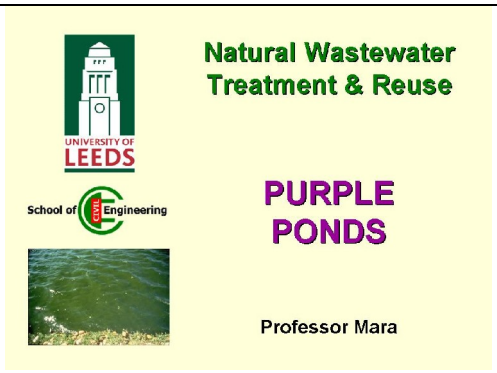
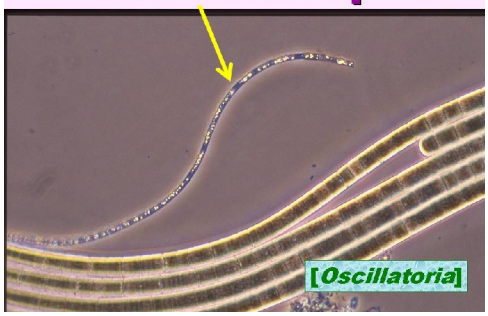
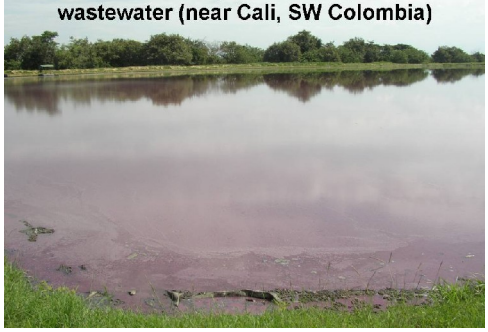
WASTE STABILIZATION PONDS 5
Purple ponds

1.		This is a presentation on purple ponds.
2.		Sometimes facultative ponds turn purple, or a red or pink colour, as you can see in this slide of a facultative pond in Jamaica.
3.	**PURPLE PONDS** Facultative ponds sometimes turn a purple (or red or reddish brown) colour. This is due to the growth of photosynthetic bacteria ❑ Occurs mainly in overloaded facultative ponds: 1. Sulphate reduction to hydrogen sulphide by anaerobic sulphate-reducing bacteria	The reason why facultative ponds turn purple is that the algae are no longer the predominant microbial group; they have been outgrown by photosynthetic bacteria. This occurs mainly in slightly overloaded facultative ponds, and it's due to these two factors. Firstly, the sulphates in the wastewater are reduced to sulphides by the obligately anaerobic sulphate-reducing bacteria, such as *Desulfovibrio* spp.
4.	2. Oxidation of hydrogen sulphide to sulphur and sulphate by anaerobic photosynthetic purple and green bacteria – no O_2 production as photosynthetic bacteria oxidize H_2S, not H_2O – Equation: $21H_2S + 10CO_2 + 2NH_3 \xrightarrow{\text{light}} 2(C_5H_8O_2N) + 21S + 16H_2O$ Produced by sulphate-reducing bacteria	Secondly, the sulphides so produced are oxidized to sulphur (and sometimes eventually to thiosulphates and sulphates) by anaerobic photosynthetic green and purple bacteria. Photosynthetic bacteria don't produce oxygen because they oxidize H_2S, not H_2O. The equation for bacterial photosynthesis is shown on the slide, and you can see that 10 moles of CO_2 are fixed by the bacteria for every 21 moles of H_2S oxidized to sulphur.

5.	❑ Two important groups of photosynthetic bacteria in WSP: – purple sulphur bacteria (Chromatiaceae) — sulphur granules deposited within cells – green sulphur bacteria (Chlorobiaceae) — sulphur deposited outside cells	In ponds there are usually two important groups of photosynthetic bacteria: the purple sulphur bacteria belonging to the family Chromatiaceae, and the green sulphur bacteria belonging to the Chlorobiaceae. The purple bacteria deposit sulphur granules inside their cells, and the green ones deposit them outside their cells.
6.	***Thiothrix* sp.**  [*Oscillatoria*]	This is a photomicrograph of *Thiothrix*, a purple sulphur bacterium, and you can clearly see the sulphur granules inside its cell.
7.	❑Bacteriochlorophyll absorbs light of longer wavelength than algal chlorophyll (750–900 nm, rather than <700 nm) ❑So photosynthetic bacteria occur in non-overloaded facultative ponds below the algae and above the anaerobic zone ❑They thus act as a sulphide filter – protecting the algae from sulphide toxicity, and also helping to control odour release.	Bacteriochlorophylls, which are the group of photosynthetic pigments in photosynthetic bacteria, absorb light of a longer wavelength than algal chlorophylls. This means that photosynthetic bacteria occur in facultative ponds which are not overloaded; they lie below the algae but above the anaerobic zone at the bottom of the pond where the sulphates are reduced to sulphides. So they act as a 'sulphide filter', protecting the algae from the toxic effects of H_2S (and also helping to control odour release).
8.	Anoxic facultative pond treating sugar mill wastewater (near Cali, SW Colombia) 	Facultative ponds, like this one in southwest Colombia, turn purple when they are overloaded. So much sulphide is produced that the algae are inhibited (in fact, by the high level of dissolved H_2S gas), and concomitantly there is a huge growth of photosynthetic bacteria as they quickly respond to the greatly increased concentrations of sulphide, so the pond turns purple.