

PROGRAM

6 / ENTOMOLOGY

7 / INSECT RESEARCH FACILITY

6 / ENTOMOLOGY

6.1 / INSECT SERVICES

Insects outnumber humans 200 million to one, yet they are the most underestimated and disregarded organisms of the animal kingdom (Joffe, 2001: 10). Insects provide crucial services to humans and are critical to our biosphere. Humans, however, regard insects as pests and want to dispose of them without any regard for the consequences. Herbivores, predators, decomposers, pollinators and parasites are some of the key roles insects play; without them the terrestrial ecosystem cannot function (Joffe, 2001: 11).

Although cereal grains, like maize and wheat, are wind pollinated and do not require a living organism for the movement of pollen grain, most fruit and vegetables are dependent on the presence of pollinators (Mayes, 2013: 6). An insect pollinator is a living organism that fertilizes a fruit-bearing flower. It does so by moving pollen grains, which attach to its hairy body when it gathers nectar, to

the stigma of a flower. Basically, this is what allows the plant to produce fruit. This movement of pollen can take place within one flower or among separate flowers in a given locality (Mayes, 2013: 7).

Pollination is one of the most significant services provided by insects in nature. It is a requirement for the seed and fruit generation that produces more than 35% of our daily food for consumption (Holzschuh, et al, 2012: 101). It is the continuous flow of pollen grains from the anthers to the stigma (male to female) that occurs when insect or animals forage for food. In the process of foraging they are instrumental to this flow of pollen grains and therefore provide a free service on which we are dependent (Mayes, 2013: 5). The destruction of these organisms affects our health regarding nutrition and food security.



6.1_ Bee collecting pollen from a sunflower; Photograph by Michael Kooren (<http://www.theguardian.com/environment/2013/feb/28/wild-bees-pollinators-crop-yields>)



6.2_ Variety of colorful flowers is main source of pollinator nutrition (<http://www.ourhabitatgarden.org/creatures/c-images/nectar-plants-large.jpg>)

6.2 / INSECT ORDER

LEPIDOPTERA



6.3.2

 Butterflies and
 Moths

DESCRIPTION /

Lepidoptera means “scale wings” and are the second largest insect order in the world (Hadley, 2015). The 2 pairs of wings are usually very colorful. Most are herbivores and the adults have long sucking tubes for mouthparts which is used to drink nectar (Culin, 2015).

HABITATS /

Variety of land habitats, and is dependant on their food sources (Hadley, 2015). When ready to pupate caterpillars usually find vegetation, soil, leaf litter or wood they have been tunneling for shelter to spin their cocoons.

LIFE CYCLE /

Consists of 4 stages; egg, caterpillar (larvae), chrysalis (pupa) and adult (Culin, 2015). The eggs are usually laid on or close to the caterpillars food plants.

HYMENOPTERA



6.3.1

Bees, wasps and ants

DESCRIPTION /

Hymenoptera means “membrane wings” (Hadley, 2015), they are also classified as insects with narrow waists between thorax and abdomen. They are the third largest insect group, but the most beneficial to humans.

HABITATS /

They live anywhere in the world, but their distribution is limited to their dependence on food supplies (Hadley, 2015). They are found in almost all terrestrial habitats; soil, leaf litter, range of vegetation, mud to construct nests or cells in man made environments (Lindauer, 2015)

LIFE CYCLE /

Most species will lay their eggs on appropriate host plants. Consists 4 stages; egg, larva, pupa, and adult.

COLEOPTERA



6.3.3

Flower Beetles

DESCRIPTION /

Coleoptera means “sheath wings”, it describes the hardened forewings which forms a protective cover for the body. (Hadley, 2015)

Usually flattened or dish-shaped, with pollen easily accessible.

HABITATS /

Coleoptera exists in nearly all climates (Gressitt, 2015). Beetles are found in nearly all terrestrial and aquatic habitats on earth (Hadley, 2015). Soil, humus, leaf litter, under the bark of living and dead trees, under stones and logs.

LIFE CYCLE /

The eggs are commonly laid near the food sources, such as in soil or on host plants depending on the species.

DIPTERA



6.3.4

 Bee Flies
 Hover Flies

DESCRIPTION /

Diptera means “two wings” (Hadley, 2015). Flower flies mimic ants, bees and wasps.

HABITATS /

Live in abundance world wide, their larvae usually require a moist environment (Hadley, 2015). Larvae are found in many habitats; water, plant tissue, beneath bark or stone, decaying plant or animal matter (Gressitt, 2015). Adult flies are seen resting or hovering over blossoms or bare ground patches in a sunny location. Adult bee flies feed on nectar from a wide variety of flowers.

LIFE CYCLE /

Consists of 4 stages; egg, larvae, pupa and adult. Eggs are usually laid close to food sources.

6.3_ The insect order classifies 4 different insect groups (Author, 2015).

6.3 / INSECT HABITATS

When a large variety of insect habitats are conserved, ecosystem services automatically improve (Holzschuh, et al, 2012: 101). Insect habitats vary from species to species, depending on nutritional requirements; safety from predators; and shelter from the elements. A common characteristic of pollinating insects is the fact that they will create and populate their own habitat in an area that provides sufficient nutrition and shelter. Natural areas that are untouched by human activities are essential for the protection of pollinators. Establishing such areas will ensure that other ecosystem services also continue (Mayes, 2013: 21). Most insect pollinators rely on these natural areas and inhabit soil, dead trees and abandoned holes to complete their life cycle. Refer to Figure 00, as seen on the site:

- Carpenter bees rely on logs for their nests
- Leaf Cutter bees use leaves
- Honeybees build their nests in the cavities of trees (Mayes, 2013: 21).

If communities are to be more considerate of the protection of pollinators, they need to provide environments that include pollen, nectar, water, nesting sites and materials required by insect pollinators to complete their life cycle. Mayes (2013: 13) explains simple methods for people to provide habitats for pollinators (refer to Figure 6.4):

1. Supplying a constant source of nectar and pollen in all seasons.
2. Leaving undisturbed areas untouched for nesting.
3. Creating pesticide-free gardens that allow predatory insects to control pests in a natural way.
4. Creating healthy and diverse gardens that beautify the environment and serve as a food source for insects.

6.3.1 BUTTERFLY HABITATS

Successful butterfly habitats consider the following factors (Joffe, 2001: 35):

1. The butterfly habitat requires 5 – 6 hours of daily exposure to sun.
2. Butterflies can get their necessary nutrients and minerals from water puddles.
3. Nectar plants, varying in color, are favored by both caterpillars and butterflies and should be included.
4. Plants and flowers should bloom during the entire summer; therefore, a wide variety of flowers that bloom at different times is required.
5. Butterflies rest/ sleep underneath leaves or in between cracks of rock.
6. Butterflies cannot survive the winter season, therefore they lay eggs in selected grasses, called 'the host', that can withstand the cold.



6.4_ Example of a diver's garden that serves as a food source, (Mayes, 2013: 13)



6.5_ Monarch butterflies gathering between branches (<https://goodmorninggloucester.files.wordpress.com/2013/09/monarch-butterflies-daybreak-willow-tree-c2a9kim-smith-2012.jpg>) edited by (Author, 2015)

Every butterfly chooses its own plant on which to lay eggs. This is called the 'host' plant, and is specific to each species of butterfly (Joffe, 2001: 34). Host plants are usually grasses, such as, Ehrharta Erecta (Shade Ehrharta) and Hyparrhenia Hirta (Common Thatching Grass). The host plant is also the caterpillars' source of nutrition after they hatch (Joffe, 2001: 34). Butterflies are therefore very sensitive to environmental change; they need to be protected and conserved to prevent extinction. Fortunately, butterflies are very loyal and will develop a preference for a certain area (with sufficient plants and flowers); they will return to this area year after year (Joffe, 2001: 34).

6.3.2 BEE HABITATS

Honey bees /

Honey bees are also called "cavity dwellers". They can create heat of up to 35 °C inside their nests. As heat makes the bees aggressive, it is vital to keep nests shaded. Nests should face east, and it must be noted that due to topography nesting sites are scarce. Except for naturally occurring sites, nests can also be built in man-made structures, such as, hollow spaces in walls, ceilings, and under the floor boards of buildings. The size and shape of nests may vary according to the size of the cavity; how long the colony has been established; and the abundance of forage available.

Trapping Bees /

When trapping bees, create an elevated decoy hive that is safe from vermin and vandals. Corrugated plastic and wax treated cardboard can be used in hive construction.



6.6_ Bees creating their hive inside a man made structure (<http://s3-wp.lyleprintingandp.netdna-cdn.com/wp-content/uploads/2014/11/14110005/bees1.jpg>)

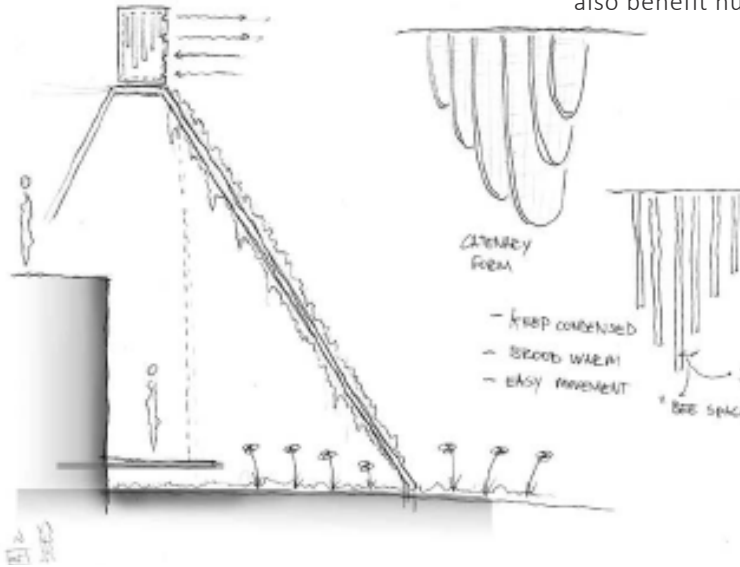


6.7_ Insect hotels created for insects to populate and create habitats (<https://s-media-cache-ak0.pinimg.com/736x/c8/db/ed/c8dbedaa8be924b4a9e8440a12036d3a.jpg>)

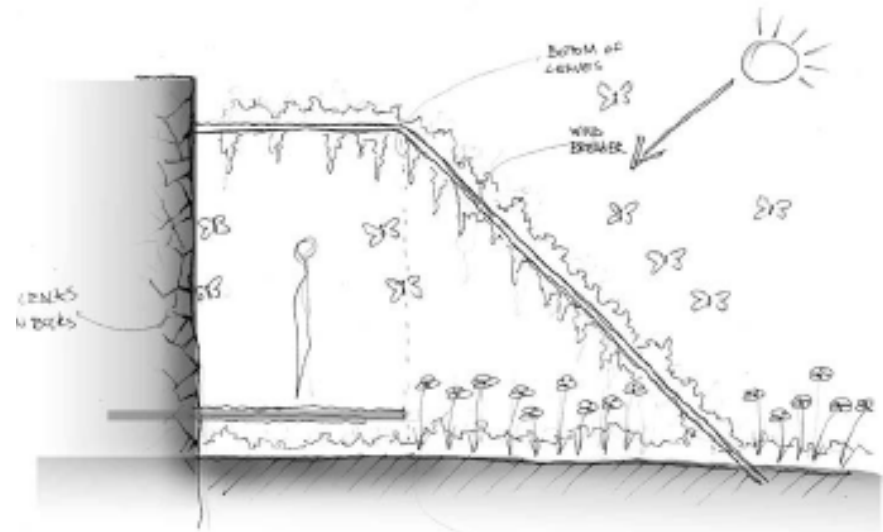
6.4 / HOW THE HABITATS CAN BECOME ARCHITECTURE

Creating a shelter for the insects is vital for their protection and conservation. The regenerative theory prescribes the creation of a mutually beneficial relationship between nature and humans. In parallel, how can sheltering insects become beneficial to humanity? Conversely, how can human shelter become beneficial to insects? The answer lies in using nature as part of the building layers, which play a vital part in the functioning of the building.

As the regenerative theory demands a mutual relationship between nature and humans, application of this theory requires that the building become a reciprocal element. The habitats of insects become a shade component that can control the temperature inside a building. Thus a structure is created as insect habitat that also shapes a livable space where people are protected from the sun and wind. Structural elements can, in a controlled way, become home to insects and also benefit humans.



6.8 _ Example of Insect habitats creating and defining spaces (Author, 2015)..



6.9 _ Example of Butterfly habitats creating space and becoming beneficial for humans. (Author, 2015).

External pressures that threaten the biodiversity and ecosystem services

LAND USE INTENSIFICATION

CLIMATE CHANGE



Habitat destruction

Pesticide use

Urban sprawl

Cyclones



Thunder storms



Drought



6.4 / THREATS TO INSECT HABITATS

Insect habitats are (much like human habitats) also threatened by climate change and environmental destruction. The difference is that insect loss far outweighs human loss. These threats, in conjunction with human activities, such as, excavation, deforestation, the misuse of pesticides, and urban sprawl, are the main contributors to the loss of insect habitats. To curb these habitat losses, the search for carbon neutrality must be combined with a more sensible way of dealing with the environment.

The key to a sustainable future lies with these small creatures and there is still much to learn of insects and their services (Mayes, 2013: 3). Pollinators contribute not only to our food security but also to the survival of plants. It is on this survival that other wildlife depends, and on which biological diversity and the economy pivot.

The future of pollinators is uncertain due to the combined threats of climate change, environmental destruction and human activities. These effect the loss of insect habitats (Mayes, 2013: 11). If no pollinators remain to facilitate the production of fruit and seeds, our diets will be severely affected.

6.10 _ External pressures that threatens insect habitats and ecosystems. (Author, 2015).