The DIRT DRAinaGe RACE

Soil Infiltration Test

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(July 2014)

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| Materials @ Each Soil Test Station | Shared Materials |
| * Soil Sample bucket
* Drip Bucket
* Soil Test Bowl
* Water Bottle (500 mL or 16.9 oz)
* Soil Dump Bucket (optional)
* Soil Shovel (can also be shared)
 | * Coffee Filters
* Filter Fabric (coffee filters will also work)
* Stopwatch
* Log book (to record observed times)
* Water Reservoir (to fill water bottles & wet filters)
* Water Dump Bucket (to drain all Drip Buckets)
* Prediction coins/tokens/markers (optional)
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Preparation: Drill 36 holes (13/64” diameter) into bottom of Soil Bowl (Evenly distribute holes)

 Pre-Cut Coffee Filters to fit bottom of bowl (Slightly oversize so entire bowl bottom covered)

 Pre-Cut Filter Fabric (Large enough to cover soils as water poured)

 Find Soils to be tested (ex. Hardware store, yard, etc.)

Tips:

* Have a log book and record each Tester’s race result (Soil Test Category > Name & Observed Time). Scientists can then compare their results to other testers. Are they consistent? What is the range of results?
* Prefill lots of 16 oz water bottles. Keep large reservoir handy.
* Insert coffee filters into soil test bowls for the testers (this can be tricky, but some might enjoy it)
* Keeping Time (Alternatives)
	+ One person can serve as THE TIMEKEEPER, while testers observe 1-2 stations. TIME KEEPER says “start” and testers pour. Testers call out soil name (ex. Gravel Done!) when water disappears and timekeeper calls out and records the time.
	+ Multiple stopwatches may be used (one at each test station).
	+ No watch. Just pour water on soils at same time and observe race to see which drains 1st, 2nd …
* Clean-up
	+ Dump drip water into common water Dump Bucket.
	+ Dump soils into Dump Buckets (if not going to reuse soils, can dump into common bucket).

**Part 1: Dry Soil Test (~10-15 minutes)**

Pre-Test:

* Testers Predict infiltration rankings for soils (fastest to slowest draining) [place numbered tokens]
* Will washed and unwashed play sand drain in the same amount of time?
* Watch the drip rate through the bottom of the container. Does it drip the same rate throughout the test?
* Ready the log book to record times (as the times are announced by testers)

Methodology

1. Each Tester selects a soil test station (or two, if tester can pour two water bottles at the same time)
2. Grab the Soil Test Bowl
3. Wet a Coffee Filter
4. Place the Filter in the bottom of the Soil Test Bowl (Make sure all bowl holes & lower edges/sides covered, do not tear or punch holes in filter).
5. Fill Bowl with Soil to 12 oz (350 mL) Line (Gently tamp & make smooth level surface).
6. Place Filter Fabric on top of Soil.
7. Place Soil Test Bowl into the Drip Bucket (Bowl must be elevated so it can freely drain into the bucket).
8. Fill Water Bottle with 16 oz of water
9. Testers get ready … then pour at … “START!”
10. Gently Pour Water onto the Filter Fabric (Goal to fill Bowl without disturbing the soil layer).
11. Carefully Remove Filter Fabric.
12. OBSERVE until water completely disappears into soil…Tester announce Soil Type Done (Ex. “Gravel Done!”)
13. Timekeeper announces the time & records in the Log Book.
14. When all soils drained, Testers collect their predictor tokens & discuss results.

**Part 2: Wet/Compacted Soil Test (~15 minutes)**

Pre-Test:

* Testers Predict infiltration rankings for soils (fastest to slowest draining) [place numbered tokens]
* How do Testers think rates will compare to dry uncompacted soils?
* Will soil drain in same order as before?
1. Let wet soils drain (~5-10 minutes)
2. Remove Soil Test Bowl from Drip Bucket
3. Gently compact soils w/ flat side of shovel (not too much & not too little – OBSERVATIONS when compacting)
4. Place Filter Fabric on top of Soil.
5. Place Soil Bowl into Drip Bucket (Bowl must be elevated so it can freely drain into bucket).
6. Fill Water Bottle with 16 oz of water.
7. Testers get ready … then pour at … “START!”
8. Gently Pour Water onto Filter Fabric (OBSERVATION did water fill to same level as before).
9. Remove Filter Fabric.
10. OBSERVE until water completely disappears into soil…Tester announce Soil Type Done (Ex. “Gravel Done!”)
11. Timekeeper announces the time & records in the Log Book.
12. When all soils drained or when final results clear, Testers collect their predictor tokens & discuss results
13. Dump Soil into the Soil Dump Bucket.
14. Dump Water into the Water Dump Bucket.

Post-Test:

Which soils changed the most/least? Why?

Facilitator Note: Record the start time of the first compacted clay sample & keep experiment running for entire event!

The DIRT DRAinaGe RACE **[Log Book]**

**Part 1: Dry Soil Test**

Clay

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Tester Name: |  |  |  |  |  |  |  |
| Drain Time: |  |  |  |  |  |  |  |

Play Sand

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Tester Name: |  |  |  |  |  |  |  |
| Drain Time: |  |  |  |  |  |  |  |

Play Sand (Washed)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Tester Name: |  |  |  |  |  |  |  |
| Drain Time: |  |  |  |  |  |  |  |

Gravel

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Tester Name: |  |  |  |  |  |  |  |
| Drain Time: |  |  |  |  |  |  |  |

Top Soil

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Tester Name: |  |  |  |  |  |  |  |
| Drain Time: |  |  |  |  |  |  |  |

**Part 2: Wet/Compacted Soil Test**

Clay

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Tester Name: |  |  |  |  |  |  |  |
| Drain Time: |  |  |  |  |  |  |  |

Play Sand

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Tester Name: |  |  |  |  |  |  |  |
| Drain Time: |  |  |  |  |  |  |  |

Play Sand (Washed)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Tester Name: |  |  |  |  |  |  |  |
| Drain Time: |  |  |  |  |  |  |  |

Gravel

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Tester Name: |  |  |  |  |  |  |  |
| Drain Time: |  |  |  |  |  |  |  |

Top Soil

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Tester Name: |  |  |  |  |  |  |  |
| Drain Time: |  |  |  |  |  |  |  |