

Water Adventure

Create an animation that showcases the water cycle. Then develop it further to reflect human impact.



INTRODUCTION



What you will need

HARDWARE

A computer capable of running Scratch 3

SOFTWARE

Scratch 3:
either online
[rpf.io/scratchon](https://scratch.mit.edu)
or offline
[rpf.io/scratchoff](https://scratch.mit.edu)

What you will learn

- Using **randomisation** and **colour effects** to create realism
- Using **clones**
- **Recording speech** to story tell

Additional notes for educators

Check out our blog post that talks about the science behind the project, integration links for teachers, and where to find more information.

Project Links

Starter project

<https://scratch.mit.edu/projects/1047236744/>

Completed project

<https://scratch.mit.edu/projects/1047236784/>

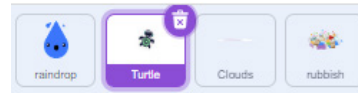
Moonhack Certificate

Finished the project? Download a certificate of completion [here](#).

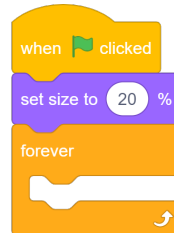
STEP 1 - TURTLE

Start by opening the starter project - <https://scratch.mit.edu/projects/1047236744/>
Let's start by animating our turtle to swim in the ocean.

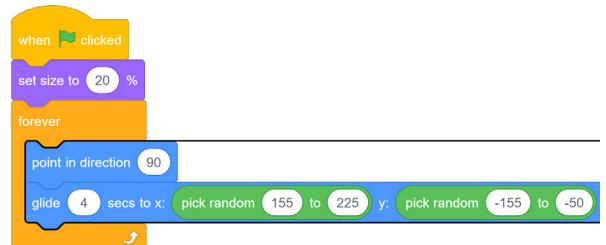
Select the turtle sprite.



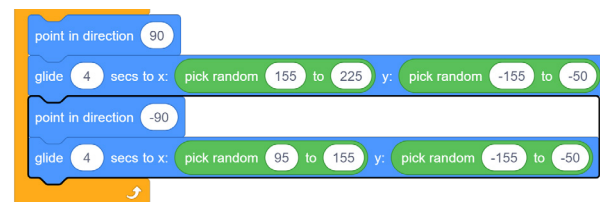
Start with the **green flag event**. Set the turtle **size to 20%** and add a **forever** control.



Set the turtle's **direction**. Add in a **glide block** and use 2 **pick random operators**. The x and y coordinates will determine one-half of the ocean area.



Duplicate the last 2 blocks. Change the direction and the coordinates.

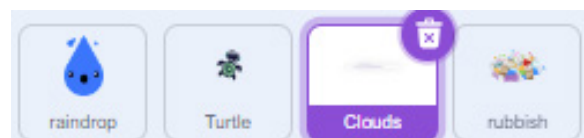


Test your code. Make any changes to the coordinates that are necessary to suit your turtle.

STEP 2 - CLOUDS

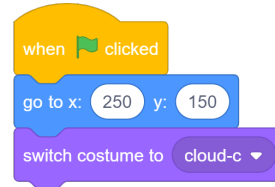
Let's code the cloud sprite to create clones of itself, slowly getting darker. This will mimic the building of storm clouds in the sky.

Select the cloud sprite.

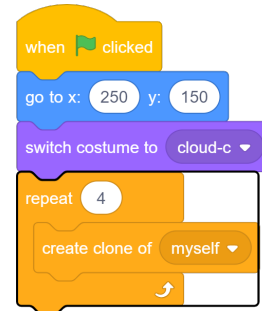




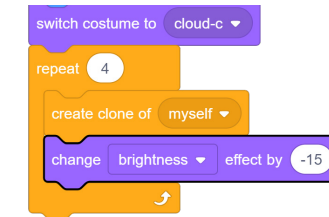
Start with the **green flag event**. Add a **motion block** to set its starting position on the left side of the screen. Add a **switch costume block** and select c.



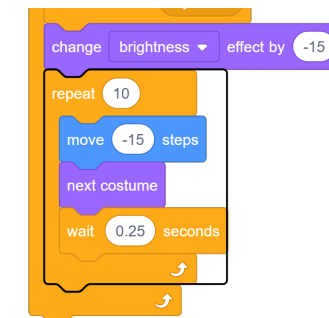
Add 2 control blocks - **repeat** and **create clone**. This will control how many clones are created.



Add a looks block to **change the brightness**. This will make the clouds slowly get darker.



Add in a **repeat** control block. This will provide animation for the cloud. Add a motion block to **move 15 steps**, go to the **next costume**, and **wait 0.25 seconds**.



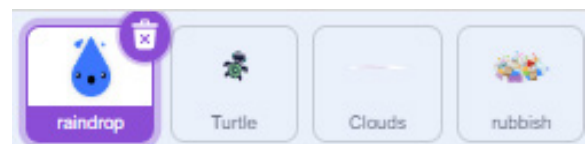
Test your code. Make any changes to the animations of the clouds to make it more realistic.

STEP 3 - RAINDROP

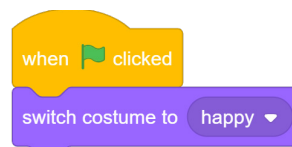
The first step in the animation is for our raindrop to take a journey through the start of the water cycle.



Select the raindrop sprite.



Start a new algorithm with the **green flag clicked event**. **Switch the costume** to happy.



1 Add a **motion block** to set the starting location.



```
when clicked
  switch costume to happy
  go to x: -180 y: -130
```

2 Add a **play sound** block. Select the record option, and record your voice saying "It's hot today!". Then add a **glide block** to find the turtle.
*Make sure you name your sound



```
when clicked
  switch costume to happy
  go to x: -180 y: -130
  play sound hot until done
  glide 3 secs to Turtle
```

3 Use the looks menu to **switch the costume to 'oh'** and a **glide block** to start the raindrop 'evaporating'.



```
go to x: -180 y: -130
  play sound hot until done
  glide 3 secs to Turtle
  switch costume to oh
  glide 2 secs to x: 70 y: -20
```

4 Add a **sound block** and record your voice saying 'I'm evaporating!'. Add another **glide block** to send the raindrop to the clouds.



```
switch costume to oh
  glide 2 secs to x: 70 y: -20
  play sound evaporating until done
  glide 2 secs to Clouds
```

5 Add a **play sound** button. Record yourself saying 'Hi friends. It's a bit cold up here'. Create a new **broadcast** of rain.



```
glide 2 secs to Clouds
  play sound friends until done
  broadcast rain
```



Test your code. Now, let's make it rain! The algorithm will create many clones, each clone being given a random number between 1 and 10 which will be used to determine its size and colour effect.

6 Add a new event **when I receive rain broadcast**. Add a block to **hide** the raindrop. Then add a control block of **repeat** and inside it add a control block of **create clone of myself**.



```
when I receive rain
  hide
  repeat 75
    create clone of myself
```

This code will create 75 clones on the screen at the same time.

The main algorithm will program what each clone does when it starts.

Add a control block **when I start as a clone**.
Add a looks block to **switch the costume to** **raindrop**. Then add a block for it to **show**.



Create a new variable called raindrop. This will be used to make each raindrop look different. ****When making the variable, tick the box 'for this sprite only'.** Set the variable to be a **random** number between 1 and 10.

Raindrops with a number 1 will be the furthest away and number 10 will be the closest.



Add a **set size** block from the looks menu. Add in an **operator with the multiply symbol** (star). Drop in the **variable** bubble. This block will take the random number of the raindrop and multiply it by 2% for the size. Low-numbered drops will stay small and high-numbered drops will be bigger.



Add a **set effect** looks block and choose ghost effect. Add an **operator with a minus symbol**. Type 100 in the left bubble. In the right bubble add another **operator with a multiply symbol**. Place in the **raindrop variable** bubble and the number 10.

This block sets the colour of the raindrop. A large ghost value means the colour is more faded. To work out the ghost value the program will start with 100 and then minus the random number of the drop multiplied by 10. ie A raindrop with number 3 will get a ghost effect of 70, number 6 will get a ghost effect of 40.

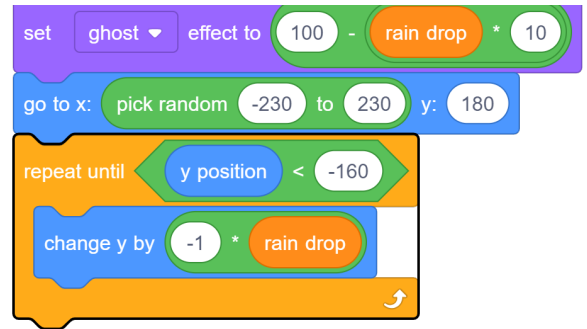


The raindrops need to start at the top of the screen in random positions across the top. Add a **go to x y** motion block. In the x coordinates add in a **random operator**. This allows the clones to start anywhere across the top of the screen. The y coordinate has the raindrop starting above the clouds.

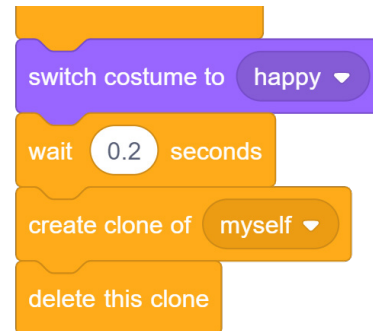




The next blocks control the 'falling' of the raindrop. Add a **repeat until** block and inside place a **less than operator**. Put the **y position** on the left side of the operator and -160 on the right side. Inside add a **change y** motion block. Add in an **operator** that will multiply -1 by the **raindrop** number. This will make the raindrops at the back fall slower and the raindrops at the front fall faster, to make it look real.



Finish the program by adding a looks block to **switch the costume** to happy. Then add a **wait** block. Finally, add control blocks to **create a clone** of itself (this is what will keep the animation going), and a block to **delete this clone**.

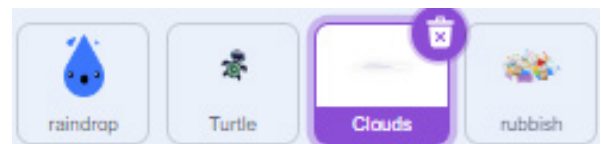


Test your code. You should have rain falling. Now it's time to program how the rain will stop. We need to have the clouds fade away, to mimic the rain finishing, and we will use this to send a broadcast to the raindrop to know when to stop.

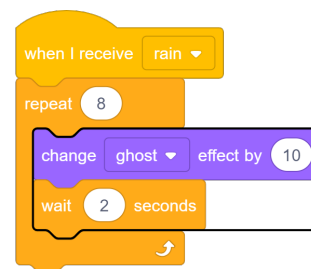
STEP 4 - RAIN ENDING



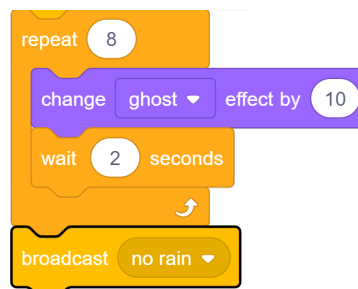
Select the cloud sprite



Start a new algorithm with the event **when I receive rain**. Add a **repeat block** and inside it a **change ghost effect** and **wait** blocks. This will repeat 8 times, making the clouds get lighter as they drop the rain.



Create a new **broadcast called no rain** and add in the block.



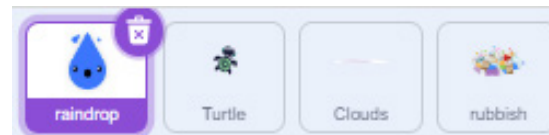
Duplicate the **repeat** block and change the input for the number of repeats.



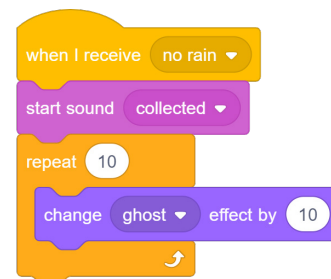
You can test your code here to see if the clouds disappear.



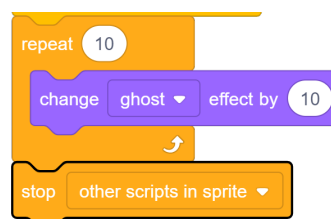
Select the raindrop sprite.



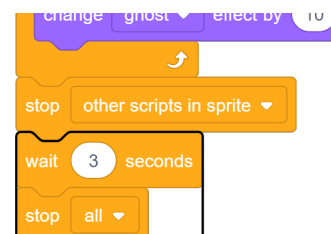
Start a new algorithm **when I receive no rain**. Add a **start sound** block and record yourself saying "I've been collected by the ocean." Add a **repeat** block and a **change ghost effect** block.



Add a control block of **stop other sprites in script**.



Add a control block to **wait 3 seconds**, and then a block to **stop all** - the rain has finished.



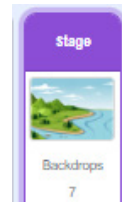
You can test your code here to see if the rain starts and then finishes. Make any changes to the inputs that you think will improve the animation.

STEP 5 - SETTING THE SCENE (OPTIONAL)

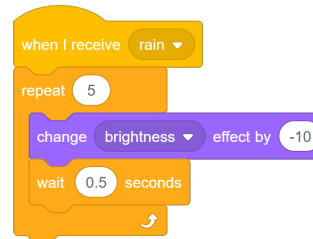
You can add some code to the background to make the environment go dark when it rains, and then lighten up as the rain finishes.



Select the stage. You will notice there are a lot of backdrops to choose from to extend your project.



Create an algorithm that starts with the event **when I receive rain**. Add a **repeat** control to **change the brightness by -10** and **wait** in between the changes.



Duplicate the algorithm. Change the event to **no rain broadcast**. Change the **brightness effect to 10**.



Test your code. You now have a completed water cycle animation. But we have a small dilemma. So far we haven't added in any information that shows the things that humans do that have a negative impact on the water cycle, or things that we can do to have a positive impact on the water cycle. What will you add to the project to incorporate this? Brainstorm your ideas below and then start coding them.

PLANNING SPACE

Challenges:

Gamify

The project currently works as an animation, to share information and tell a story. How could you change the project to gamify it and have the user engage with it?

Different locations

The stage area has multiple backgrounds. The water cycle works differently depending on the environment it is in. Think of the differences in the water cycle in a desert, over the ocean, over farmland, or in a drought. Use the backdrops to extend your project.

Call to action

Create your project to be a call to action for everyone around the world. What message can we give them about the impact that humans are having on the water cycle and the things we can do to make positive changes for our environment?

Congratulations! You're a Moonhack changemaker. You can try one of our other projects or try one of the challenges above.

Don't forget to talk to an adult about registering your participation and downloading your certificate at moonhack.com

