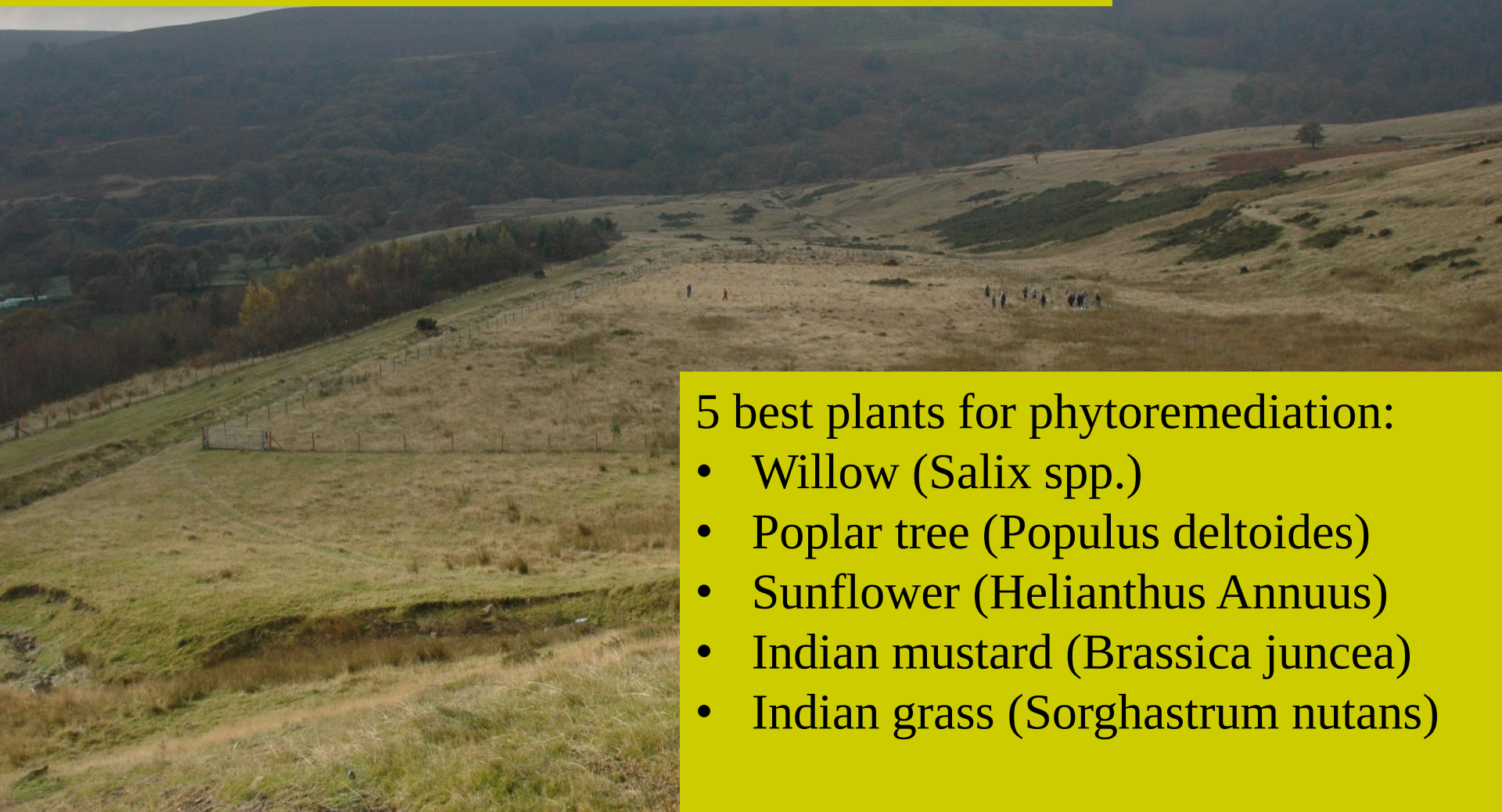


Land Remediation

- Traditional physical-chemical methods – expensive
- Soil structure disruption – affects future use
- Phytoremediation – two types suitable for heavy metal contamination:
 - Phyto-extraction – plant roots absorb the contaminants and stored in leaves & stems
 - Phyto-stabilisation – chemical compounds in the plant immobilise contaminants rather than degrade them

Phytoremediation:

“the direct use of living green plants for in situ removal, degradation or containment of contaminants in soils, sludges, sediments, surface water and groundwater.” (UNEP, 2013)



5 best plants for phytoremediation:

- Willow (*Salix* spp.)
- Poplar tree (*Populus deltoides*)
- Sunflower (*Helianthus Annuus*)
- Indian mustard (*Brassica juncea*)
- Indian grass (*Sorghastrum nutans*)

Phytoremediation

Advantages	Limitations
<i>In situ</i> passive method	High concentrations – risk to plants
Uses solar energy	Timeframe and space requirements
90% lower costs	Suitable for only moderate rates of contamination
Minimal effects on soils	Depth of soil and water
Soil stabilisation - ↓erosion; ↓run-off	Transfer of contaminants into food chain via animals
Carbon capture	Contaminants can enter groundwater
Recreational/aesthetic benefits	Disposal of contaminated plants
Biodiversity	

(Jakovljevic *et al.*, 2016)



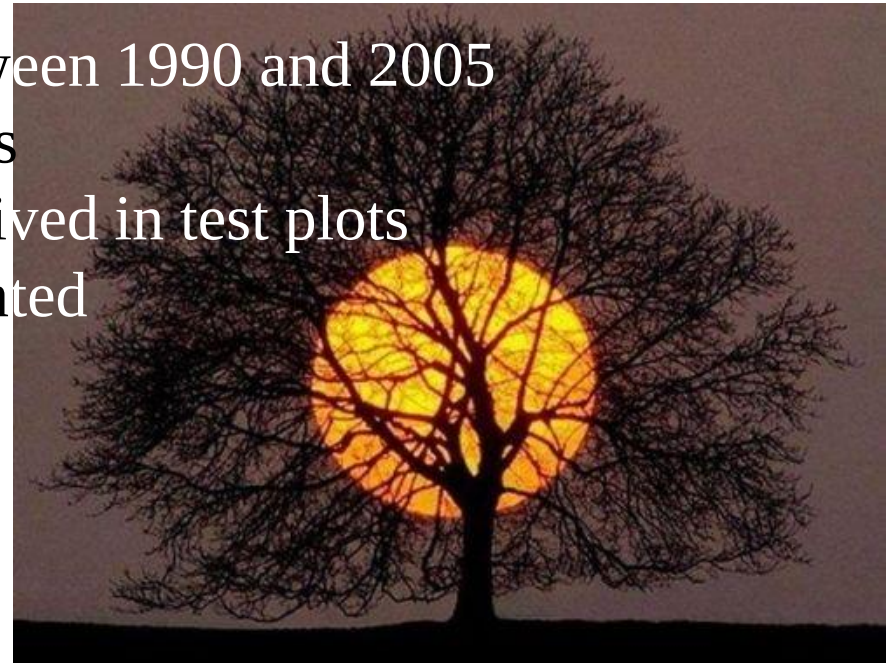
Large tracts of land, officially described as ‘reclaimed’ from former mineral workings, are in poor condition. Problems include gullyng, soil erosion, soil compaction, accelerated run-off and poor vegetation cover. Some of these problems are caused by low quality and inappropriate engineering. Some are due to poor land husbandry.

Haigh, M. (1992) Degradation of ‘reclaimed’ lands previously disturbed by coal mining in Wales: Causes and remedies. Land Degradation & Development



Site: Varteg Hill Reclamation, near Blaenavon

- Land reclamation since 1963 (National Coal Board)
- Now managed as open grazing (Common Land) rather than the oak woodland prior to industrialisation
- Challenges: Minespoil compaction; gulley incision; poor vegetative growth
- Government acknowledges issues but remediation is cost prohibitive
- Project run by Earthwatch between 1990 and 2005
- Today project run by volunteers
- Around 10,000 trees have survived in test plots
- University plot – 400 trees planted



Project's aim is to bring despoiled land into a more sustainable functioning system which would benefit the local community.

- Providing more aesthetically pleasing landscapes for recreation
- Improves air quality in the long-term
- Climate stabilisation role
- Improving water drainage/run-off



Tree planting at “Coed Mike”



Alder *Alnus glutinosa*



Sessile oak
Quercus petraea



Goat willow
Salix caprea



Downy birch *Betula pubescens*



Silver birch *Betula pendular*

Planting

- Latin Square
- Some single species rows
- Ploughed



Block A1

D	A	S	G	O
S	A	G	O	D
S	G	O	D	A
G	O	D	A	S
O	D	A	S	G

Block D2

M	A	A	A	A
M	A	A	A	A
M	A	A	A	M
M	A	A	A	A
O	O	O	O	O





The site
suffers
considerable
run-off and
erosion

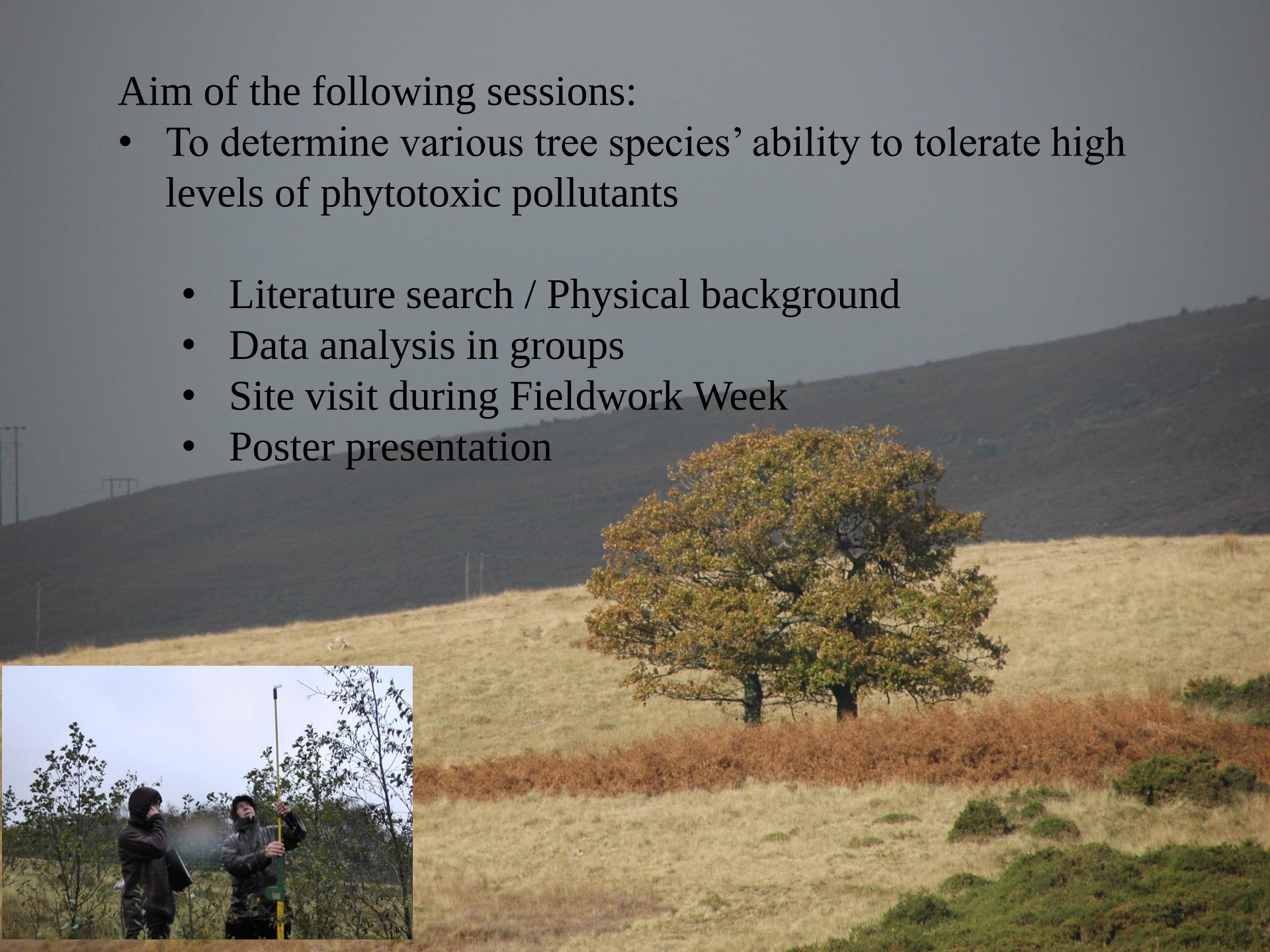


Soil compaction also
makes vegetative
growth challenging



Aim of the following sessions:

- To determine various tree species' ability to tolerate high levels of phytotoxic pollutants
- Literature search / Physical background
- Data analysis in groups
- Site visit during Fieldwork Week
- Poster presentation



Tree dead in 2007
Tree dead in 2008
Tree dead in 2009
Tree dead in 2010
Tree dead in 2011
Tree dead in 2012
Tree dead in 2013

Mortality in D1

301	302	X	304	305
306	307	308	309	310
X	312	X	X	315
X	317	318	X	X
X	322	X	X	X

Block D1		2006	2007	2008	2009	2010	2011	2012	2013						Vitality	2006	2007	2008	2009
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	2009 Comments	2010 Comments	2011 Comments	2012 Comments	2013 Comments	Index	Year 1	Year 2	Year 3	Year 4
Tag No.	Species	Height (cm)	Height (cm)	Height (cm)	Height (cm)	Height (cm)	Height (cm)	Height (cm)	Height (cm)							Base Diam (cm)	Base Diam	Base Diam	Base Diam
301	Mixed (Spruce)	41	47	52	63	75	96	127	153	Healthy	Healthy	Healthy	healthy	Needle loss	3	5	6	10	12
302	Alder		71	80	87	95	106	110	112	Sparse foliage	Spindly	Fair	wind blown	Poor; leaf loss	2	6	5	6	10
303	Alder	59	57	56						Stick in ground	Couldn't find	Missing	couldn't find	Couldn't find	0	6	6	6	
304	Alder	55	53	39	60	74	84	95	105	Healthy	Healthy but sparse	Spindly	bushy	leaf damage	3	5.5	5	8	12
305	Mixed (Spruce)	30	36	40	55	60	67	83	105	Healthy	Healthy	Healthy	bushy	needle loss but bushy	4	6	6	8	12
306	Oak	48	49	50	52	48	17	17	23	Regrowth from base	Clinging to life	Reshoot	smothered by gorse by healthy - sheltered perhaps	Clinging to life; in gorse	2	8	5	12	9
307	Oak	41	44	42	49	44	48	48	47	Sparse foliage	Spindly	Healthy	smothered by gorse by healthy - sheltered perhaps	fair; in gorse		5	5	5	6
308 (*)	Oak	50	47	46	28	29	36	45	5	Regrowth from base	Healthy	Twin shoot	smothered by gorse by healthy - sheltered perhaps	fair; in gorse	3	6	6	6	10
309	Oak	40	43	42	34	40	23	15	16	Sparse foliage	Small and spindly	Die back on top	reshoot	clinging to life	2	6	5	5	6
310	Oak	67	63	60	48	58	42	44	12	Sparse foliage	Spindly	Die back on top	poor	clinging to life, reshoot	2	7.8	8	8	7
311 (*)	Mixed (GW)	73	63	58	15	16	19	18		Regrowth from base	Clinging to life	twin re-shoot	reshoot	Couldn't find	0	8	4	6	2
312	Oak	49	46	46	11	13	18	35	33	Regrowth from base	reshooting from base	new shoot healthy	healthy reshoot	clinging to life	2	10	10	10	10
313	Alder	56	56	53						Stick in ground	Couldn't find	Missing	couldn't find	Couldn't find	0	8	5	6	

Tree Vitality

Using the Vitality Index provided as a guide, you are required to map a mortality grid. You may use the vitality index provided or create your own.

Vitality Index:

0 = Disappeared/missing

1 = Stump/stick in ground

2 = Poor foliage/insect infestation etc

3 = Average foliage with some leaf damage

**4 = Good growth but uneven distribution
leaves/branches**

5 = Excellent growth/ form typical of species



A1	1	X	3	4	5
	6	7	8	9	10
	11	12	13	14	15
	16	17	18	X	20
	21	22	23	24	X
A2	X	27	28	29	30
	31	32	X	X	35
	X	X	38	X	40
	X	42	X	X	45
	X	X	X	49	X

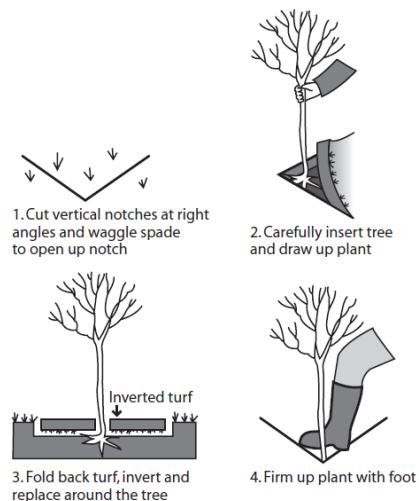
Missing
Stump
Poor
Average
Good
Excellent

- And finally some ideas.....
 1. Annual differences? Causes?
 2. Investigate the correlation between KPN (fertiliser), species and tree vitality
 3. Investigate the correlation between compost and tree vitality
 4. Provide possible reasoning for any trends which may appear

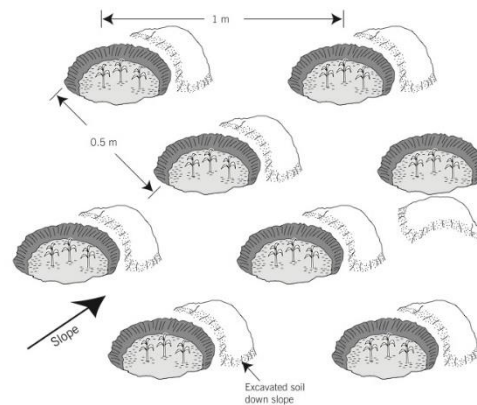
Initial Results: Effects of planting method on growth and survival of *Alnus glutinosa* and *Quercus petraea* (Haigh *et al.*, 2013)

- Survival & growth rates are significantly better for trench planted trees.
- Growth rates for trench planted ↑ with time
- Mortality rates (Pit vs trench) become less significant with time
- Loosened, lower density, rooting substrate is key to growth & survival
- Trench planting – greater soil moisture in rooting zone

Notch planting



Pit planting



Trench planting

