GUARDIANS OF THE POND

HANDBOOK

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Preface

Pathways to water resilient South African cities (PaWS)

This handbook has been developed to raise awareness about the importance of managing and stewarding stormwater ponds in urban environments. It is based on the outcomes of a research project that has been undertaken by researchers from the Future Water Institute at the University of Cape Town (UCT), South Africa and the University of Copenhagen (UoC), Denmark on a research project called 'Pathways to water resilient South African cities (PaWS). Many South African cities make use of stormwater ponds (like the one in Fulham Rd, Mitchells Plain) to manage local flooding, but they are often neglected, barren spaces that are prone to informal invasion and criminal activity. The main aim of the PaWS project was to understand whether better use can be made of stormwater ponds by turning them into open spaces with many different functions, i.e. creating a stormwater infiltration area so that groundwater can be replenished; thinking about ways to improve the amenity and education value of the pond; and restoring and protecting the indigenous vegetation and animal life in the area. In this way it is hoped that these stormwater ponds can help the City and its residents build resilience towards climate change impacts and droughts, while supporting human wellbeing and improving the overall liveability of neighbourhoods.

Funding statement

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FRIENDS OF THE POND / WETLAND

Hi ! My name is Stella, and I am the champion of the school pond. I oversee the titans and work with the community to build stewardship, encourage water and plant conservation, as well as educate people about our water systems.
Meet the rest of my team!

Hi! I'm Pisca.
I care for the rivers, lakes, ponds and wetlands. I mainly enjoy taking care of the school pond and ensuring it is clean and safe.

My name is Aqua. I care for all moving bodies of water. I ensure that they reach the sea without being distrupted.

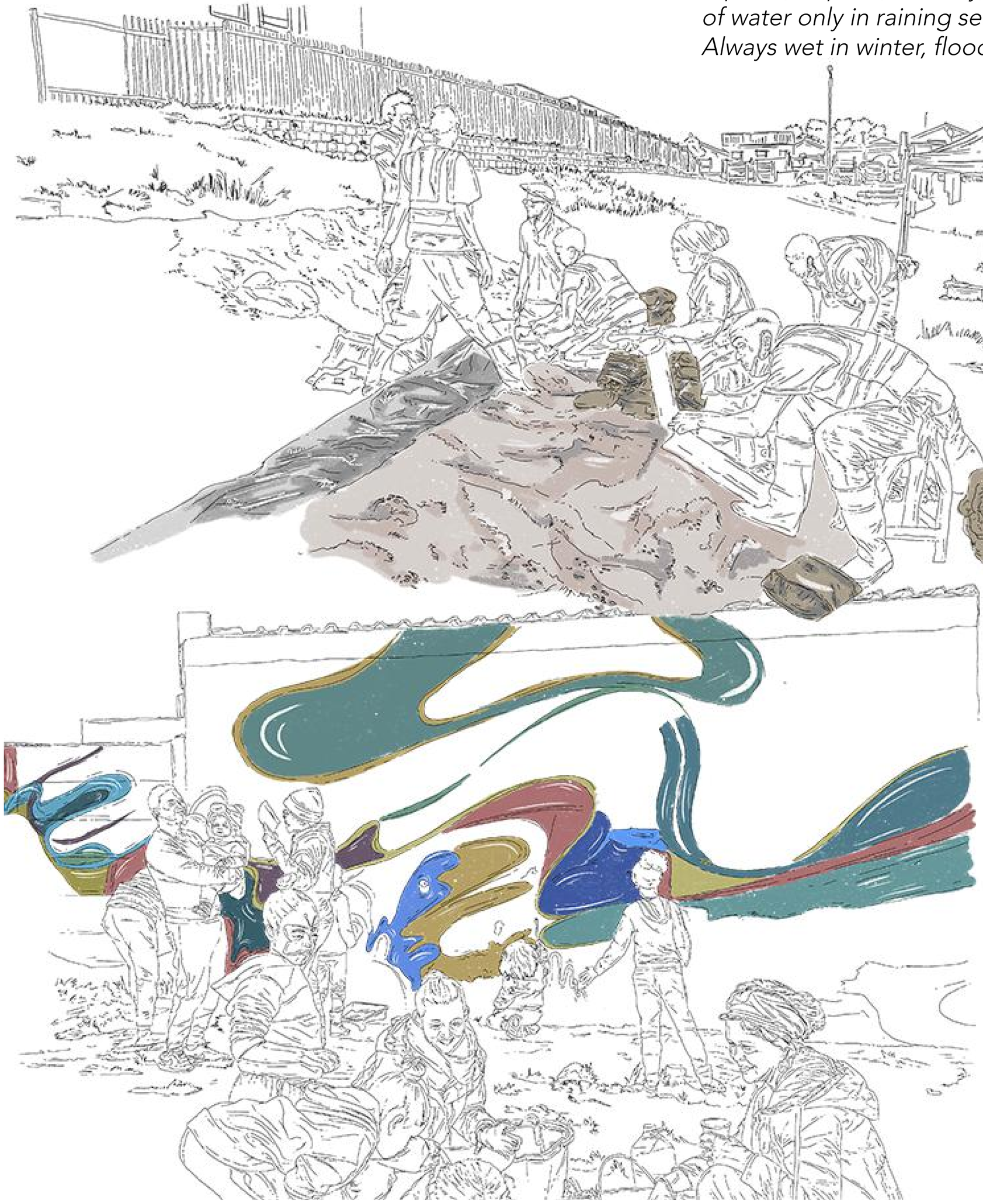
My name is Kola, and I am a lover of all things green, small, tall and bushy. I ensure that the natural plants, soil and small living organisms are cared for and protected.

Hi there! Im Erida and my job is to care for all living aquatic life. Even the micro-organisms!

The School Pond as a Freshwater Aquatic System

Place Making: Tending to the School Pond

Empty open pond, barren left to derelict.
I watch from my wall, waiting for the slightest fill.
More often it lies, cluttered with teenage murmurs and last christmas's plastic bottles and dragonflies.
Children kick about the dust, curious about what it could possibly be.
A place, a space, a library, empty, unused, with the sighting of water only in raining seasons.
Always wet in winter, flooded to the brim.



One morning,
I spotted change outside my yard, floral scents, croaking noise, butterflies, bees and birds.

An attempt to make the pond a home ?

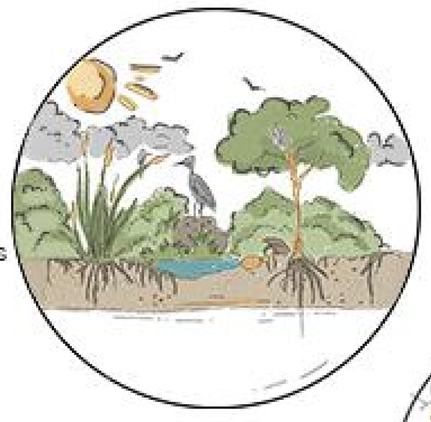
What gardener is responsible for a garden outside their own?

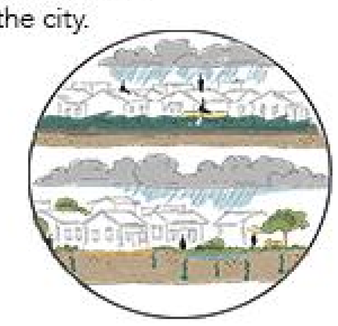
Nature Based Solutions (NBS) as part of Blue Green Infrastructure (BGI)

Place Making: The purpose of the school pond retrofit

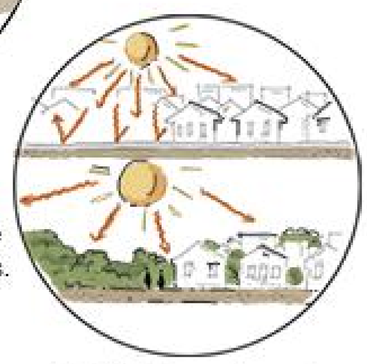
What is Blue-Green Infrastructure (BGI)?

Blue-Green Infrastructure
BGI refers to inter-connected natural
and designed open planted spaces (green) and water bodies (blue) that perform many functions in
the city.





BGI reduces flooding
Blue-green permeable spaces allow stormwater to infiltrate the ground & reduce flooding events.

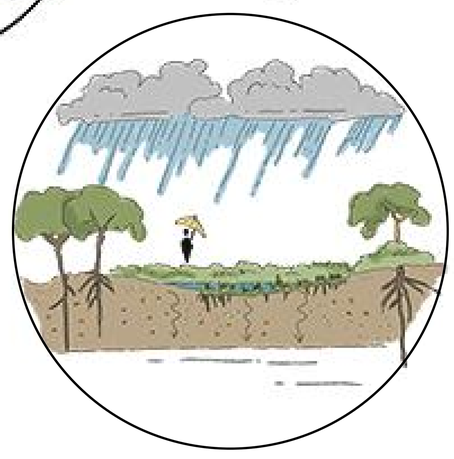


What does BGI do for us?

BGI cleans storm-water run-off
BGI slows, filters and cleans stormwater through the interactions of living (plants, microbes, etc.) and non-living (sunlight, oxygen) elements.

BGI helps reduce the build-up of urban heat
BGI is made up of plants that help to lower urban surface & air temperatures by providing shade and cooling effects.

BGI is vital to our well-being
We rely on BGI for many things in our daily lives. This includes the growing of food, providing clean air, providing for our physical and mental well-being.



BGI helps recharge groundwater
BGI allows water to filter into the ground and down into the aquifer below.

The pond has been converted from a mono-functional pond into a multi-functional blue-green infrastructure. This has allowed for the pond to successfully:

- Infiltrate stormwater runoff to recharge the Cape Flats Aquifer (CFA), contributing to Managed Aquifer Recharge (MAR), which can supplement Cape Town's water supply.
  Serve a water treatment function using
- nature-based approaches to improve water quality before it enters the aquifer or downstream systems.
- Provide amenity and ecological functions, creating green spaces that enhance biodiversity and improve the well-being of residents, especially in disadvantaged neighbourhoods.
- Address environmental injustice by transforming spaces previously neglected due to apartheid spatial planning into valuable community resources.

Check Dams and Litter Traps

Rip- Rap water dissipater

Mole protection barrier

Berm + Infiltration Swale

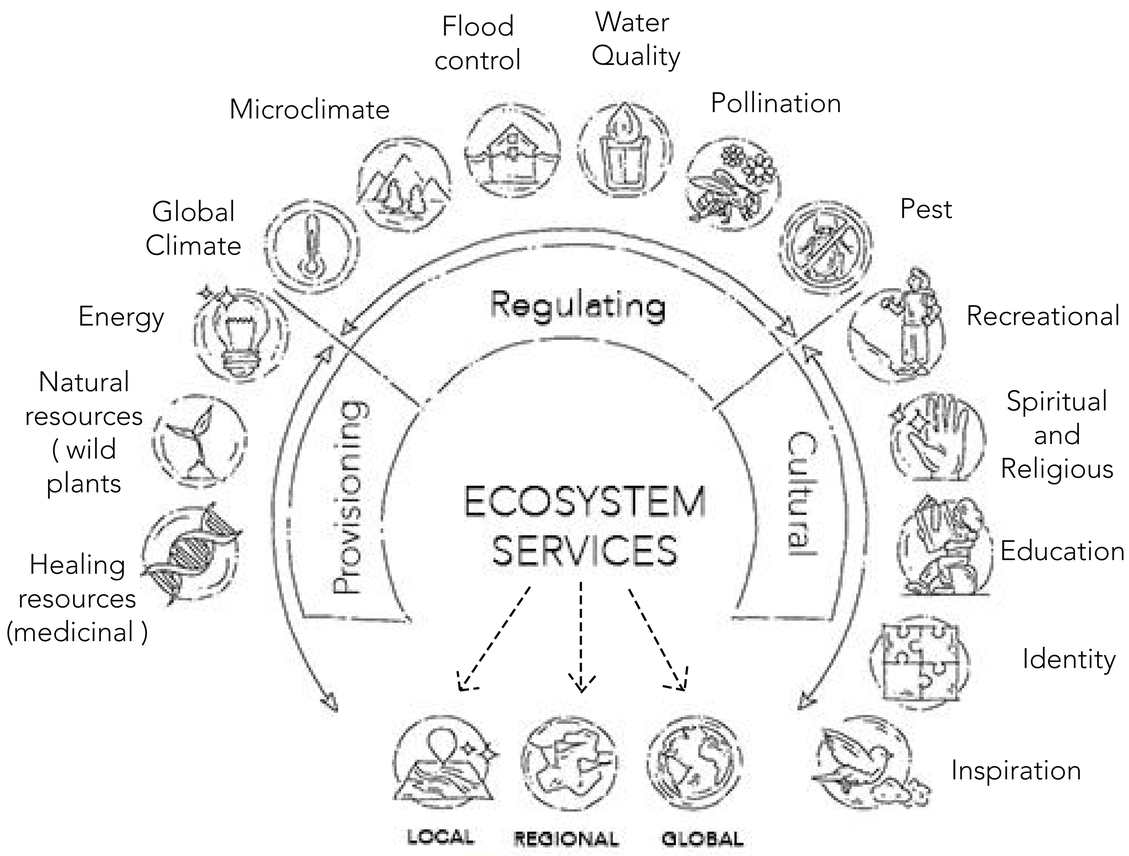
Planting Beds

Walking Path

Concrete Weir

The success of the School Pond

Sense Making: The pond as a Library and floodwater protection system



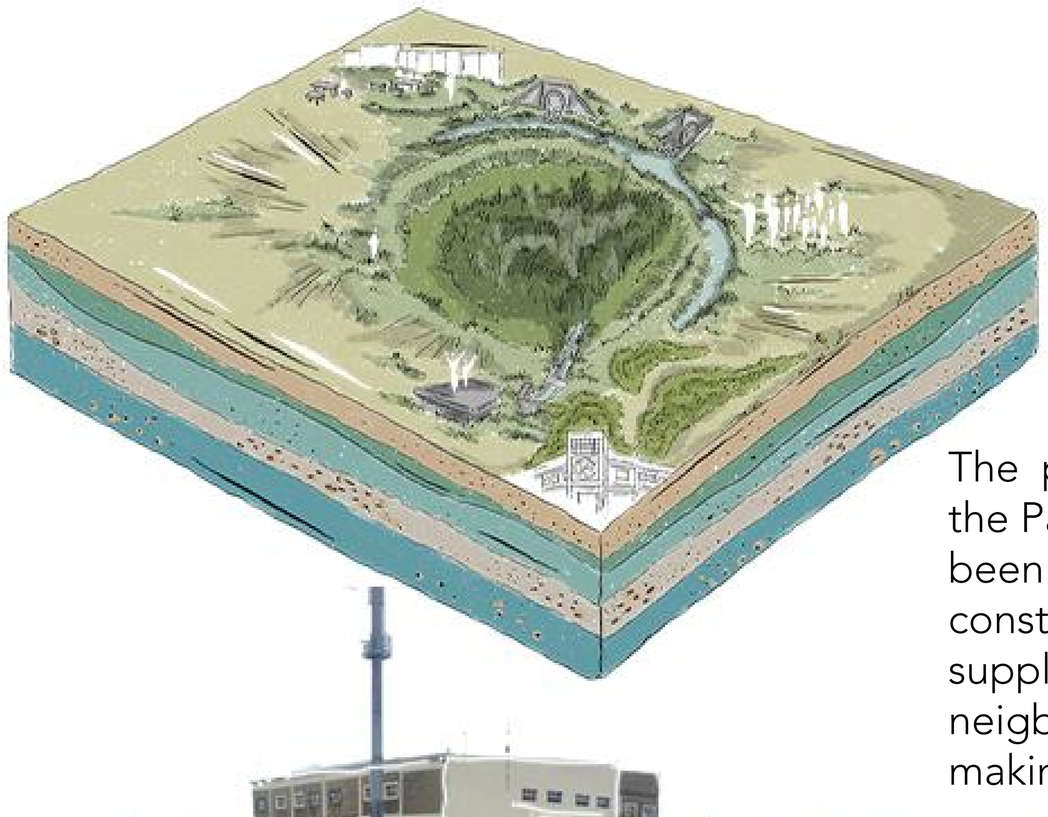
The pond retrofit is aimed at building water resilience in Cape Town while offering socio-environmental benefits to the community. These benefits include Freshwater Ecosystem provisions which consist of a wide range of essential services.

These are referred to as ecosystem services which help sustain the global hydrological cycle, the carbon cycle and nutrient cycles, and support water security. They also provide natural freshwater storage, regulate flows, purify water, and restore groundwater (Bernex, 2016).

Think Bubble

What are the local ecosystem services you can name that are found at the school pond ?

How have they helped improve your quality of life ?



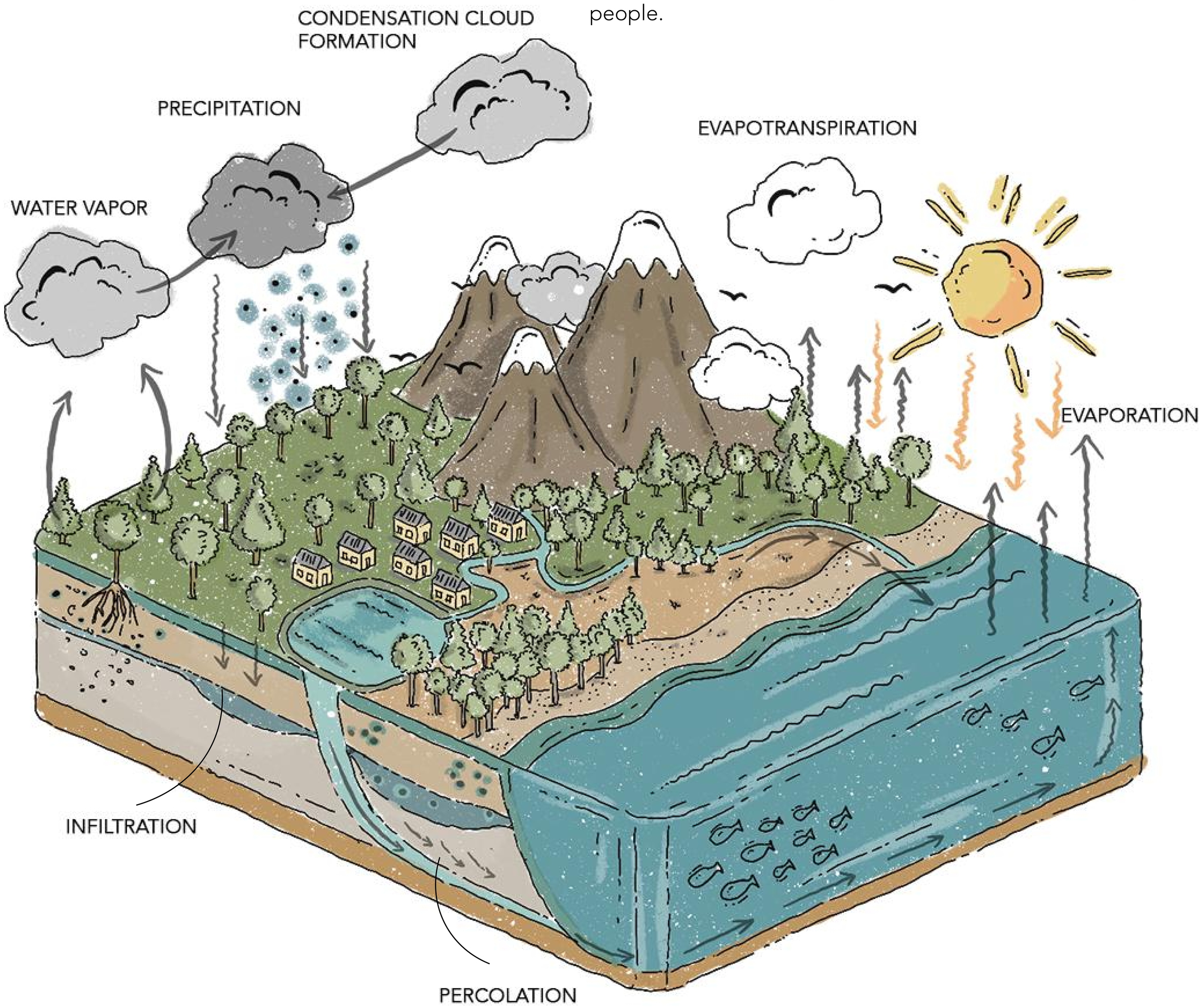
School Pond at Work

The purpose of the pond is to manage flood attenuation. Under the Pathways to water resilient South African cities (PaWS), It has been further retrofitted to increase its infiltration ability through the construction of an infilitatrion trench. This increases ground water supplies and helps the city with alleviating flooding within neigbourhoods. It has also improved the quality of the stormwater, making it safer for the pond as a living green lab.

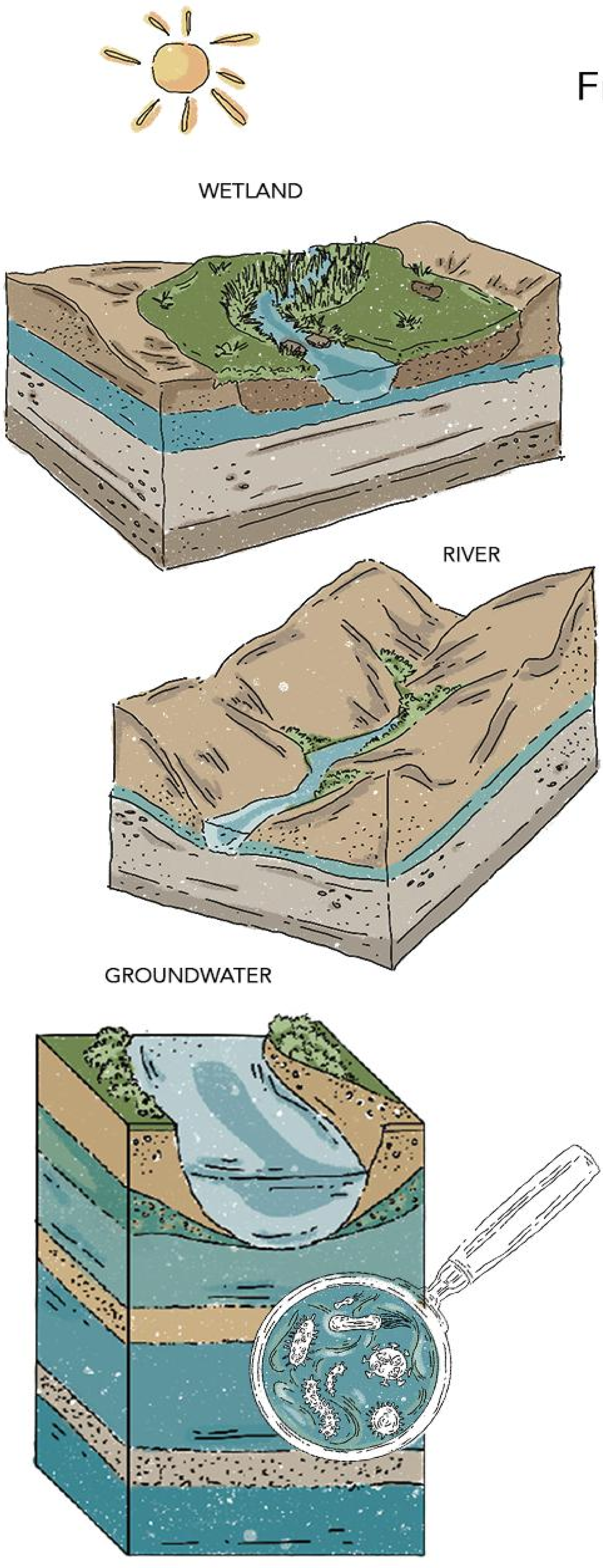
The Hydrological Cycle

From Source to Sea

Freshwater on the land surface is an important part of the water cycle for everyday human life. Freshwater is stored in rivers, lakes, ponds and streams on the landscape. As a part of the water cycle, surface water bodies are generally regarded as renewable resources dependent on other parts of the water cycle. Inflows to these water bodies generally come from precipitation, overland runoff, groundwater infiltration, and tributary inflows.
Outflows from these water bodies include evaporation, movement of water into groundwater, and withdrawals by people.



Freshwater Aquatic Ecosystems + Habitats + Stormwater Systems

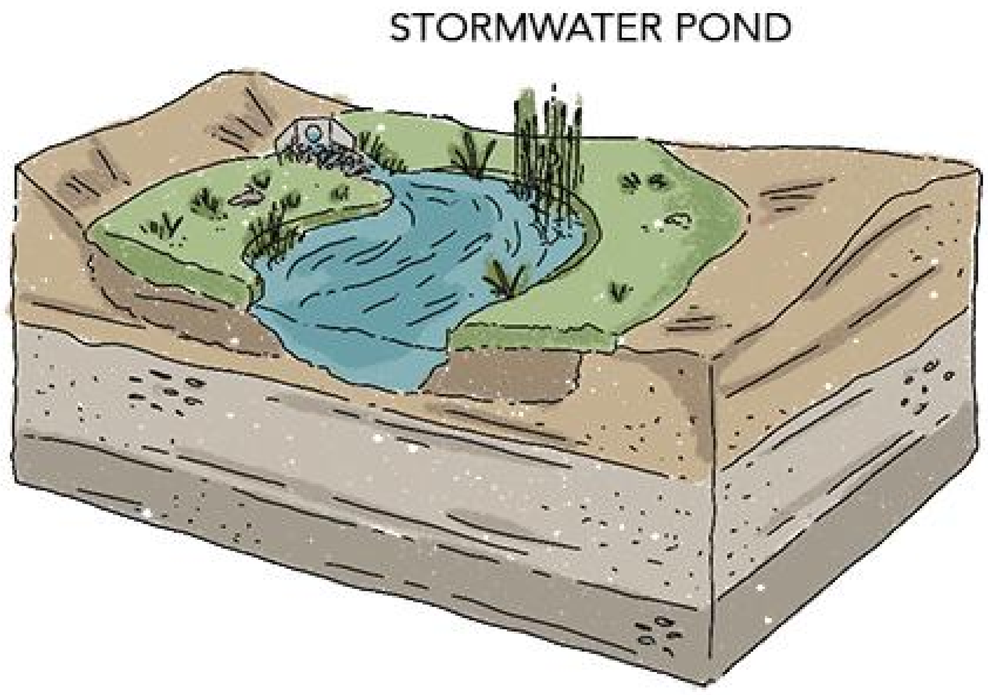


Ponds, Wetlands, Rivers and Groundwater

Freshwater aquatic ecosystems include a group of interacting organisms which are dependent on one another and their water environment for nutrients and shelter. Examples of aquatic ecosystems include oceans, lakes, ponds and rivers (Byus, 2024). Freshwater ecosystems are divided into two types, lentic and lotic.

- Lentic ecosystems are stored water ecosystems. e.g. ponds, lakes etc.
- Lotic refers to ecosystems with running water. e.g. rivers, streams etc.

Nutrient and energy flow also play a critical role in ecosystems. Within an ecosystem, each living organism has its habitat with characteristics that enable it to fulfil its life cycle.



Hidden hydrologies and groundwater microbiome

Did you know..

Freshwater can be found in less obvious places. More than half of all fresh water on our planet seeps through soil and between rocks to form aquifers that are filled with groundwater. The top surface of an aquifer is called the water table, and this is the depth where wells are drilled to bring fresh water into cities and homes.

Deep underground, lies a hidden world full of tiny living organisms called microbes. These microbes make up the microbiome, a community of bacteria, fungi, and other microscopic organisms that live in aquifers, underground layers of rock and sand which hold water. They are important because they help purify the water, increasing the quality of the water.

The School Pond Challenges:

Socio-Environmental Stressors and Safety Concerns

Vandalism of research equipment

Overgrown Vegetation

The school pond has experienced a number of safety concerns that have compromised the research site equipment which are used to conduct water quality tests.
The site equipment and installed features such as the weir had been destroyed a number of times, thus compromising the function of the school pond.
As a community, it is important to realise the role the school pond plays in assisting with flood control and providing a public open space that encourages place-making and sense-making.

Vandalised weir

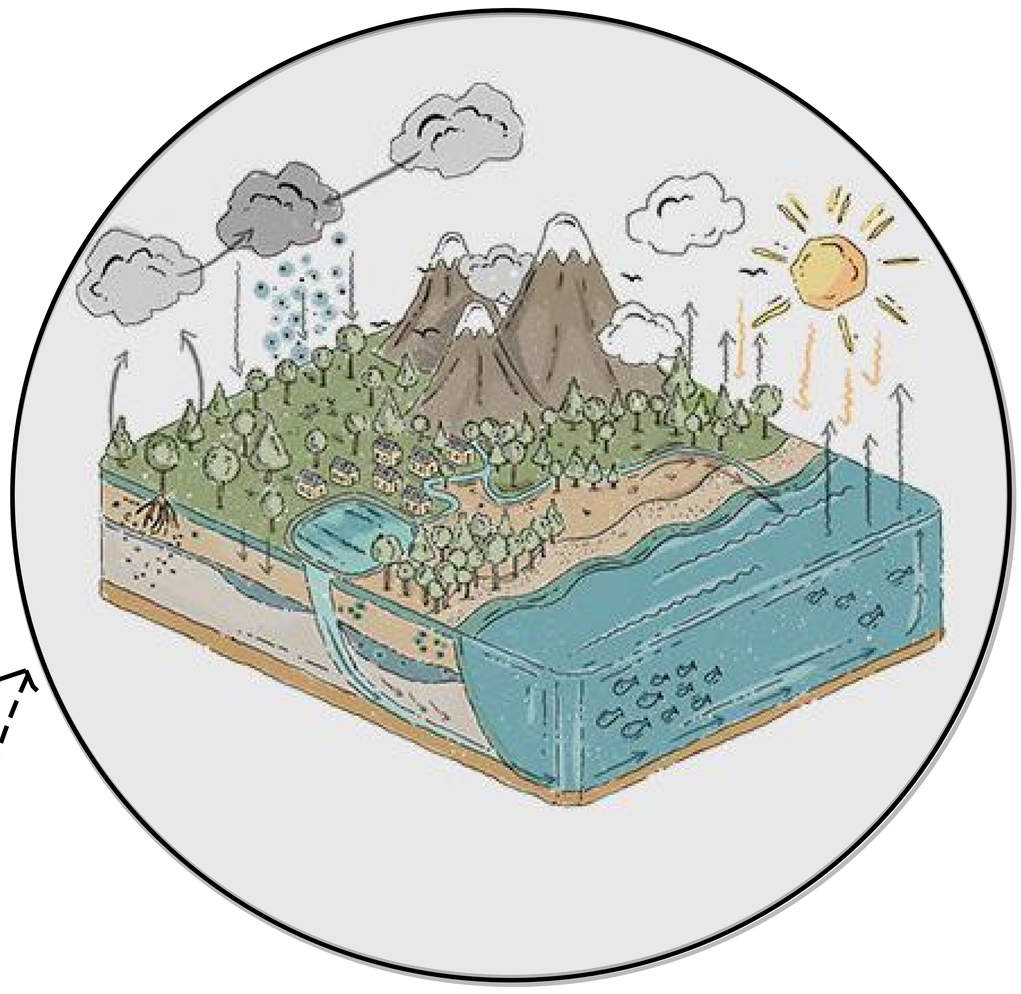
Oil spill leaks

Shallow wells and the theft of research equipment

Mowing on wetland zone and along pioneer plant zones.

Vandalised information boards/signage along knowledge garden

Poor litter management



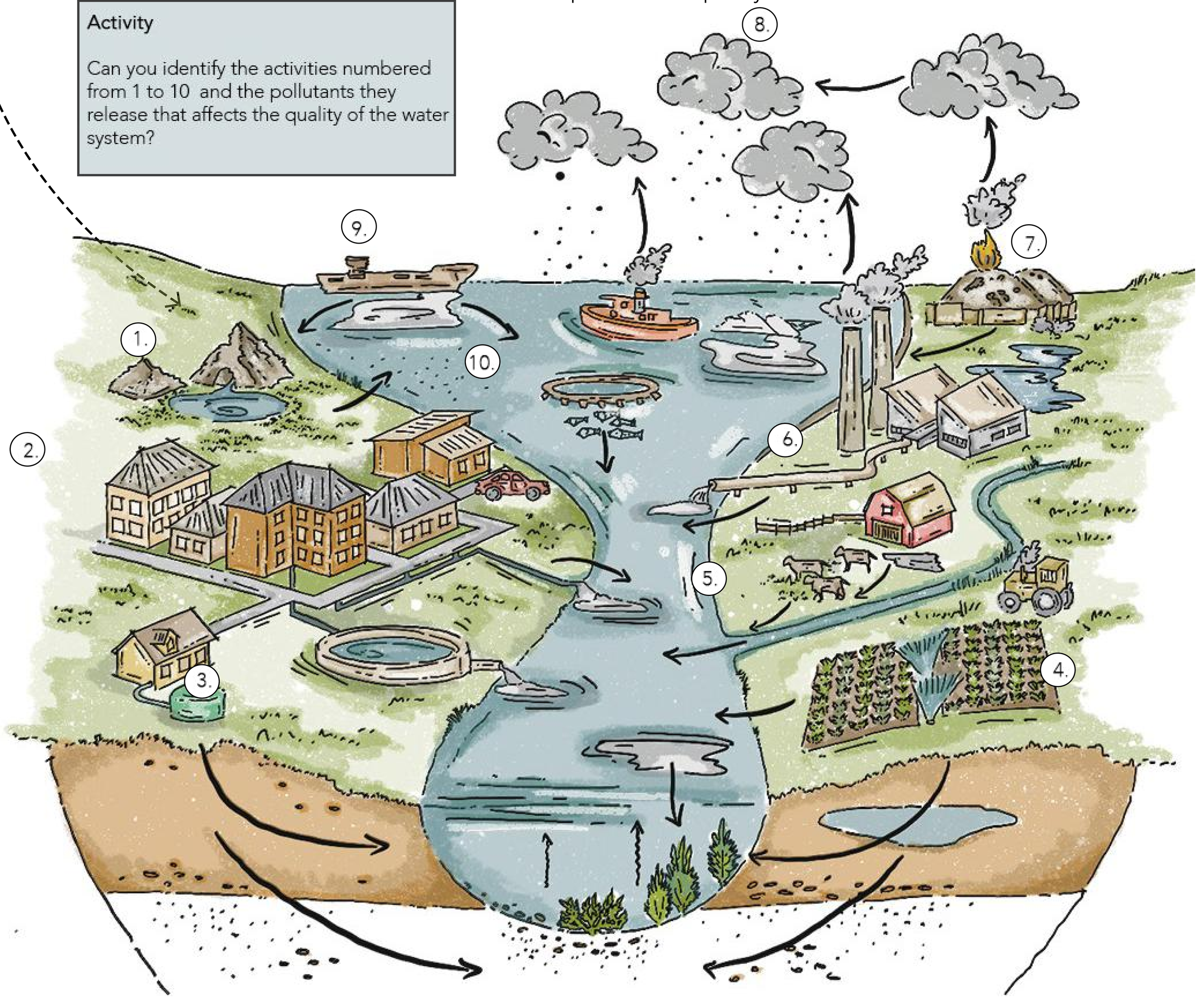
Sources of Water Pollution

The pollution cycle : Water contamination below and above ground

There has been an increase in demand for freshwater, due to accelerated population growth. This has resulted in rapid urbanisation, thus compromising most of our natural freshwater systems such as rivers, ponds and wetlands. Urbanisation introduced human activities such as farming, sewer systems, factories, mine and rubbish dump sites as well as sea boats. These activities have contributed towards polluting our natural freshwater systems causing them to have poor water quality.

Activity

Can you identify the activities numbered from 1 to 10 and the pollutants they release that affects the quality of the water system?



Pond +Plants + People

The Future School Pond Reimagined

The school pond has undergone many changes to improve its function as a wastewater system. These changes further help reduce flood risks and increase infiltration during the winter.
There are other noticeable changes such as increased natural biodiversity
consisting of pioneer plant species, birds, insects, frogs and butterflies. However, the school pond further acts as an educational environment that allows for engagements such as play, learning and preservation.

Think bubble

Can you reimagine the school pond as a place for play, learning and conservation ?

Stewardship as Sense Making

Conservation, Remediation and Rehabilitation of the school pond

Stewardship as sense making involves taking the responsibility to protect and enhance the health and well-being of both natural environments and human communities. It is inclusive of both adults and children actively engaging in activities that aim to encourage learning, team work, personal growth, sharing, caring and memory making.

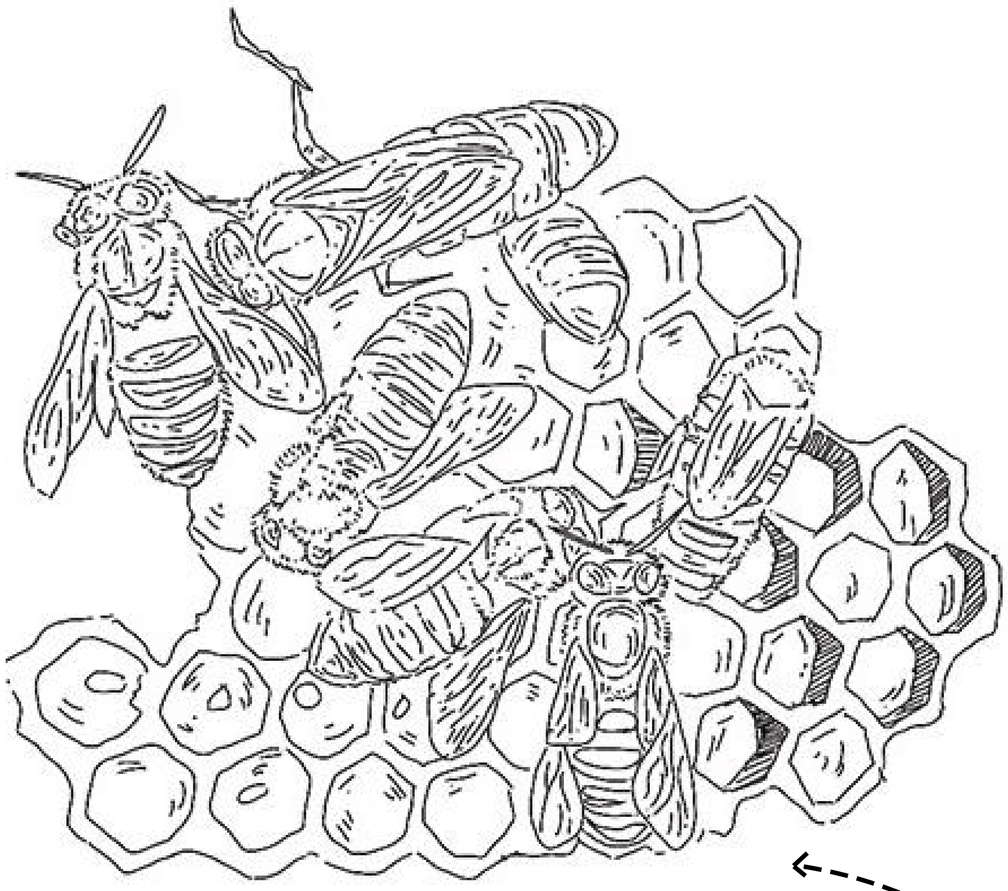
The Fulham pond neighborhood participated in workshops hosted by Future Water Research Institute as part of the Pathways to water resilient South African cities (PaWS) Project.

These engagements included seed harvesting, mural painting, planting the knowledge gardens and creating the knowledge path. These remedial efforts did not only help increase the natural biodiversity, they also increased community knowledge around protecting and acknolwedging the Fulham pond as the school pond and recognising it as a special natural environment that brings people together and assists with protecting their homes from flooding.

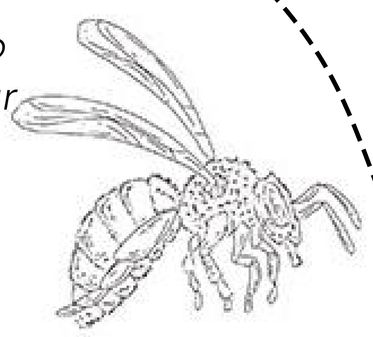
Custodians of the Natural Environment

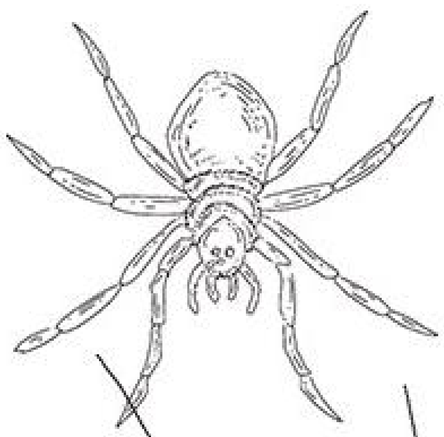
Cues to Care: The bee, the ant and the spider

In the act of sense making, there are custodians that can be found within our gardens which carry out important functions that foster a good relationship with the natural environment. The most commonly known custodians are the bees, the ants and the spiders. They are exemplary of a community working together and individuals taking responsibility of their surroundings as a way to sustain their homes, their families and their own lives.

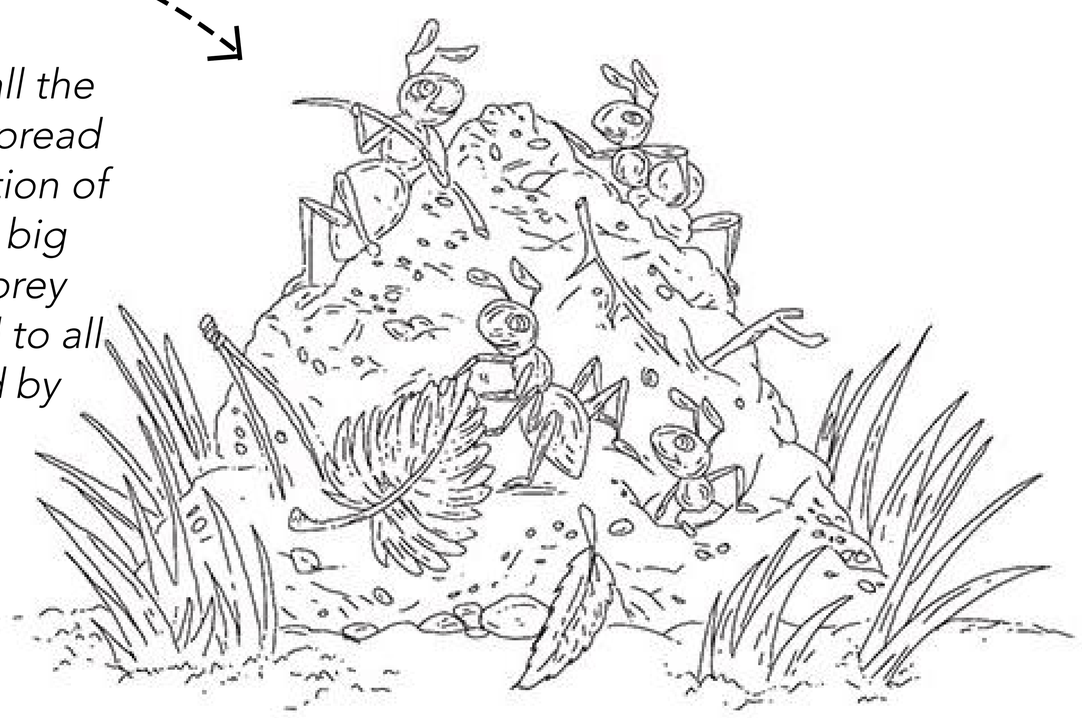


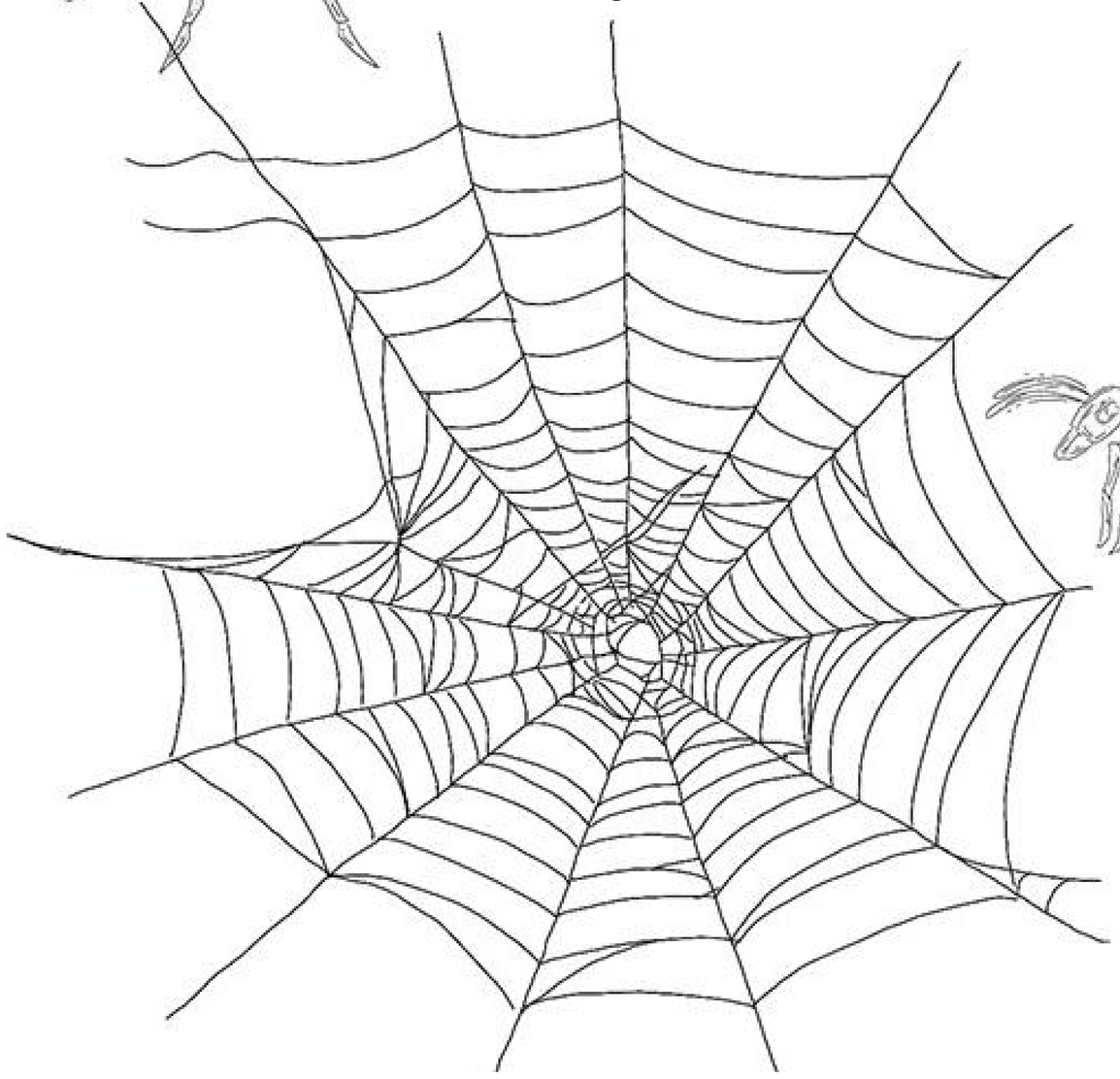
"The flowers provide and the bees disperse and create sweet nectar. They protect their queen and ensure to keep their hive a honey haven. They keep our environments growing and show up on our windows sharing healing with their honey and wisdom.

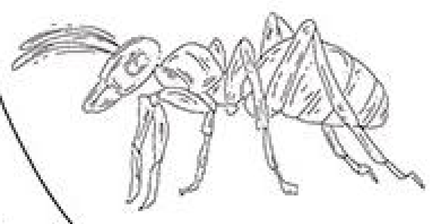




The spider, always in solitude, known to take shelter in corners of all the rooms. It eats those that carry and spread disease, ensuring safety and protection of our well-being. It builds its home so big and fragile, but good at capturing prey and recycling its web . It adapts well to all environments, and is not threatened by change or resistance.







The ant is small but stronger than the bees. It lives in colonies, belonging to communities. It scurries for food during summer, working hard to keep sustenance afloat. Though deaf it may seem, it is the most diligent and patient of them all. They tunnel through the earth increasing water infiltration and highly alert when sniffing out danger.

Labyrinth Pond Library

Paths to knowledge and the living landscape

As part of the Sense making activities, the Fulham pond community had the opportunity to participate in introducing new plants at the pond. They created new knowledge gardens namely, the strandveld medicinal garden, the strandveld edible garden and the strandveld wetland garden. These became essential for learning about the plants we eat, plants that heal and plants that protect our natural environment. They have started to form a living library with insects and animals such as frogs, butterflies, birds, bees and spiders that anyone can explore.

Cape Flats Dune Strandveld
Edible Garden

Cape coastal vegetation, or strandveld, has an exceptional diversity of indigenous food plants. It is believed that the nutritional value of these plants contributed to the survival of modern humans (Homo sapiens sapiens) in the Cape for over 160 000 years!

beautiful

Common name: Rose-scented pelargonium
Family: GERANIACEAE

Common name: Dune spinach
Family: AIZOACEAE
Species: Tetragonia decumbens

Common name: Sour fig
Family: AIRSPACE
Species: Carpobrotus edulis

Common name: Wild rosemary
Family: ASTERACEAE
Species: Eriocephalus africanus

Common name: Slaaibos
Family: AIZOACEAE
Species: Tetragonia fruticosa

hmm

Common name: Veldkool
Family: ASPHODELACEAE
Species: Trachyandra ciliata

Common name: Wild sage
Family: FABACEAE
Species: Salvia aurea

Credit: FynbosLife

Labyrinth Pond Library

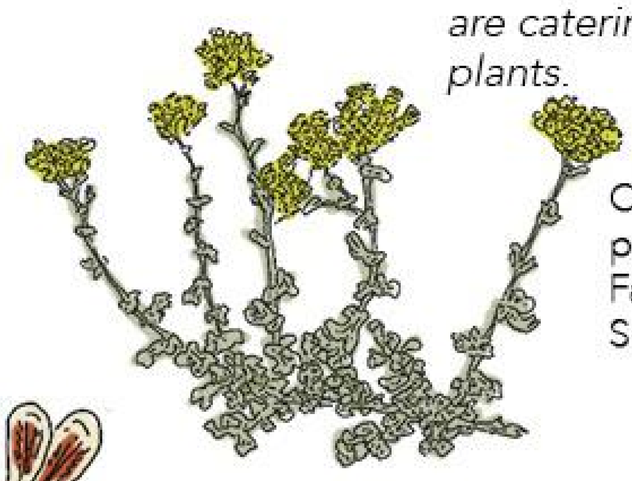
Paths to knowledge and the living landscape

Cape Flats Dune Strandveld Medicine Garden

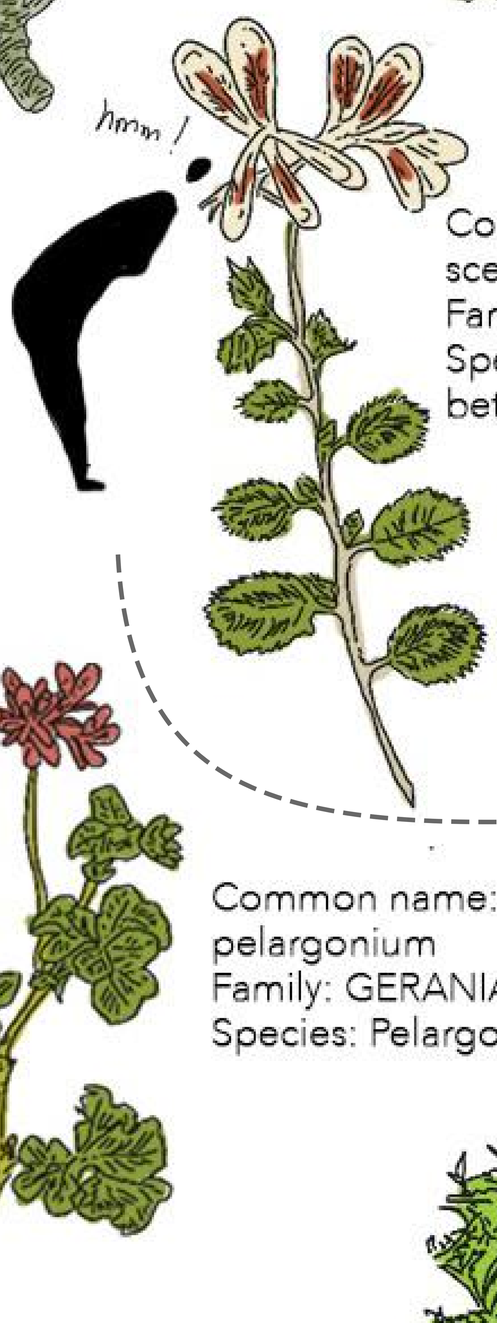
Most South Africans rely on traditional medicine for their basic healthcare needs, and Cape Flats Dune Strandveld is particularly rich with medicine plants.

Sadly, wild plant populations are declining from overharvesting. By creating this useful medicine garden, we are catering for human needs while protecting our wild plants.

Common name: Pig's ears
Family: CRASSULACEAE
Species: Cotyledon orbiculata



Common name: Rose-scented pelargonium
Family: GERANIACEAE
Species: Pelargonium capitatum



Common name: Camphor-scented pelargonium
Family: GERANIACEAE
Species: Pelargonium betulinum

Common name: Sour fig
Family: AIZOACEAE
Species: Carpobrotus edulis

Common name: Cancer bush
Family: FABACEAE
Species: Lessertia frutescens

Common name: Rose-scented pelargonium
Family: GERANIACEAE
Species: Pelargonium

Common name: Confetti bush
Family: RUTACEAE
Species: Coleonema album

Common name: Wild rosemary
Family: ASTERACEAE
Species: Eriocephalus africanus

Credit: FynbosLife

Labyrinth Pond Library

Paths to knowledge and the living landscape

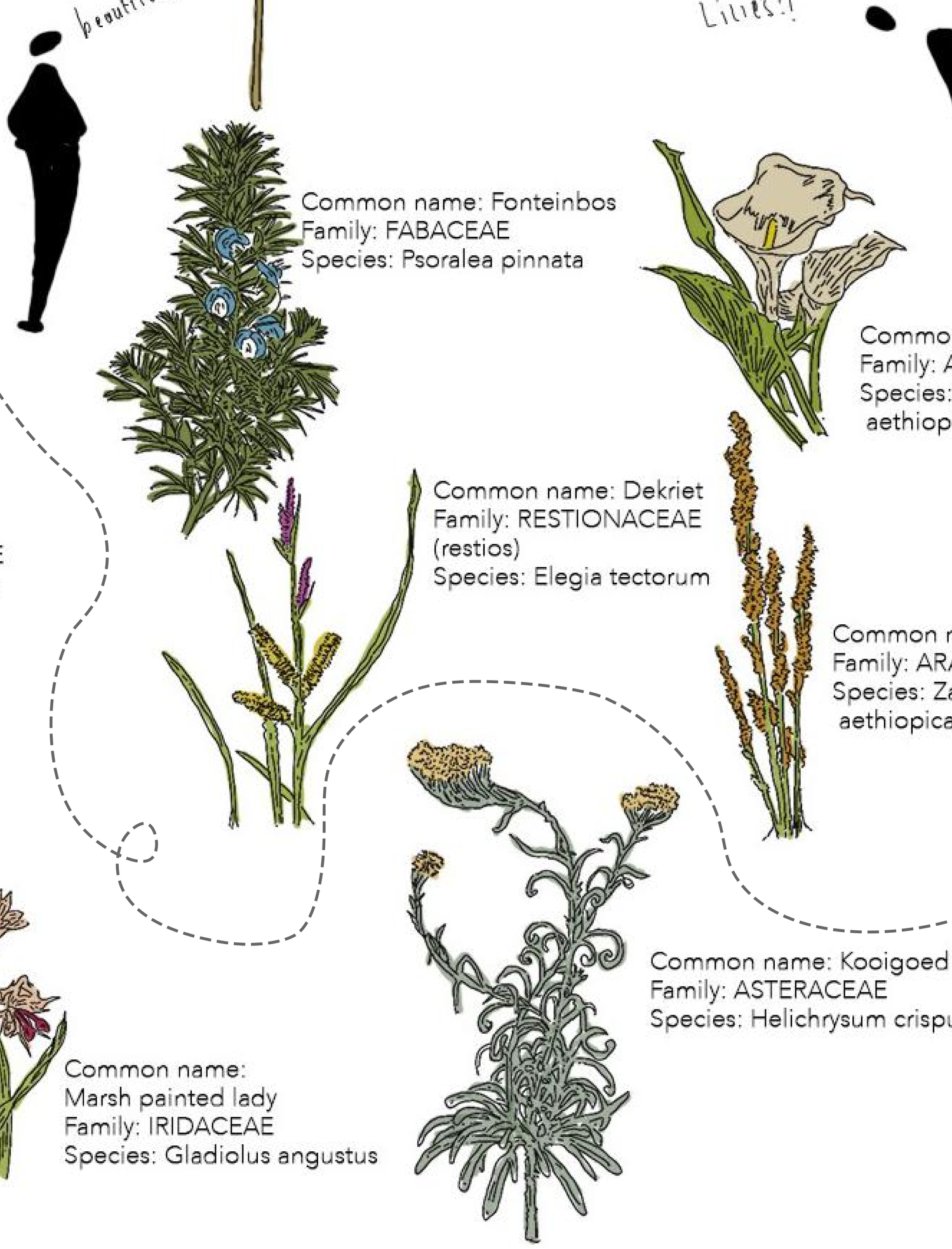
Cape Flats Dune
Strandveld Wetland Garden

Although many of the wetland plants present here emerge naturally from the seedbank, some are commonly reintroduced to increase species diversity.

Diverse wetland vegetation, which includes sedges, restios,
grasses and rushes, is key for effective water filtration,

Common name: Sea rose
Family: GENTIANACEAE
Species: Orphium frutescens

Common name: Spinetip purplegorse
Family: POLYGALACEAE
Species: Muraltia mitior



Common name: Fonteinbos
Family: FABACEAE
Species: Psoralea pinnata

Common name: Arum lily
Family: ARACEAE
Species: Zantedeschia aethiopica

Common name: Lakpypie
Family: IRIDACEAE
Species: Watsonia meriana

Common name: Dekriet
Family: RESTIONACEAE (restios)
Species: Elegia tectorum

Common name: Arum lily
Family: ARACEAE
Species: Zantedeschia aethiopica

Common name: Marsh painted lady
Family: IRIDACEAE
Species: Gladiolus angustus

Common name: Kooigoed
Family: ASTERACEAE
Species: Helichrysum crispum

Credit: FynbosLife

Labyrinth Pond Library

Knowledge Gardens and the Protected Landscape

This stormwater pond is a living, breathing space. It lies within the critically endangered Cape Flats Dune Strandveld fynbos vegetation type that occurs nowhere else in the world. It also supports a number of mammal, bird, amphibian and insect species that contribute to a living ecosystem.
There are critically endangered plant and animal species that can be found at the school pond such as the Barber ranger butterfly that is depedent on the Imperata grass and the Western Leopard Toad.
The Kikuyu grass which predominantly covers the north eastern section of the pond is very invasive as it spreads quickly and can be uncontrollable if not managed.

Kedestes barberae bunta, the Cape Ranger,only 50-100 of these butterflies are known to remain in the wild, at a single location near Strandfontein. The greatest threat to their survival is habitat loss to urbanisation, invasive alien plants, drought and inappropriate wildfires.

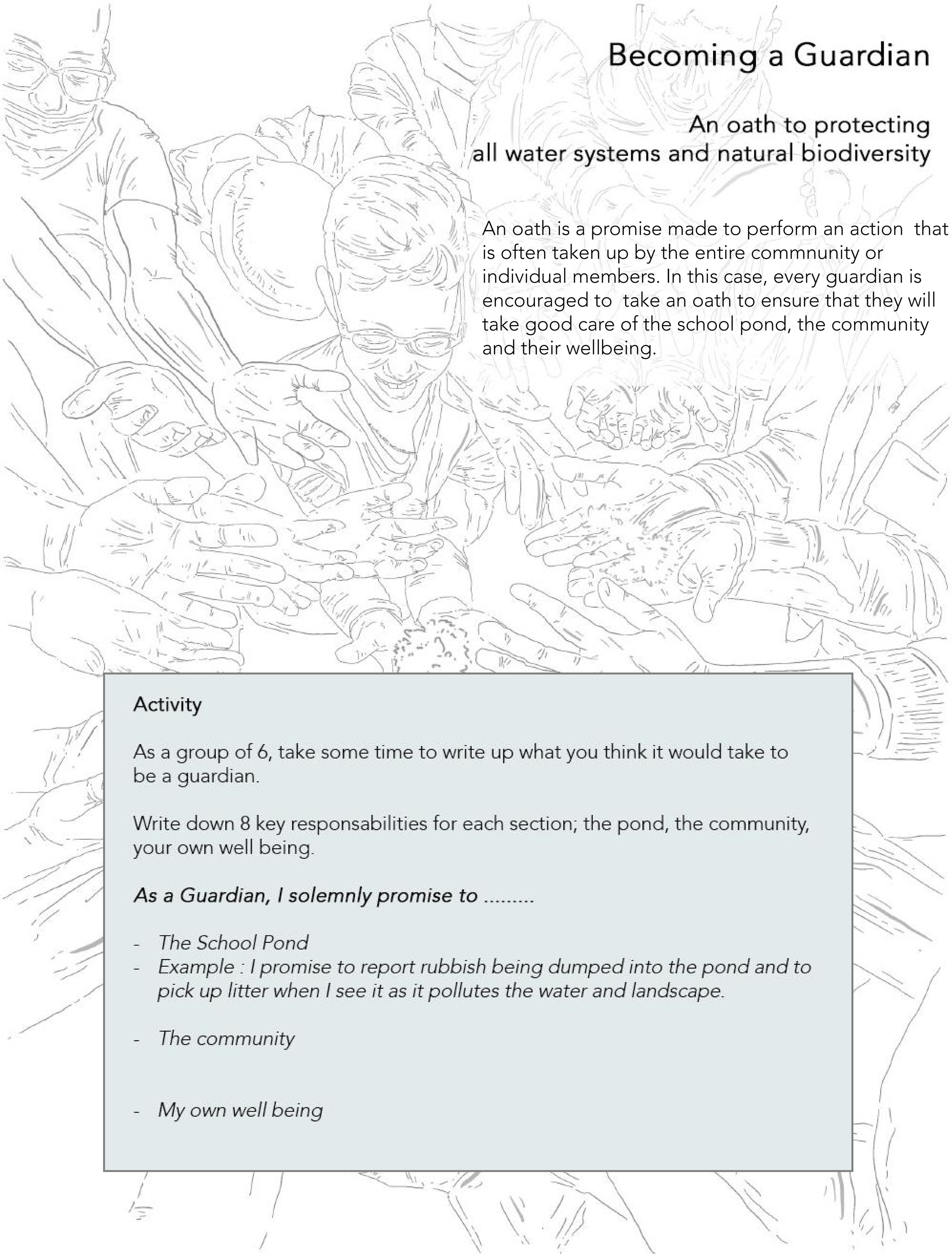
The Western Leopard toad is endangered due to their habitats being drained for development purposes. They are mainly found within wetland areas but can also be spotted along any permanent water bodies.

Imperata cylindrica has sharp and scaly grass tips. It sometimes can be spotted with its silvery-white and cylindrical flower heads. This grass needs to be protected at the school pond because the butterlfies lay their larvae (eggs) on them.

1 : 400

0 10 20 m

Credit: FynbosLife



Becoming a Guardian

An oath to protecting all water systems and natural biodiversity

An oath is a promise made to perform an action that is often taken up by the entire commnunity or individual members. In this case, every guardian is encouraged to take an oath to ensure that they will take good care of the school pond, the community and their wellbeing.

Activity

As a group of 6, take some time to write up what you think it would take to be a guardian.

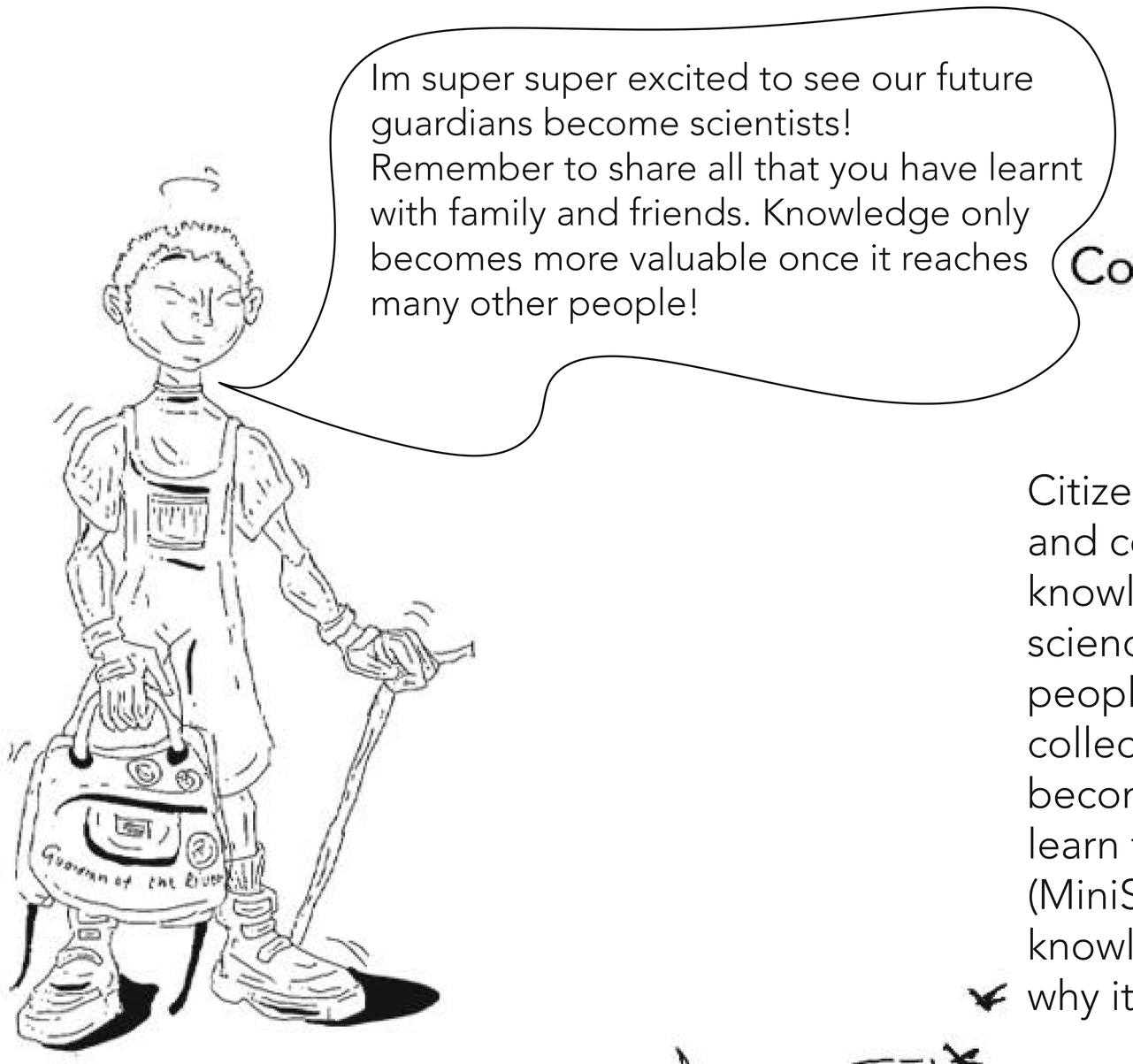
Write down 8 key responsabilities for each section; the pond, the community, your own well being.

As a Guardian, I solemnly promise to .....

- *The School Pond*
- *Example : I promise to report rubbish being dumped into the pond and to pick up litter when I see it as it pollutes the water and landscape.*

- *The community*

- *My own well being*



Citizen Science

Conducting a Mini Science Assessment at the School Pond (MiniSass)

Citizen science is the practice of public participation and collaboration in research which encourages knowledge building and the practical application of science engagement. Through citizen science, people share and contribute to data monitoring, collection and processing. The school pond has now become a living lab that the community can easily learn from. Conducting a mini science assessment (MiniSass) at the pond would further develop more knowledge about what can be found at the pond and why it is important to protect it.

To the Pond we go !!

School Pond as a living lab

The School Pond expedition: Magnifying the plants, birds, mammals and insects

This MiniSass consists of plant, insect and sound identification. Follow the instructions on the inventory and score sheet provided. Remember, at the end of the assessment, you get issued a certificate and get officiated as a Guardian!

Glossary

Word Discovery

Urbanisation: city expansion or development

Infiltration: filter through, soak in

Biodiversity: variety of life forms in a specific environment

Conservation: guarding, protecting, managing

Re mediation: to correct, fix or repair

Rehabilitation: to reconstruct, amend or adjust

Stewardship: guardianship or entrusted to ones care

Enhance: increase, build up or upgrade

Custodian: protector, warden or overseer

Disperse: to spread, distribute or scatter

Nectar: honey or syrup

Foster: to encourage, cultivate or strengthen

Monitoring: keeping track, watch or observe

Inventory: register, checklist or record

Engagement/ engaged: Participating in or take part

Sustenance: nourishment

Solitude: in isolation, alone

Oath: to pledge or make a promise

Magnifying: enlarge, extend or amplify

Contamination: to make unclean, pollute

Managed Aquifer Recharcharge (MAR): Injection and extraction of surface water (river, reclaimed and potable water into an aquifer or ground water storage.

Activity

Can you identify some if not most of these terms in your own lanugage ?

P.S Dont forget to tick the words off once you have found them in the book!

Barren: unproductive or bare

Derelict: in ruins or run down

Cluttered: mess up or make untidy

Brim: edge or margin

Croaking: sound commonly made by frogs

Converted: changed, transformed or reshaped

Monofunctional: only serves one use or function

Retrofit: to modify, change or make better

Permeable: accessible, spongy, allows infill

Aquifer: underground water supply or storage

Replenish: to refill or restore

Attenuation: reduction or lowering

Trench: an open channel or a ditch

Renewable: continuous use or sustainable repurposing

Condensation: turning gas to liquid/water

Transportation: the process of water moving from land to the atmosphere through evaporation

Percolation: moving through permeable or spongy surface

Evaporation: turning liquid into gas

Water vapour: water in the form of gas

Precipitation: rain, snow hail or sleet

Compromising: causing damage or disruption

Vandalised: destroyed or damaged

Injustice: violation of rights

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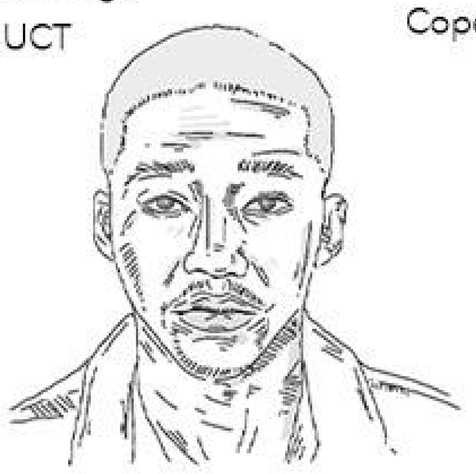

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