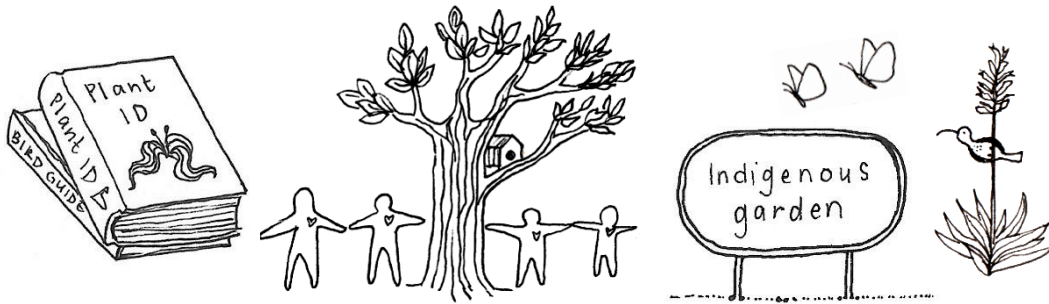


TEACH for ESD



BRING BIODIVERSITY INTO THE SCHOOLYARD

OVERVIEW

Bringing biodiversity into the schoolyard has a range of benefits for both humans and the natural environment. It has great educational value and it can support many ESD related activities. Planting more trees and other plants can provide ecosystem services such as shade, and contribute both to human well-being and biodiversity conservation.

We can bring biodiversity into our schoolyards by **raising awareness** about it by means of **identifying** and **recording** the species diversity that is already there. If our schoolyard is barren, then we can bring biodiversity into the schoolyard and contribute to biodiversity conservation by planting **indigenous** plant species. We can also “entice” more animal species to come into the schoolyard by **creating habitats** and homes for them.

1. IDENTIFY, RECORD AND RAISE AWARENESS

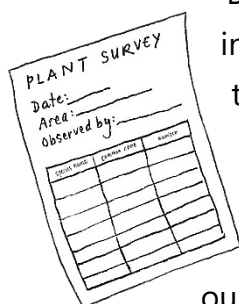
IDENTIFY & RECORD



Bringing biodiversity into our schoolyards can simply be the act of identifying and recording the different types of animal and plant species that already occur there.



Learn how to identify and classify animals and plants by reading **pg. 5 - 7** in *Taxonomy and Systematics*.



By doing a biodiversity inventory (audit) of plants, insects, reptiles, birds, mammals etc. we can determine the **species richness** of our schoolyard. We can then investigate how many indigenous and non-indigenous species are present.



If repeated over time, a biodiversity inventory can be a good way of monitoring how our schoolyard's biodiversity may be changing. This is an ideal activity for an outdoor lesson or a fun project for an enviro-club. Also see *Toolkit 3.8 – Teaching in the Great Outdoors*.



Check out **Section 2 - 4** in the *Schoolyard Biodiversity Investigation Educator Guide* to learn more about how you can conduct a biodiversity inventory.



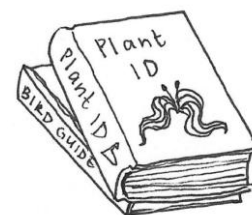
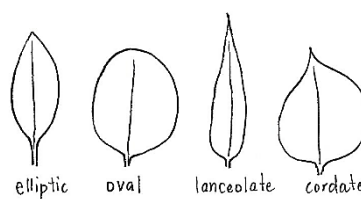
Refer to the chapter on **Collecting Information** in *Tools of the Trade* from *Toolkit 3.8* for more instructions on sampling and use the biodiversity **Audit Sheets** from the *Green Audit Toolkit* found in *Toolkit 3.3 – Reduce Resource Use*.



Plants are the group of living organisms that are generally the easiest to identify.



Learn how to identify plants with *Plant Identification Basics*.



Many of the plants that are found in garden nurseries originally come from other parts of the world. In Namibia, succulents are popular garden plants, but many of these are also not indigenous – and some can even become invasive (see the next section for more on indigenous and non-indigenous species).



Use the **Ornamental Plants at NAAC** slideshow, the *Succulent Plants: A Guide to CITES-listed Species* and the *Tree Atlas* from *Toolkit 1.1 – Know Namibia's Environment* to start identifying the plants on the schoolyard.



TOOLKIT 3.4 BRING BIODIVERSITY INTO THE SCHOOLYARD

Insects and other arthropods are one of the most diverse groups of organisms, and it can be quite difficult to classify them down to the species name. We can however try to identify which order or family the insects on our schoolyard are from. Catching them and studying them up close can be a rich educational experience – but we need to take care to not hurt or kill them!

RESOURCE CHECK

Get familiar with insect families and orders – use the **Identifying Insects** guide from *Master Gardener*, then start sampling with **Invertebrate Sampling Techniques**.



Reptiles and small mammals are not as easy to observe and identify, due to their behaviour: moving very fast or only being active at night. But we might still be able to see and study their tracks!

RESOURCE CHECK

Use the **Hands-On** booklets **Common Household Life** and **Schoolyard Life** to start classifying arthropods, reptiles, birds and mammals that you might find around the schoolyard.
If you live in a more arid environment, use **It's Time to Identify**.

Birds require a little bit more patience; however, this group has been well studied and there is a wealth of resources on identifying birds in Namibia. Binoculars are a very useful tool to identify birds.

RESOURCE CHECK

Use **Birds to Watch in Namibia**, **The Owls of Namibia** and **Namibia Large Birds of Prey** to identify birds around the schoolyard.

RESOURCE CHECK

If you have a smart phone, download the free **Merlin Bird ID** app!



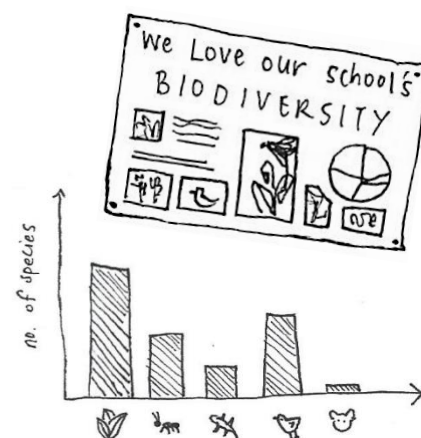
Did you know that Namibia has close to **700** bird species?

See **Toolkit 3.8** for more identification resources on grasses, snakes, dragonflies and animal tracks etc.

RAISE AWARENESS

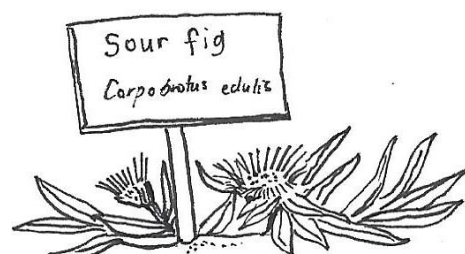
Conducting a biodiversity inventory, can help us to educate and raise awareness about our school's biodiversity. One way of doing this is to make small signs or placards with both common names and species names for well-established plants.

We can design an outdoor poster or mural, where we can list and include photos of the animal species found in our schoolyard, and eventually add statistics about our school's biodiversity.



RESOURCE CHECK

Watch the video **How to Make Upcycled Metal Garden Markers**.



2. PLANT INDIGENOUS PLANTS

CHOOSE INDIGENOUS PLANTS

On a planetary scale, biodiversity is critical in combating and mitigating climate change. Therefore, by contributing to biodiversity conservation, we can help reduce the risk and effects of climate change. One way of to do this is by establishing and protecting indigenous plants in our schoolyard. We need to determine which plant species are indigenous to our biome and vegetation type - remember, what might be indigenous to the Broad-leaf Tree and Shrub Savanna, might not be indigenous to the Nama Karoo. Refer back to **Toolkit 1.1 – Know Namibia's Environment**.

INDIGENOUS

Species that originate or occur naturally in a particular place.



RESOURCE CHECK

Read the brochure **Why is it Important to Preserve Indigenous Trees** and find more resources on the **Botanical Society of Namibia** website.

Several indigenous plants are still being used as traditional food plants and for medicinal purposes. These are part of our natural heritage. Planting indigenous food or medicinal plants therefore also serves the purpose of conserving and integrating indigenous knowledge.

RESOURCE CHECK

Learn more about Namibia's indigenous plant products by reading **Indigenous Plant Products of Namibia**.



Another benefit of indigenous plants is that they are adapted to the local soil and climate. This makes them 'waterwise' plants meaning that we won't have to water them as much as we may have to water exotic garden plants.

RESOURCE CHECK

How do you plant a tree? Read this information sheet on **How to Plant a Tree**.



In land ecosystems, plants are the base of food chains and food webs. They also play a pivotal role in establishing and creating habitats: once established, plant communities attract insect communities and other primary consumer animals, which in turn attract their predators, such as reptiles, birds and mammals.



NURSERY AND SEEDBANKS

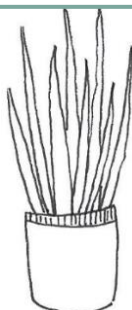
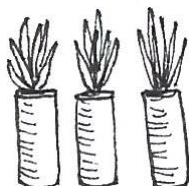
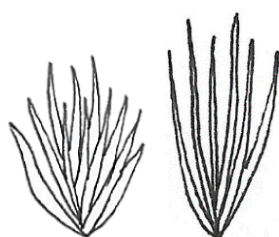
With only a handful of indigenous plant nurseries in the country, it can be difficult to buy indigenous plants locally. A solution to this is for us to start our own indigenous garden nursery! We can also start an indigenous seed bank and share these with our community!



Read **pgs. 9 – 12** in *Growing Mother-tree Seedlings*. Then let **Chapter 1 – 3** in *Growing Rare Plants: A Practical Handbook on Propagating the Threatened Plants of Southern Africa* be your guide!



Learn more about creating seed banks by reading *How to Organise a Community Seed Bank*.



Remember that you may not remove indigenous plants - rather collect their seeds!



Unsure about the conservation status of a plant? Scan the *Red Data Book of Namibian Plants*.

DON'T PLANT ALIEN INVASIVE PLANTS!

Many of our garden plants are not indigenous, which makes them **alien species**. Some alien plant species, especially cacti, can actually become invasive plants! As we learned in *Toolkit 1.3 - Namibia's Environmental Issues*, alien invasive species can be a large threat to our indigenous biodiversity.

ALIEN SPECIES

Species that have become established in areas outside their natural range.



ALIEN INVASIVE SPECIES

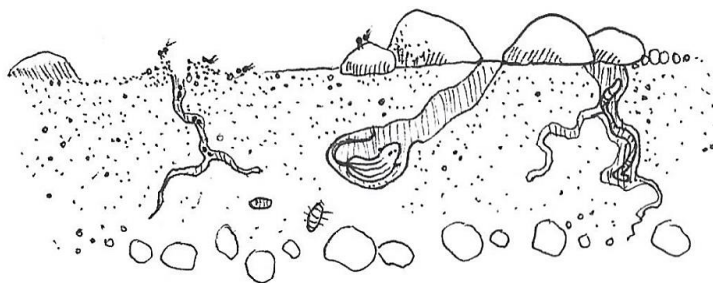
Alien species that can cause significant harm to our environment, the economy or to society.



Refer to the resources on alien invasive plants in *Toolkit 3.10 – Sharing with Others*, to learn more about which plants are highly invasive or potentially invasive plant species in Namibia.

3. CREATE HABITAT

Planting a greater variety of plant species will naturally attract more animals, such as insects and birds. However, to increase in the diversity of animal species in our schoolyard we must create a suitable habitat for various other living organisms, such as soil-dwelling animals and microorganisms. Restoring or creating **healthy soils** is a good first step in creating this habitat.



RESOURCE CHECK

The Soils Challenge Badge explains why soils are so important! Read **pgs. 71 – 75** to take action!

RESOURCE CHECK

The Science and Spectacle of Soil Life is a beautifully illustrated book for primary school learners.

Natural features, such as boulders, rocks and tree stumps are liked by reptiles such as lizards and birds to perch on – especially in arid environments. Building a pond to mimic a natural wetland area can attract a variety of aquatic animals, e.g. frogs, dragonflies or wetland birds.

If there was once a wetland on our school property, this can become part of a small restoration project.



RESOURCE CHECK

Build a pond with the instructions on **pg. 10** of *Bush Telegraph: Water is Life*.

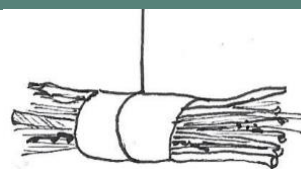
If our aim is to attract more local indigenous species, we need to create habitats that resemble the biome and vegetation type of our area, even if this is an urban environment. For example, if we live in a more arid environment, creating a wetland in our schoolyard does not make the most ecological sense. A bird bath is not necessarily a natural feature in arid environments either, however the educational value will be high, when we are able to observe birds more closely.

RESOURCE CHECK

How does one make a bird bath? Find out by reading the manual **Make the Perfect Bird Bath**.

TOOLKIT 3.4 BRING BIODIVERSITY INTO THE SCHOOLYARD

Insect hotels are both creative and educational projects. These little “houses” create homes for a variety of insects. One very important ecosystem service that many insects provide us with is pollination – this can be of particular value if we are establishing a food garden at our school as well.



RESOURCE CHECK

Watch the video **Easy Bug Hotel** to make insect hotels with younger learners. For older learners, print out the instructions **Make a Bug Hotel**.

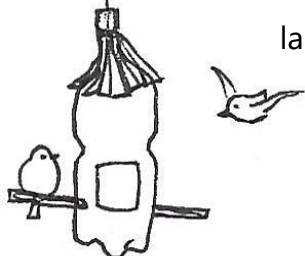


Birds like to nest in small, elevated and contained spaces. Bird boxes can provide suitable nesting sites, especially if there is not a lot of vegetation (such as large trees) in our schoolyard. If a pair of birds decide to breed in our box, it allows learners to observe them up close and to witness their natural reproductive cycle.

RESOURCE CHECK

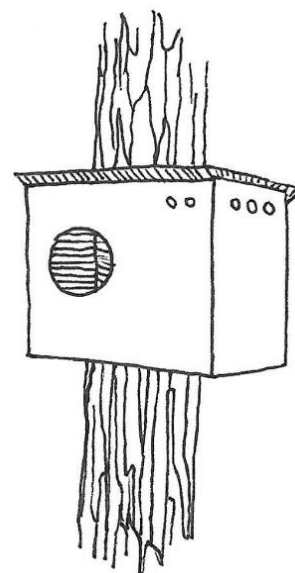
To build your own bird house read **Upcycled Bird Houses**.

If we build larger bird boxes, we might even attract larger birds of prey, such as owls or hawks.



OWLS NEED HOMES

Throughout history, owls were seen by many as bad omens and are sadly still surrounded by superstition to this day. In addition, habitat loss through human development and the use of poisons and pesticides on farms has led to a decline in owl populations. However, we need owls! They play an important role as pest controllers in both rural and urban areas!



RESOURCE CHECK

Create a home for an owl and help their populations to recover! Read the information and instructions from **How to Build an Owl Box** and let your students help you build it.

RESOURCES

SOURCE KEY

Hardcopy



Softcopy



Online



1. IDENTIFY, RECORD AND RAISE AWARENESS

Taxonomy and Systematics



BOOKLET: This booklet lays out the basics of taxonomy and systematics. It explains what they are, providing history and guidance on the fields, how they co-related and why the practices matter (including case studies).

AUTHOR: South African Biosystematics Initiative (2017)

Link: <http://learningthroughnature.co.za/resourcedownloads/taxonomy-and-systematics-booklet/>

Schoolyard Biodiversity Investigation Educator Guide



MANUAL: This booklet guides teachers on how to develop knowledge and appreciation for biodiversity through a biodiversity investigation. It includes lessons plans, samples and templates for the investigation.

AUTHOR: E. Baker (2011)

Link: <https://www.fishwildlife.org/application/files/4815/1373/1123/ConEd-Schoolyard-Biodiversity-Guide.pdf>

Plant Identification Basics



GUIDE: This guide introduces the basics of how to identify different plant species. Using many illustrations, it explains characteristics to look for and how to use them to classify the plant and identify it.

AUTHOR: Montana State University Extension (2013)

Link: <https://static1.squarespace.com/static/5804eb039f74569692067655/t/5aeb007e0e2e725df96d287c/1525350535812/identification+basics.pdf>

Ornamental Plants at NAAC



PRESENTATION: This guide provides photos, species names and some information about many ornamental plants that are found in nurseries; however, are not in Namibian plant guides as they are alien plants.

AUTHOR: K. Ravikumar, SPA, NAAC (2017)

Link: <http://www.naac.gov.in/images/docs/campus/Ornamental%20plants%20at%20NAAC.pdf>

Succulent Plants: A Guide to CITES-listed Species



BOOK: Introducing CITES, this book outlines the purpose of the initiative and the succulents protected under it. It includes a species list, identification techniques, and key implementation and enforcement issues.

AUTHOR: C. Rutherford, M. Groves, M. Sajeve (2018)

Link: https://www.minambiente.it/sites/default/files/archivio/allegati/cites/Succulent_Plants.pdf

Identifying Insects



GUIDE: This booklet guides students on identifying insects through the following: arthropod taxonomy, insect anatomy and growth, and insect orders. There are many helpful photos.

AUTHOR: D. E. Whiting, M. Small (2017)

Link: <https://cmg.extension.colostate.edu/wp-content/uploads/sites/59/2020/01/GN-310-Entomology.pdf>

RESOURCES

SOURCE KEY

Hardcopy 

Softcopy 

Online 

Invertebrate Sampling Techniques – A Field Guide

MANUAL: The educational booklet on invertebrates provides lesson plans and material to introduce collecting and sampling of species at school/home. It includes both active and passive sampling methods.

AUTHOR: D. Archery, D. Padayachee, A. Ramishwer, M. Ndlovu, F. Vukomba, S. Vroom, N. Nxale, P. Sokhela, P. Chetty (2009)

Link: <http://learningthroughnature.co.za/resourcedownloads/invertebrate-sampling-techniques/>

Hands-On Resources

GUIDE: These resources (*Common Household Life* and *Schoolyard Life*) serve as field guides to plant and animal species found in the two different environments, including identification guidance and basic facts.

AUTHOR: M. Manquele (2003) and D. L. Christians (1993)

Link: http://learningthroughnature.co.za/resourcedownloads/?view=category&sort=post_title

It's Time to Identify

GUIDE: This local identification booklet focuses on selected animals and plants found in the Namib desert. It contextualises the area, followed by identification guidance, pictures, facts on species and "similar species."

AUTHOR: NaDEET (2015)

Link: https://nadeet.org/sites/default/files/It%27s%20Time%20to%20Identify_2015%20Internet.pdf

Birds to Watch in Namibia

BOOK: This book focuses on the "Red, Rare and Endemic Species" of Namibian birds. It explains the meaning of the categories and gives a full list of birds for each and why the species is found there.

AUTHOR: R.E. Simmons, C.J. Brown, J. Kemper (2015)

Link: https://www.researchgate.net/publication/277308856_Birds_to_watch_in_Namibia_red_rare_and_endemic_species

The Owls of Namibia

GUIDE: This resource is a guide to identification and general information on the various species of Namibian owls. It educates on behaviour, protection, care and owl's role in nature.

AUTHOR: NARREC (2009)

Link: <http://the-eis.com/elibrary/sites/default/files/downloads/literature/The%20Owls%20of%20Namibia%20-%20Identification%20and%20General%20Infomation.pdf>

Namibia Large Birds of Prey

GUIDE: This illustrated booklet on birds of prey includes key information on the various species found in Namibia, their identification, conservation facts and figures, rehabilitation, and the predatory role they play.

AUTHOR: NARREC (2009)

Link: <http://the-eis.com/elibrary/sites/default/files/downloads/literature/Namibian%20Large%20Birds%20of%20Prey%20Identification%20Conservation%20Status%20Future%20Survival.pdf>

RESOURCES

SOURCE KEY

Hardcopy



Softcopy



Online



Merlin Bird ID



APP: The app is described on the brochure. Download the free app to identify and grow your knowledge of birds, their habitat, calls, characteristics and behaviour.

AUTHOR: The Cornell Lab of Ornithology and Merlin

Link: <https://merlin.allaboutbirds.org/download/>

How to Make Upcycled Garden Markers



VIDEO: This how-to video presents step-by-step the making of high-quality, upcycled garden markers from easily accessible items.

AUTHOR: Perennial (2020)

Link: https://www.youtube.com/watch?v=Cw_BeZCTd_k

2. PLANT INDIGENOUS PLANTS

Why is it Important to Preserve Indigenous Trees



BROCHURE: This brochure answers basic questions relating to the significance and role of indigenous trees in Namibia. It highlights the need to preserve them and gives guidance on their protection and care.

AUTHOR: Botanical Society of Namibia (n.d)

Link: http://botanicalsociety.biodiversity.org.na/documents/Indigenous_trees_pamphlet.pdf

Botanical Society of Namibia



WEBSITE: The Botanical Society of Namibia's website links to their newsletter, contact details, useful links and resources as well as explaining and showing with the Society does, including answering FAQs.

AUTHOR: Botanical Society of Namibia

Link: <http://botanicalsociety.biodiversity.org.na>

Indigenous Plant Products in Namibia



BOOK: This book explores indigenous plants and the corresponding products that have come about as a result of the plant's natural properties. It explains the product commercialisation in Namibia.

AUTHOR: Venture Publications (2014)

Link: <http://the-eis.com/elibrary/sites/default/files/downloads/literature/Indigenous%20Plant%20Products%20in%20Namibia.pdf>

How to Plant a Tree



HOW-TO: This guide shows how to plant a tree and the specifics around making sure it survives. It also includes a list of common Namibian trees in English and Oshindonga, and their most important uses.

AUTHOR: Forest Awareness and Tree Planting Project

RESOURCES

SOURCE KEY

Hardcopy



Softcopy



Online



Growing Mother-tree Seedlings



MANUAL: This resource can be used to inform and teach a lesson to do with tree growing. It includes background reading material and suggests activities to apply and practically engage with this knowledge.

AUTHOR: Share-Net, Handprint (2009)

Link: <https://www.sanbi.org/wp-content/uploads/2018/03/11mother-treeseedlings-all.pdf>

Growing Rare Plants: A Practical Handbook on Propagating the Threatened Plants of Southern Africa



BOOK: This guide shows practically how to successfully propagate threatened plant species in southern Africa, including differing methods depending on the plant, and gives information on the different species.

AUTHOR: G. Nichols (2005)

Link: <https://www.sanbi.org/wp-content/uploads/2018/04/sabonet-report-no-36-growing-rare-plants.pdf>

How to Organise a Community Seed Bank



MANUAL: This is a step-by-step guide on establishing a productive community seed bank. It runs through what a bank is and then goes into setting one up, from the initial planning to maintenance.

AUTHOR: Seed Savers Exchange (n.d)

Link: <https://www.seedsavers.org/site/pdf/Start-Seed-Bank.pdf>

Red Data Book of Namibian Plants



BOOK: This book is a compilation of the red data list Namibian species. It explores past trends and current information of species under threat, presenting a species list, information and distribution maps for analysis.

AUTHOR: S. Loots (2005)

Link: <https://www.sanbi.org/documents/sabonet-report-no-38-red-data-book-of-namibian-plants/>

3. CREATE HABITAT

Soils Challenge Badge



BOOKLET: This booklet, a part of the Challenge Badge series from YUNGA, consists of educational material on soil. It includes learning objectives, activities and useful resource links tailored to three age groups.

AUTHOR: Food and Agricultural Organisation of the United Nations, YUNGA (2015)

Link: <http://www.fao.org/3/i3855e/i3855e.pdf>

The Science and Spectacle of Soil Life



BOOK: This illustrated book aims to educate young children on soil and the health of underground life systems. It informs on soil health, it's role and humans' impact on the resource, and on the lives soil sustains.

AUTHOR: S. Keats (2020)

Link: <http://www.fao.org/world-soil-day/bookcontest/en/>

RESOURCES

SOURCE KEY

Hardcopy



Softcopy



Online



Bush Telegraph: Water is Life



BOOKLET: This issue focuses on water as a source of life and natural resource to be protected. Aimed at educating children on water, it contains informative engaging text, activities, an interview and visual aids.

AUTHOR: NaDEET (2007)

Link: https://nadeet.org/sites/default/files/pdf/educational_material/Bush%20Telegraph%206%20No%201.pdf

Make the Perfect Bird Bath



HOW-TO: This guide shows how to make a simple, effective bird bath. It includes the important things to remember when making and placing your bird bath, and what difference these considerations will make.

AUTHOR: RSPB (n.d)

Link: <http://www.seenature.org.uk/wp-content/uploads/2017/05/make-a-bird-bath.pdf>

Easy Bug Hotel



VIDEO: This how-to video shows a simple way to make an insect habitat out of upcycled materials that should be easy to source. It goes step by step through the creation process and explains the benefits of building one.

AUTHOR: Red Ted Art (2020)

Link: https://www.youtube.com/watch?v=Smv_9vgN39A

Make a Bug Hotel



HOW-TO: This explains how to make an insect habitat from easily sourced items. Potentially more suitable to senior primary children or a class group project for junior primary.

AUTHOR: RSPB (n.d)

Link: <https://www.rspb.org.uk/globalassets/downloads/kids--schools/teaching-resources/make-a-bug-hotel.pdf>

Upcycled Bird Houses



HOW-TO: A practical, step by step guide including a materials list, on how to build an upcycled bird house.

AUTHOR: Iamsamm, Wordpress (2013)

Link: <https://iamsamm.wordpress.com/2013/01/19/upcycled-bird-houses/>

How to Build an Owl Box



HOW-TO: Including some background reading on owl habitats and behaviours, this resource guides on how to build an owl box, from the building-plan to construction and the installation process and considerations.

AUTHOR: Share-Net, WESSA (2012)

Link: <https://safcei.org/wp-content/uploads/2015/06/How-to-build-an-owl-box.pdf>