SASTA OLIPHANT SCIENCE AWARDS

SOUTH AUSTRALIAN SCIENCE TEACHERS ASSOCIATION

Prize Winner

Scientific Inquiry

Year 3-4

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How plants help with soil and water conservation?

Questioning and predicting

In this project, I will study how plants help with soil and water conservation. My prediction is that landscape with plant coverage can better keep the soil in place and retain water in the soil.

Planning and conducting

I'm going to do an experiment using grass to help answer the question. I'll test three things: a patch of grass, a patch of plain dirt, and a floor tile. The dirt shows what dry land looks like, and the tile is like a hard ground with no plants. I'll use a garden hose to make pretend rain and see what happens. I'll check how heavy each patch is before and after the rain to see how much water they soak up and how much dirt washes away. I'll also try making the rain heavier and tilting the ground to see if anything changes.

Equipment and Materials

The equipment and materials I used include:

- Three 50cm x 50cm floor tiles
- One 50cm x 50cm grass patch (Buffalo grass from Bunnings)
- A big pile of dirt
- Garden hose and tap water
- Notebook
- Pencil
- Timer (on a cell phone)
- Weight scale
- Protractor

The tiles were very heavy. My dad helped me move it around. There was no other risk.

Processing and analysing data and information

I took the following steps to prepare for the experiment:

1. My dad put three floor tiles in a row on our front porch (Figure 1).

Grass patch Soil patch Bare tile

Figure 1. The three flat landscapes in my experiment

2. I laid the grass patch it onto the first tile. The grass patch is about 5cm thick.
3. Then I piled up the soil onto the second tile. I made it about 5cm thick to compare with the grass patch, and pressed it firm.
4. I left the third tile as is.
5. We weighed each landscape unit on a scale and put down the number on the notebook.

Then I did my experiments:

Experiment 1: storm on flat landscapes

1. I turned on the water and used the garden hose to spray water from right above onto each landscape for one minute using a timer. I used the "shower" function to mimic storm because the water spray from the "shower" mode is very strong.
2. My dad helped me weigh each unit after the storm and I put down the numbers.
3. Then we waited for 24 hours and weighed each unit again to see how much water was kept after evaporation.

Experiment 2: shower/drizzling on flat landscapes

I followed steps 1 to 3 in Experiment 1 above except that in Step 1, I used the "mist" function to mimic small rain for one minute.

Experiment 3: storm on sloping landscapes

In this experiment, I used a protractor to tilt each landscape to be 15-degree gentle slopes (Figure 2), and later 30-degree steep slopes. Then, I followed Steps 1 to 3 in Experiment 1 in each case.

Grass patch Soil patch Bare tile

Figure 2. The three gentle slope landscapes in my experiment

Experiment 4: shower/drizzling on sloping landscapes

In this experiment, I also used slanted ground like I did in Experiment 3, but this time I used the "mist" setting on the hose.

I checked the weight of each patch right before and after the rain, and then again after 24 hours. The changes in weight are shown in Table 1.

Table 1. Weight changes in all experiments

Landscape	Rain type	Measuring time	Grass	Tile	Soil
Flat	Storm	Instant	1.8 kg	-0.1 kg	-1.7 kg
		After 24 hours	1.2 kg	0 kg	-2.0 kg
	Shower	Instant	0.9 kg	0.1 kg	0.5 kg
		After 24 hours	0.6 kg	0 kg	0.1 kg
Gentle slope (15°)	Storm	Instant	1.5 kg	0.1 kg	-2.2 kg
		After 24 hours	0.8 kg	0 kg	-2.4 kg
	Shower	Instant	0.8 kg	0.1 kg	0.6 kg
		After 24 hours	0.5 kg	0 kg	0.2 kg
Steep hill (30°)	Storm	Instant	1.9 kg	0.2 kg	-3.5 kg
		After 24 hours	1.1 kg	0 kg	-3.6 kg
	Shower	Instant	0.9 kg	0.1 kg	-1.5kg
		After 24 hours	0.5 kg	0 kg	-1.8kg

I found a few things in my experiment:

1. Grass soaked up the most water during the rain and still had the most water after one day. The dirt under the grass stayed in place and didn't wash away.
2. The tile didn't hold any water. The rain just ran off and it dried up quickly.
3. The plain dirt got messy in heavy rain. Some water stayed during light rain, but most of it dried up fast, and some of the dirt washed away.

Evaluating

My experiments supported my predictions plant cover can better keep the soil in place and absorb water in the soil. In the future, I can try different plants and types of dirt to get more complete results. My findings can help people decide what landscape to build in their gardens to conserve soil and water.

Communicating

I found out that grass holds the most water out of the three landscapes, and the water dries up the slowest. Plain dirt can wash away easily during big rainstorms,[i] especially if the ground is steep. Hard surfaces, like tiles or concrete, don't soak up much water at all, and most of the rain just runs off.

So plants are the best choice because they stop dirt from washing away and help save water by soaking it up and keeping it from drying too fast. Places with only a few plants can lose a lot of soil. Hard surfaces can't hold any water and might even cause floods during heavy rain.[ii]

So we should plant more plants wherever we can, especially on bare ground. Families can look online to find the best plants to grow in different conditions.[iii]

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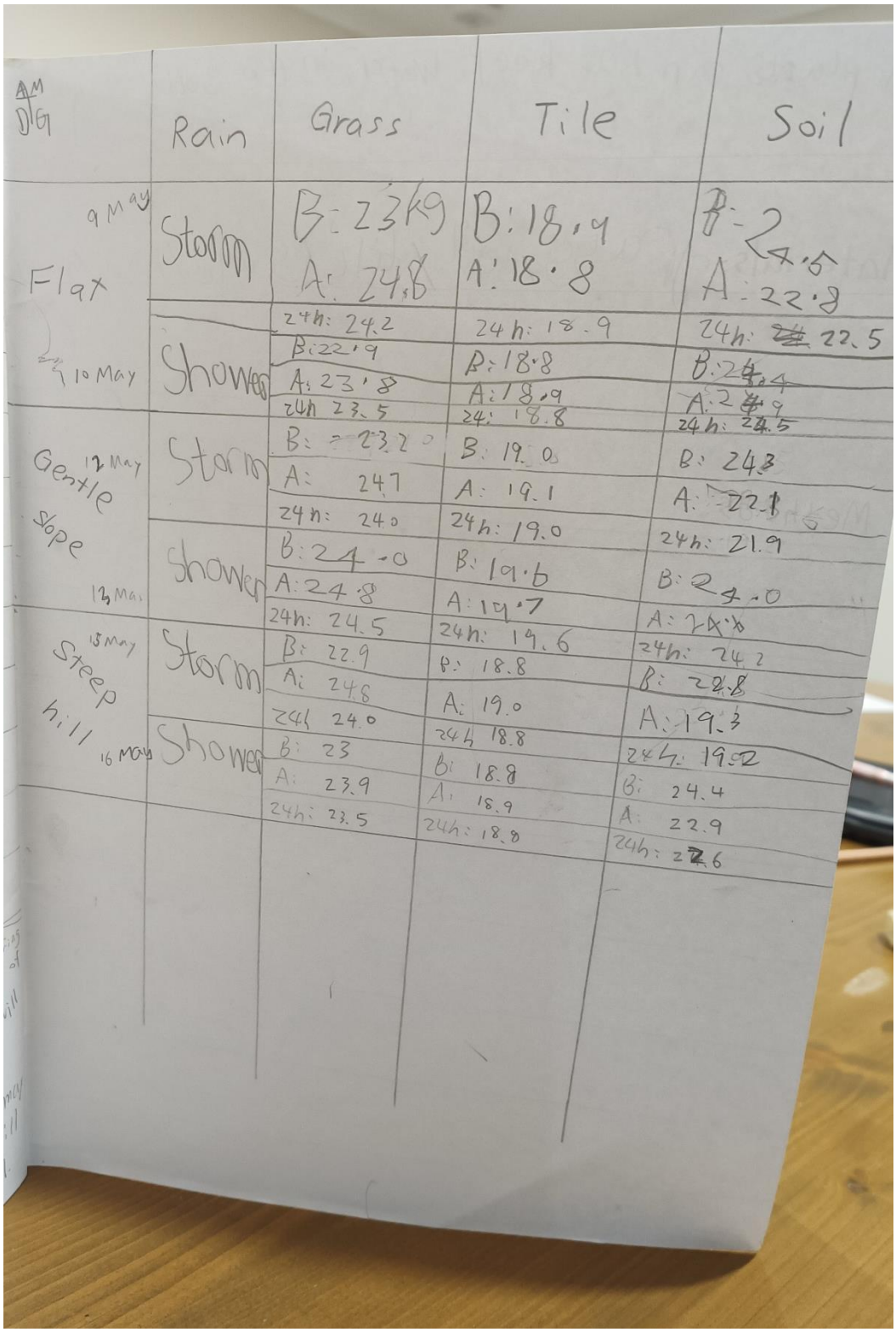
[i] NSW Department of Primary Industries. Fact sheet 2: Indicators of erosion. https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/255154/fact-sheet-2-indicators-of-erosion.pdf

[ii] Health Land & Water. Urban Development affects Water Cycle (fact sheet). https://www.hlw.org.au/resources/downloads/threats/90-threats-cities-impact-waterways-factsheet/file

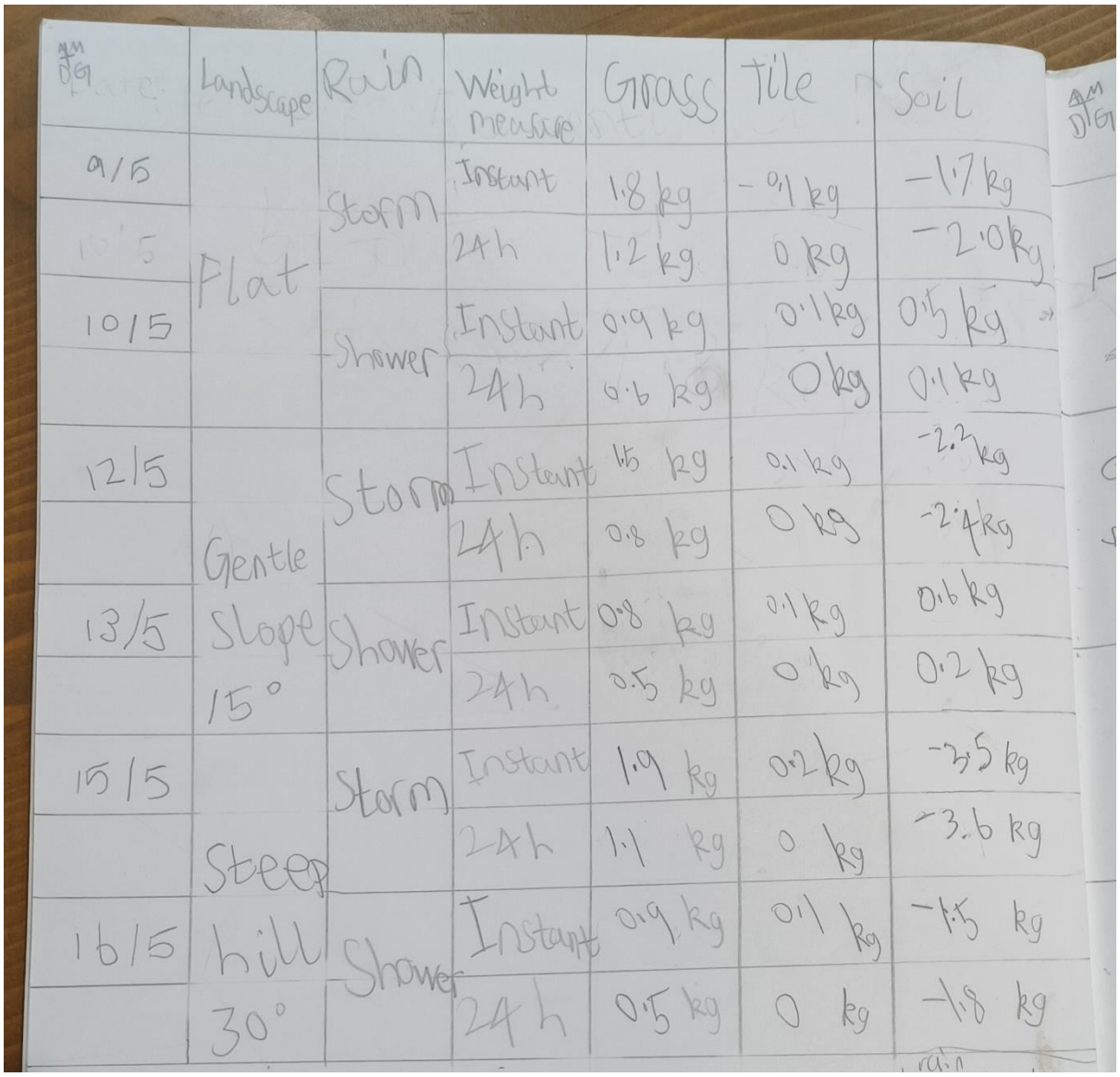
[iii] For example, see https://bestplants.com.au/best-plants-for-slopes/#:~:text=Look%20for%20plants%20with%20vigorous,with%20the%20ground%20cover%20plants.

Original weight records



AM DIG	Rain	Grass	Tile	Soil
9 May Flat	Storm	B: 23kg A: 24.8	B: 18.4 A: 18.8	B: 24.5 A: 22.8
10 May	Shower	24h: 24.2 B: 22.9 A: 23.8 24h 23.5	24h: 18.9 B: 18.8 A: 18.9 24h: 18.8	24h: 22.5 B: 24.4 A: 24.9 24h: 24.5
12 May Gentle slope	Storm	B: 23.2 A: 24.7 24h: 24.0	B: 19.0 A: 19.1 24h: 19.0	B: 24.3 A: 22.1 24h: 21.9
13 May	Shower	B: 24.0 A: 24.8 24h: 24.5	B: 19.6 A: 19.7 24h: 19.6	B: 24.0 A: 24.8 24h: 24.2
15 May Steep hill	Storm	B: 22.9 A: 24.8 24h 24.0	B: 18.8 A: 19.0 24h 18.8	B: 22.8 A: 19.3 24h: 19.2
16 May	Shower	B: 23 A: 23.9 24h: 23.5	B: 18.8 A: 18.9 24h: 18.8	B: 24.4 A: 22.9 24h: 22.6

Records of weight changes



Date	Landscape	Rain	Weight measure	Grass	Tile	Soil
9/5	Flat	Storm	Instant	1.8 kg	-0.1 kg	-1.7 kg
10/5			24h	1.2 kg	0 kg	-2.0 kg
10/5		Shower	Instant	0.9 kg	0.1 kg	0.5 kg
			24h	0.6 kg	0 kg	0.1 kg
12/5	Gentle Slope 15°	Storm	Instant	1.5 kg	0.1 kg	-2.2 kg
			24h	0.8 kg	0 kg	-2.4 kg
13/5		Shower	Instant	0.8 kg	0.1 kg	0.6 kg
			24h	0.5 kg	0 kg	0.2 kg
15/5	Steep hill 30°	Storm	Instant	1.9 kg	0.2 kg	-3.5 kg
			24h	1.1 kg	0 kg	-3.6 kg
16/5		Shower	Instant	0.9 kg	0.1 kg	-1.5 kg
			24h	0.5 kg	0 kg	-1.8 kg

OSA RISK ASSESSMENT FORM

for all entries in (✓) ☐ Models & Inventions and ☐ Scientific Inquiry

This must be included with your report, log book or entry. One form per entry.

STUDENT(S) NAME: Hannah Zeng ID: _____

SCHOOL: St Ignatius College

Activity: Give a brief outline of what you are planning to do.

I study how plants help with soil and water conservation. I use the garden hose to mimic rainfall and compare the weights of a grass patch, a tile and a soil patch before and after the rain to see how much water is absorbed and how much soil is washed away in each case.

Are there possible risks? Consider the following:

- Chemical risks: Are you using chemicals? If so, check with your teacher that any chemicals to be used are on the approved list for schools. Check the safety requirements for their use, such as eye protection and eyewash facilities, availability of running water, use of gloves, a well-ventilated area or fume cupboard.
- Thermal risks: Are you heating things? Could you be burnt?
- Biological risks: Are you working with micro-organisms such as mould and bacteria?
- Sharps risks: Are you cutting things, and is there a risk of injury from sharp objects?
- Electrical risks: Are you using mains (240 volt) electricity? How will you make sure that this is safe? Could you use a battery instead?
- Radiation risks: Does your entry use potentially harmful radiation such as UV or lasers?
- Other hazards.

Also, if you are using other people as subjects in an investigation you must get them to sign a note consenting to be part of your experiment.

Risks	How I will control/manage the risk
none	There is no such risk in my project.

(Attach another sheet if needed.)

Risk Assessment indicates that this activity can be safely carried out

RISK ASSESSMENT COMPLETED BY (student name(s)): Hannah Zeng

SIGNATURE(S): Hannah Zeng

☑ By ticking this box, I/we state that my/our project adheres to the listed criteria for this Category.

TEACHER'S NAME: Caroline O'Halloran

SIGNATURE: _____ DATE: 12/5/25