Cumberland State Forest
Earth and Environmental Science Year 11 (Stage 6)
Lesson Plan

Syllabus Links

8.3 – The Local Environment
2. The properties of local soils affect the local biological environment

Students learn to:

- Analyse the ways in which the vegetation of an area can be influenced by soil composition and climate
- Relate the presence of particular animals in the local environment to their requirements within the local environment

Students:
Choose equipment, plan and perform first-hand investigations during a local field study to:

- identify the main parent rock types (if present)
- analyse the soil in each area for:
  - organic content
  - pH
  - moisture content
  - presence of salts (chlorides)
- identify, gather and process first-hand or secondary data to identify the dominant types of plants and animals in the area studied

3. The impact of humans on local aquatic and terrestrial environment will differ with locality
Students:
Identify data, gather, process and analyse first-hand information and use available evidence to assess current human impact on the local biotic and abiotic environment

Activities and Lessons

Introductory talk

Give context and history about Cumberland state forest – has been logged in the past and is not in a completely natural state. Explain that the old logged sections are reasonably close to a natural composition, but the recently logged areas, and arboretum are not.

Split students into groups of 4 or 5. At each stopping location you will need to rotate the groups between the equipment to get all of the tests done in time.
There are three main stopping points along the track. Site 1 is just after marker 3, in the area with log seating. Site 2 is at the 1993 re-growth area (marker 4) and Site 3 is just before marker 9 as you proceed north to the arboretum.

Activity 1

At site 1 (the creek), students are to collect a water sample to test:

- Salt content (use silver nitrate or an EC meter)
- pH
- turbidity
- whether the water is flowing or not

Activity 2

At each of the three locations students are to:

- Describe the canopy and estimate canopy cover (%)
- Describe the groundcover and estimate ground cover (%)
- Describe the undergrowth
- Name the main plant species
- Look and listen for animals, insects and birds, noting the difference between each site. Students might look for scats, tree scratchings, nests etc.
- Note evidence of rocks and rock types e.g. sandstone, shale
- Test soil pH
- Texture a soil sample
- Measure soil moisture
- Conduct the ASWAT test (testing for salts)
- Do a soil colour rubbing

Activity 3

Take students back to the visitors centre and briefly discuss:

- Government regulation and management of forests (including weed management, land use and rehabilitation)
- Focus on the legal sides of these issues

Timing

- Introductory talk – 10 minutes
- Site 1 – 25 minutes
- Site 2 – 15 minutes
- Site 3 – 15 minutes
- Plus 30 minutes walking time
- Closing discussion – 15 minutes

Resources and Equipment

- Worksheets
- Students need to bring clipboards and pencils.
- Shovel/hand trowel for soil
- Bucket of water to texture soil and wash hands
- pH test kits
- Containers for water sampling
- Soil moisture meter
- Petri dishes
- Sliver nitrate for testing presence of salts (chlorides) (or EC meter)
- Deionised water or rainwater for the ASWAT test

How to texture a soil

1. Take a handful of soil. Don't take the soil directly from the surface because you'll get mostly plant roots. Dig a small hole and take the soil from about 10cm depth. Remove all pebbles and stones.
2. Add water slowly until you can make a wet ball with the soil – a 'bolus'. Be careful not to add too much water, as it's very difficult to texture a soil that is saturated.
3. If you can't make a ball, and the soil feels like sand, you've probably got a sand.
4. Keep working the soil around in your hand. Using your thumb and forefinger, try and make a 'ribbon' out of the soil
5. Use the flow chart and table to work out your soil texture.

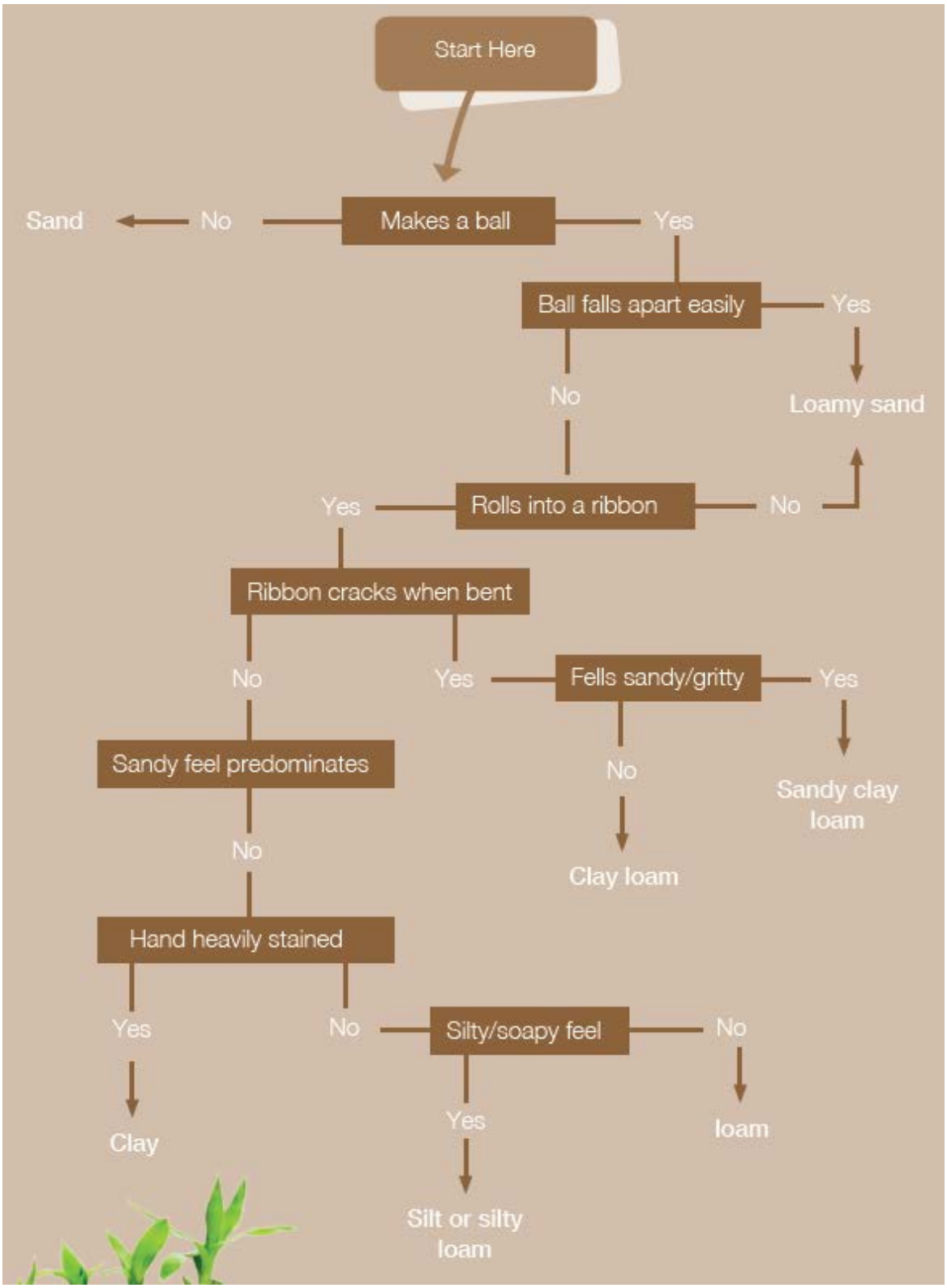
Slowly add water to soil

Work soil in hand to make a 'bolus'

Soil Texture	Description	Ribbon Length
Sand	Sand granules up to 2 mm in size. Sand	Sand granules up to 2 mm in size. Sand
Loam	Approximately 40 % sand, 40 % silt and 20% clay. When worked into a bolus, a loam is smooth and spongy in the hand, and very coherent.	Approximately 40 % sand, 40 % silt and 20
Clay	A clay will become more plastic (i.e. more difficult to squash) when worked in the hand. Clay soil often stains your hand	> 75 mm

Note: a soil with higher organic matter will feel a bit 'spongy', like a loam.

Flow chart to use when texturing a soil



The Aggregate Stability in Water (ASWAT) Test

You can get an idea of how salty a soil is by using the ASWAT (Aggregate Stability in WATer) test. You will need:

- Air dry aggregates of soil (called peds)
- Rainwater (or distilled water if you don't have any rainwater)
- A Petri dish, or shallow clear container

Method

1. Fill the container with 1 – 2 cm of rain water
2. Carefully place 3 or 4 soil aggregates into the dish, evenly spaced around the edges
3. Check them immediately and record if the soil has slaked or dispersed
4. After 10 minutes, check the aggregates again
5. Leave the aggregates undisturbed for 2 hours, then check (you won't have enough time for this step at the State Forest, but if doing the test again, you should include this step)

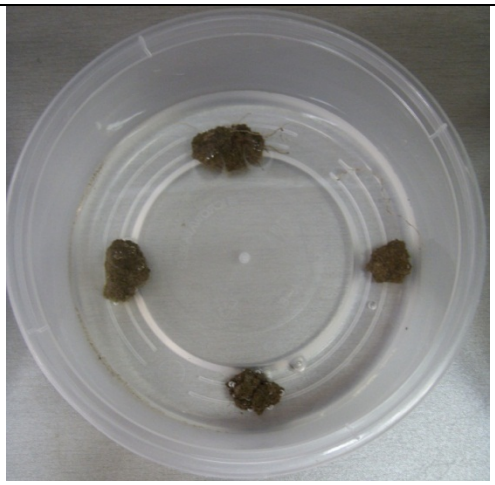
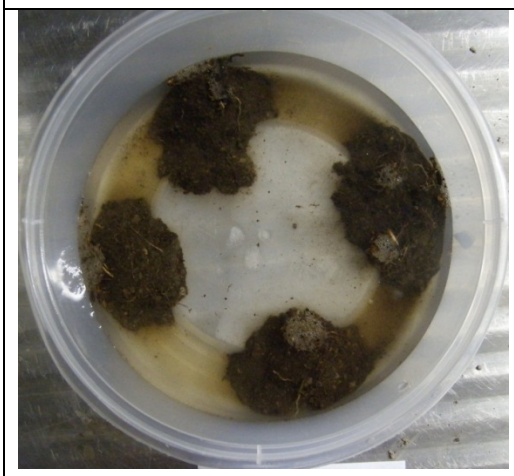
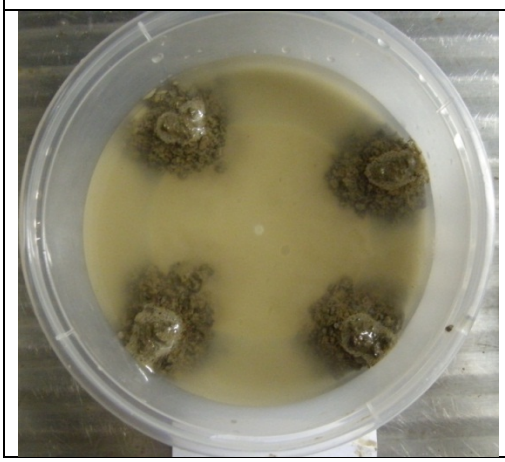
If the water around the aggregates becomes 'cloudy', then dispersion has occurred. If the aggregates have only 'crumbled', then only slaking has occurred. You can have both slaking and dispersion at the same time.

The more a soil disperses, the more salt (sodium) it contains.

A soil that slakes, has a weak structure. This means that if the soil was cleared, it would be more likely to erode. Soil slakes because the water enters pores in the ped and forces it apart. A slaked soil also indicates low organic matter content. The more organic matter a soil has, the stronger its structure.

If the aggregates remain intact you have a soil with a good structure, and enough organic matter to hold it together. This is good for plant growth, as the soil will retain its structure during rainfall or irrigation.

ASWAT Test Descriptor Photos

	No slaking or dispersion
	Slaking, minimal dispersion
	Slaking and dispersion. Note how the water around the soils is very cloudy – this is dispersion

Cumberland State Forest Worksheet
Year 11 Earth Science

Name: _____

1. Take water samples from the creek (site 1) and measure the following parameters:

	Site 1
Salt content	
pH	
Describe the water: **Water colour** **Is it clear or turbid?**	
Is the creek flowing?	

Fill out the following table at each of the site:

	Site 1	Site 2	Site 3
Canopy cover (%)			
Canopy cover description			
Ground cover (%)			
Ground cover description			
Undergrowth description			
Main plant species			
Look & listen for any plants, animals and birds. Write down what you see and hear (e.g. scat, tree scratchings, nests)			
Rock types in the area			
Soil pH			
Soil texture (sand, loam, clay, or something in between?)			
Soil Moisture (%)			
Soil structure: **Slaking?** **Dispersion?**			
Soil colour rubbing **(a 'blacker' soil will contain more organic matter)**			

2. What differences do you notice about the undergrowth at each of the sites? Explain these differences.

3. What are some of the environmental regulations applying to the forestry industry?

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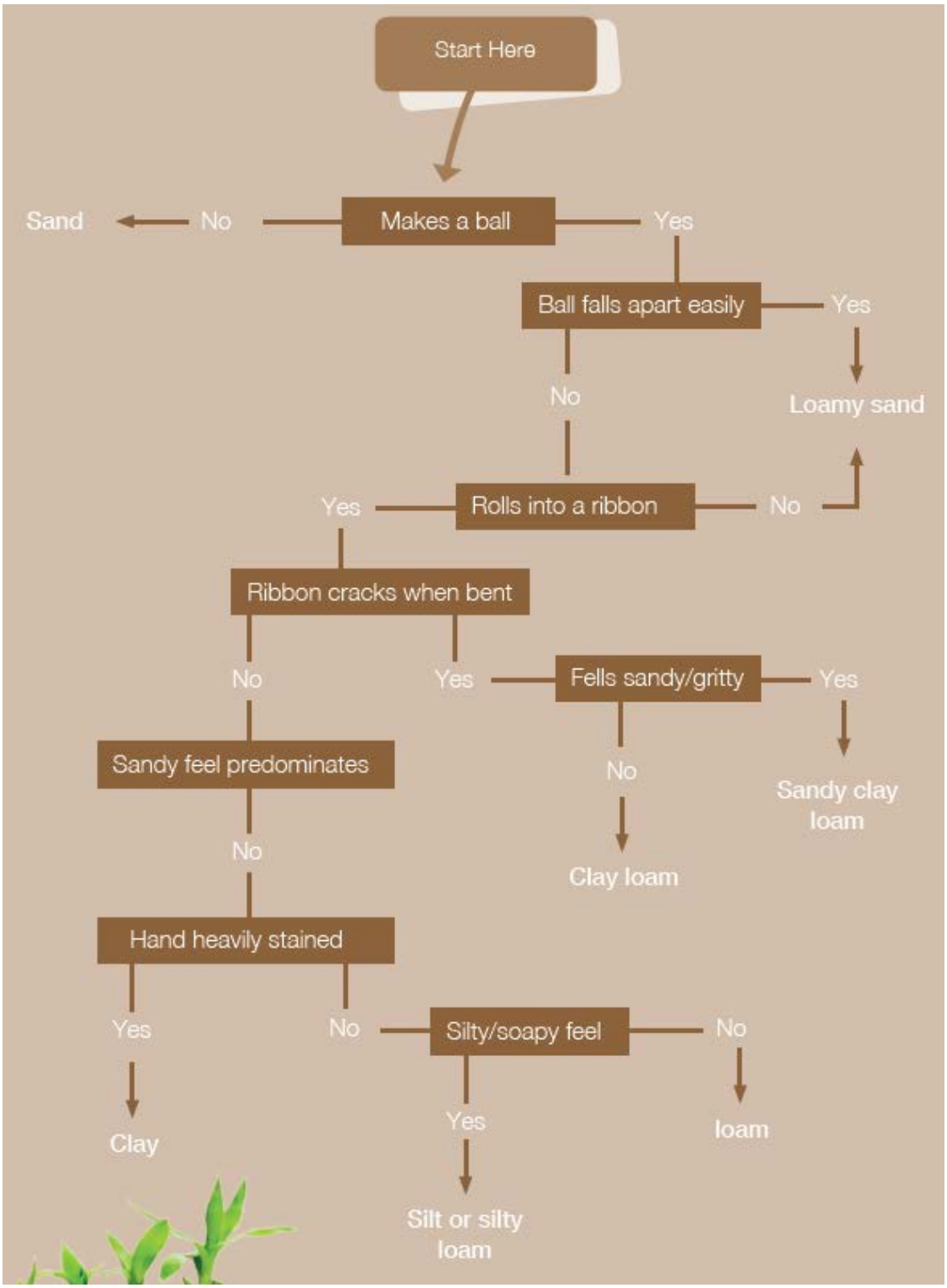

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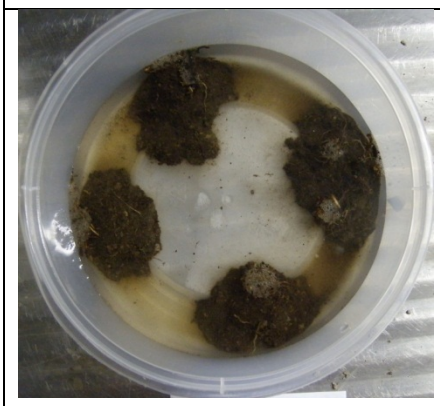
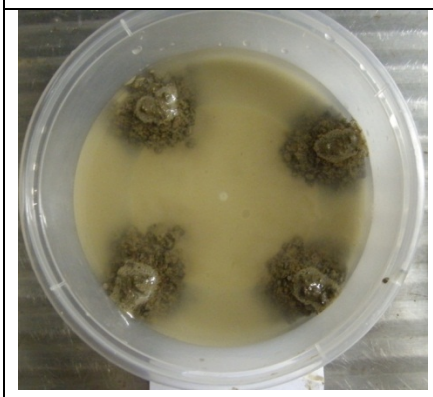
	Slaking, minimal dispersion
	Slaking and dispersion. Note how the water around the soils is very cloudy – this is dispersion

Cumberland State Forest Map