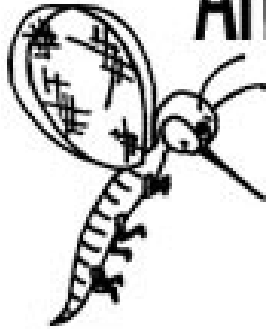


CONTROLLING MOSQUITOES AROUND YOUR HOME



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Preface

MOSQUITOES are a diverse group of flies that can be found worldwide from the tropics to the Arctic regions of the world. New mosquito species are continually being introduced into the United States, and there are 85 species currently found in Texas.

The biology of these insects varies between species; however it is safe to say that one common feature between species is their ability to locate and bite people. Mosquitoes are considered the biggest medical threat to humans, since they are able capable of spreading many diseases. Mosquitoes are known to transmit a variety of pathogens that result in diseases, such as West Nile Virus, Eastern Equine Encephalitis, and Yellow Fever. These diseases kill millions of humans worldwide.

Some examples of different types of mosquitoes include: *Anopheles* mosquitoes transmit malaria in more than 100 countries that causes 2.5 million deaths every year. Other types of mosquitoes are *Culex*, *Aedes*, *Culiseta*, *Ochlerotatus*, *Mansonia*, and *Phosphora*. These mosquitoes usually breed around our homes and they usually have short flight ranges.

In this booklet are a series of exercises to assist with educating your students about mosquitoes and various methods that can be used to suppress mosquito populations.



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*******Lesson 1: Exercise 1*******

Reading Exercise

Approximately 25 Minutes

Overview: Students will read the following passage in the classroom and then answer relevant questions pertaining to the passage. The students will get an overview about mosquito biology and how to prevent mosquitoes from breeding in their yards.

Ask the students before reading the passage: Have they ever seen a mosquito? Can they describe it? Have they ever been bitten by a mosquito? Where have they been bitten? What time of day they were bitten? What time of year were they bitten?

Instructions:

Read the passage either in groups or as a class:

Objective: Students will be able to recognize a mosquito from other insects, they will know why mosquitoes bite humans, and they will know how to prevent mosquitoes from breeding around their homes.

TEKS

Science

2.1a, 2.1b, 2.2a, 2.2b, 2.3a, 2.3b, 2.4a, 2.4b, 2.6a, 2.6b, 2.8a, 2.8b, 2.9a, 2.9b
3.1a, 3.1b, 3.2a, 3.2b, 3.3a, 3.3b, 3.5a, 3.5b, 3.8a, 3.8b, 3.9a, 3.9b

Materials:

Handouts of passage and questions 1-5.
Overhead copy of the passage.

Reading Exercise A

Mosquitoes are insects known as flies. Mosquitoes live in Texas, and they are active during the day and night. Both male and female mosquitoes feed on nectar produced by flowers. Male mosquitoes do not bite people. However, female mosquitoes bite people and feed on blood.

Once a female mosquito has bitten a person, she will lay her eggs somewhere water is present. The mosquito eggs hatch into larvae known as tumblers. The larvae feed on bits of food found in the water. Once they have fed for two weeks, the larvae will become pupae. Adult mosquitoes will emerge from the pupae.

There are many ways to stop mosquitoes from biting people. Mosquitoes do not like to lay their eggs in clean water. Therefore, it is important to empty or change the water in cans, water dishes for dogs and cats and bird baths. This will keep the water clean. Another way to keep mosquitoes away is to keep doors and windows in a house closed. This will keep mosquitoes out of your home.

Reading Exercise B

Mosquitoes are flies, since they have two wings used in flight. Their second pair of wings is reduced into small, knobbed structures called **halteres**. These structures help the mosquito to stabilize itself in flight.

Mosquitoes have scales on wings, legs, and other parts of their bodies. These scales can be colored and arranged differently, which helps to identify certain species.

Mosquitoes live in Texas and they are active during the day and night. Both male and female mosquitoes feed on nectar produced by flowers. There are differences between male and female mosquitoes. One difference is the male mosquito's **proboscis** is too flexible to pierce skin, so the male can not bite humans. However, female mosquitoes bite people and feed on blood. Males also differ from females by having hairy antennae and palpi. Also, their palpi are twice as long as their proboscis.

The mosquito's mouthparts consist of a pair of sensory organs (**palpi**) and a long proboscis. The proboscis is made up of six elongated parts that are enclosed in a flexible membrane, the labium. When a female mosquito lands on a human, her labium folds up to allow the rest of the mouthparts to be inserted into the skin.

The females use the blood to help develop her eggs. Female mosquitoes have to consume a blood meal in order to produce a batch of eggs. On average the female will ingest 2 ½ times her weight. A record exists for a mosquito ingesting 15 times her weight in blood. There have been instances of dogs and cattle dying due to massive mosquito attack.

There are many ways to stop mosquitoes from biting people. Mosquitoes do not like to lay their eggs in clean water. Therefore, it is important to empty or change the water in cans, water dishes for dogs and cats and in bird baths. This will keep the water clean. Another way to keep mosquitoes away is to keep doors and windows closed. This will keep mosquitoes out of your home.

Questions to answer:

1. What kind of insect is a mosquito? **A mosquito is a fly.**
2. What do male and female mosquitoes eat? **Male and female mosquitoes feed on nectar produced by flowers.**
3. Why must a female mosquito have a blood meal? **Females feed on blood to produce a batch of eggs.**
4. Where do mosquitoes lay their eggs? **Mosquitoes usually lay their eggs in dirty water.**
5. How can you reduce mosquito populations in your yard?
You can empty or change the water in containers.

6. What is the name of a mosquito's mouthparts? **A mosquito's mouthparts are called a proboscis.**

Wrap-Up:

Remind students of the importance of mosquitoes, such as mosquitoes are known to transmit a variety of pathogens that result in diseases, such as West Nile Virus, Eastern Equine Encephalitis, and Yellow Fever.

Also mention ways to control mosquito populations in their own backyards: empty or change the water in cans, water dishes for dogs and cats and bird baths.

*******Supplemental to Lesson 1: Exercise 1*******

Mosquito Double Puzzle

Approximately 25 Minutes Instructions: Teacher should refer to reading in Lesson 1: Exercise 2.



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Unscramble each of the clue words, and then copy the letters in the numbered cells to other cells with the same number.

| Word Bank: | | |
|------------|----------------|-----------|
| Itching | Eggs | Important |
| Bites | Water | Flight |
| Blood | Carbon dioxide | Pupae |
| Nectar | Sweat | Saliva |
| Adult | Antennae | Larvae |

*****Lesson 1: Exercise 2*****

Magic Mosquito Matching
Approximately 25 Minutes

Overview:

Students will read the passage pertaining to a mosquitoes' lifecycle, in order to have a better understanding of how this insect develops. They will also gain understanding about why a mosquito bites humans and why the bite itches.

Instructions:

Read the passage either in groups or as a class:

Objective:

Students will be able to recognize the mosquito lifecycle and habits after reading the passage and completing the word jumble.

TEKS

Science

2.1a, 2.1b, 2.2a, 2.2b, 2.3a, 2.3b, 2.4a, 2.4b, 2.6a, 2.6b, 2.8a, 2.8b, 2.9a, 2.9b

3.1a, 3.1b, 3.2a, 3.2b, 3.3a, 3.3b, 3.5a, 3.5b, 3.8a, 3.8b, 3.9a, 3.9b

Materials:

Handouts of passage and the double puzzle.

Overhead copy of the passage.

Student Exercise: Teacher should ask the following questions.

Mosquitoes can be found everywhere in Texas. Not only are they a **nuisance**, but they are considered the most **important** insect to transmit **disease** to **humans**.

How do mosquitoes develop? Mosquitoes have four distinct life stages: egg, larva, pupa, and adult. Mosquito eggs are laid either singly or in cluster on the water surface or in dry areas that are subject to flooding. The mosquito **eggs** will hatch into larvae. The larval stage must live in **water** to survive. The larvae feed on microscopic plants, animals, and other organic debris. The pupal stage is the stage between the mosquito larva and adult. The **pupae** must live in water to survive. The pupal stage does not feed. The **adult** stage has **wings**. Both the male and female mosquito feeds on **nectar** and other plant juices. However, the female mosquito also needs a blood meal to produce eggs.

How do mosquitoes know to bite us? Female mosquitoes use both visual cues and chemical cues to locate humans. Visual cues are used in **flight** and then chemicals cues, such as **carbon dioxide** are detected by the mosquito's antennae as they get closer to humans. Skin temperature, amount of **sweat** produced, perfumes, soaps, lotions, and hair care products may also attract mosquitoes to certain people.

Why does the bite itch? When a female mosquito bites, she injects **saliva** to prevent your **blood** from clotting. This saliva causes both swelling and **itching** for a few hours after **bites** occur.

Student Exercise B

Directions: Match the terms that are related in each column by drawing a connecting line.

Left Column

Mosquito
Itch
Water
Males
DEET
Egg, Larva, Pupa, Adult
Carbon Dioxide, Heat
Females
Buzz
Summer
Feed

Right Column

Hot Weather
Blood
Lifecycle
Bite
Sound
Repellent
Nectar
Attractant
Day/Night
Breeding Site
Fly

Mosquito=Fly
Itch=Bite
Water=Breeding site
Males=Nectar
DEET=Repellent
Egg, Larvae, Pupa, Adult=Lifecycle
Carbon dioxide, Heat=Attractant
Females=Blood
Buzz=Sound
Summer=Hot Weather
Feed=Day/Night

Wrap up:

REMEMBER: By reducing standing water around your home, you will reduce the mosquito populations in your yard.

Wrap Up:

How many stages are there in a mosquitoes' lifecycle? **There are 4 lifestages.**

Name the stages in a mosquito's lifecycle. **Egg, Larva, Pupa, Adult.**

Will the larvae and pupae survive without water? **No, they can not survive without water.**

Will male mosquitoes bite humans? **No, males will not bite humans.**

What causes mosquito bites to itch? **The mosquito's saliva causes itching and swelling.**

*****Lesson 2: Exercise 3*****

Word Find

Approximately 20 Minutes

Overview:

Students will read the passage containing information about the mosquitoes' lifecycle, how they feed, and what diseases they can transmit to humans.

Objective:

Students will understand how a mosquito completes its lifecycle, how it feeds on human blood, and what diseases mosquitoes are capable of transmitting.

TEKS**Science**

2.1a, 2.1b, 2.2a, 2.2b, 2.3a, 2.3b, 2.4a, 2.4b, 2.6a, 2.6b, 2.8a, 2.8b, 2.9a, 2.9b

3.1a, 3.1b, 3.2a, 3.2b, 3.3a, 3.3b, 3.5a, 3.5b, 3.8a, 3.8b, 3.9a, 3.9b

Materials:

Handouts of passage and the word find.

Overhead copy of the passage.

Instructions:

Read the passage either in groups or as a class:

A **mosquito** is a **fly**, which is found in the Order **Diptera**. Mosquitoes have a complete life cycle with the following stages, **egg**, **larva**, **pupa**, and adult. The eggs are usually laid on the surface of the water. The eggs then hatch into larva. Mosquito larvae are called “wigglers”, since they move from side to side and move tail first through the water. Larvae eat algae, bacteria, and fungi. They eat by drawing these particles into their mouths using their beating mouth brushes. Most larvae breathe using an air tube that penetrates through the water’s surface. The larvae then molt into pupa. The pupae do not feed, but they are mobile. Mosquito pupae are called “tumbler,” since they somersault head over tail in the water. They breathe through a pair of trumpets that penetrate the water’s surface to allow them to take in air. The pupa then molts into the adult mosquito. On average female mosquitoes will live 2 weeks to a month on average, while the male mosquito lives a few days.

Mosquito eggs, larvae, and pupae all require water to develop. A mosquito’s lifecycle is completed at various times due to different species and temperature. With proper temperatures and enough food, eggs will hatch in one to three days; larva will develop on seven to 10 days; pupa will develop and emerge as adults in one to three days. The total life cycle of the mosquito takes between 10 to 16 days.

They are annoying for the buzzing sound they make as well as their bites. There are many types of mosquitoes including *Aedes* and *Culex* that are living in Texas. Both males and female adult mosquitoes feed on nectar of plants as a **sugar** source. Male mosquitoes do not bite people. However, adult female mosquitoes **bite** people, feed on **blood**, and can transmit pathogens like the West Nile Virus that result in a **disease**.

Mosquito Word Find

C D I S R G A K Z Q D J V R C
E S Q F X A H F L K A T G U I
U R Y H C E G A X M F K L F U
G V X P V Q R U F O N E B M W
O R T R R V N A S S X T U I A
V R U O A P H R R Q P T Z I T
O A M B W U O E U U D H Z A E
S U B O T P V T A I O Z I M R
S H L S D A Z P Z T D M N G N
U F E C I L M I A O V D G H R
U S R I S Y S D D A E Z V P V
W E O S E F Q C O B D L E Z Z
M D G I A J L T O R R T P W X
H E L G S H Y Y L S I F A A U
X A Z D E R T I B B P S Z S M

Words to find:

| | | | |
|-----------------|-----------|---------|-------|
| MOSQUITO | BITE | TUMBLER | EGG |
| FLY | BLOOD | PUPA | LARVA |
| DIPTERA DISEASE | AEDES | CULEX | |
| WATER | PROBOSCIS | SUGAR | |

Wrap Up:

Why is a mosquito's larvae called a "wiggler?" **The larvae wiggles side to side as it moves.**

Why is the mosquito's pupae called a "tumbler?" **The pupae somersault head over tail in the water.**

What is the name of a mosquito's mouthparts? **The mosquito's mouthparts are called a proboscis.**

Name some of the diseases that mosquitoes are able to transmit. **West Nile, EEE, WEE, Yellow Fever, etc.**

Is there only one type of mosquito that bites humans? **No, there are many different species of mosquitoes that bite humans.**

Enhancement Activities:

*******Supplemental to Lesson 2: Maze*******

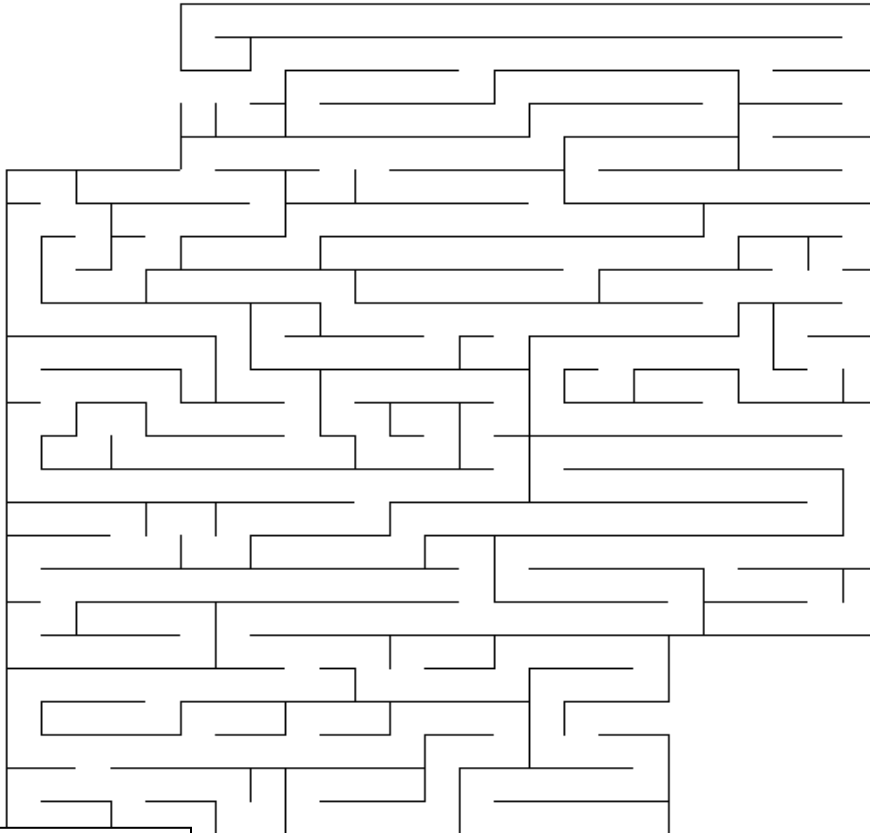
Help Mazzie get her blood meal

Approximately 10 Minutes



**Spiders, bats, birds
and dragonflies are
predators of**

**Mosquitoes rely on sugar as
their main source of energy.**



**Dark colors capture heat
and make most people more
attractive to mosquitoes.**

**A mosquito can fly
1 to 1.5 miles an
hour.**

*******Lesson 3: Exercise 4*******

Coloring Page

Approximate Time: 30 Minutes

Overview

Students will gain knowledge about mosquito breeding areas that exist around their own houses. The students will then be able to control mosquito breeding in their own backyards.

Objective

Students will be able to locate and eliminate areas of standing water in and around their homes. They will be able to inform their parents about these areas in order to get rid of the existing standing water.

TEKS

Science

2.1a, 2.1b, 2.2a, 2.2b, 2.3a, 2.3b, 2.4a, 2.4b, 2.6a, 2.6b, 2.8a, 2.8b, 2.9a, 2.9b

3.1a, 3.1b, 3.2a, 3.2b, 3.3a, 3.3b, 3.5a, 3.5b, 3.8a, 3.8b, 3.9a, 3.9b

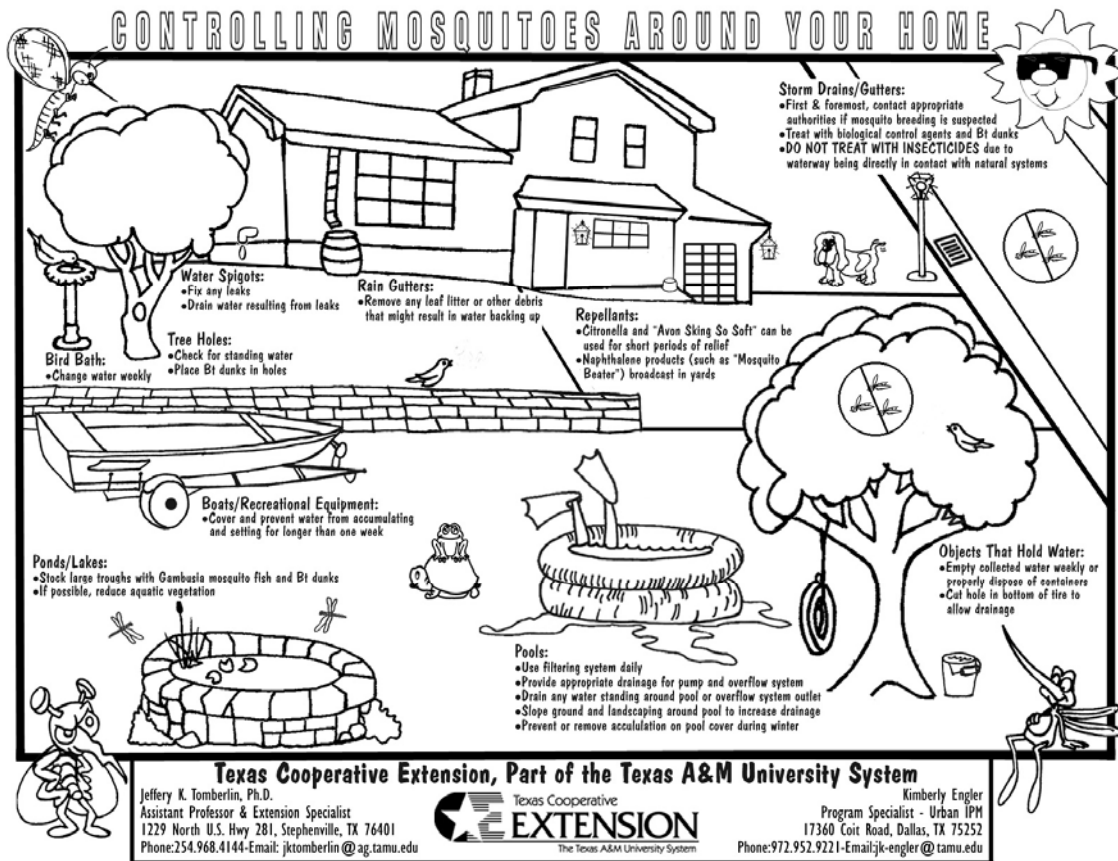
Materials:

Handout of illustration and the “I Spy...Water” activity.

Overhead copy of the illustration.

Instructions:

Read the captions on the picture and locate all areas where mosquitoes could breed. Then the students may color the picture, before taking it home to show their parent/guardian. This is an opportunity for the students to point out possible areas of standing water to their parents/guardians, in order to eliminate these areas.



Wrap Up:

- What stages of a mosquito's lifecycle must have water to survive? **Egg, Larva, Pupa.**
- Are there other areas where mosquitoes could breed? **Yes, mosquitoes can complete their lifecycle in as little as a cupful of water.**
- If you dumped out a bucket containing water, would this eliminate mosquitoes from completing their lifecycle? **Yes, it would prevent the mosquito from becoming an adult.**
- How many days does it take for a mosquito to complete its lifecycle? **It takes about 7 days for a mosquito to complete its lifecycle.**

Enhancement Activities:

The students may walk around their homes and fill out the "I Spy....Water" worksheet. This worksheet lists areas where water is currently standing. They can take the illustration with them as a reference, but they should also be able to find other areas of standing water. The students can complete this exercise with a parent/guardian or the students can complete the exercise alone and then share it with their parent/guardian upon completion. The students will then report two areas where they found standing water and ways to eliminate the water, the following class period.

I SPY.....WATER



Areas of standing water

- 1.
- 2.
- 3.
- 4.
- 5.

Ways to eliminate the water

- 1.
- 2.
- 3.
- 4.
- 5.



*******Lesson 4: Exercise 5*******
Cross Word Puzzle
Approximately 25 Minutes

Overview

Students will gain knowledge about integrated pest management (IPM) in order to reduce mosquito populations. They will learn about different methods to control mosquitoes instead of relying on chemicals.

Objective

Students will learn how to reduce mosquito populations after reading the passage and solving the crossword puzzle.

TEKS

Science

2.1a, 2.1b, 2.2a, 2.2b, 2.3a, 2.3b, 2.4a, 2.4b, 2.6a, 2.6b, 2.8a, 2.8b, 2.9a, 2.9b
3.1a, 3.1b, 3.2a, 3.2b, 3.3a, 3.3b, 3.5a, 3.5b, 3.8a, 3.8b, 3.9a, 3.9b

Materials:

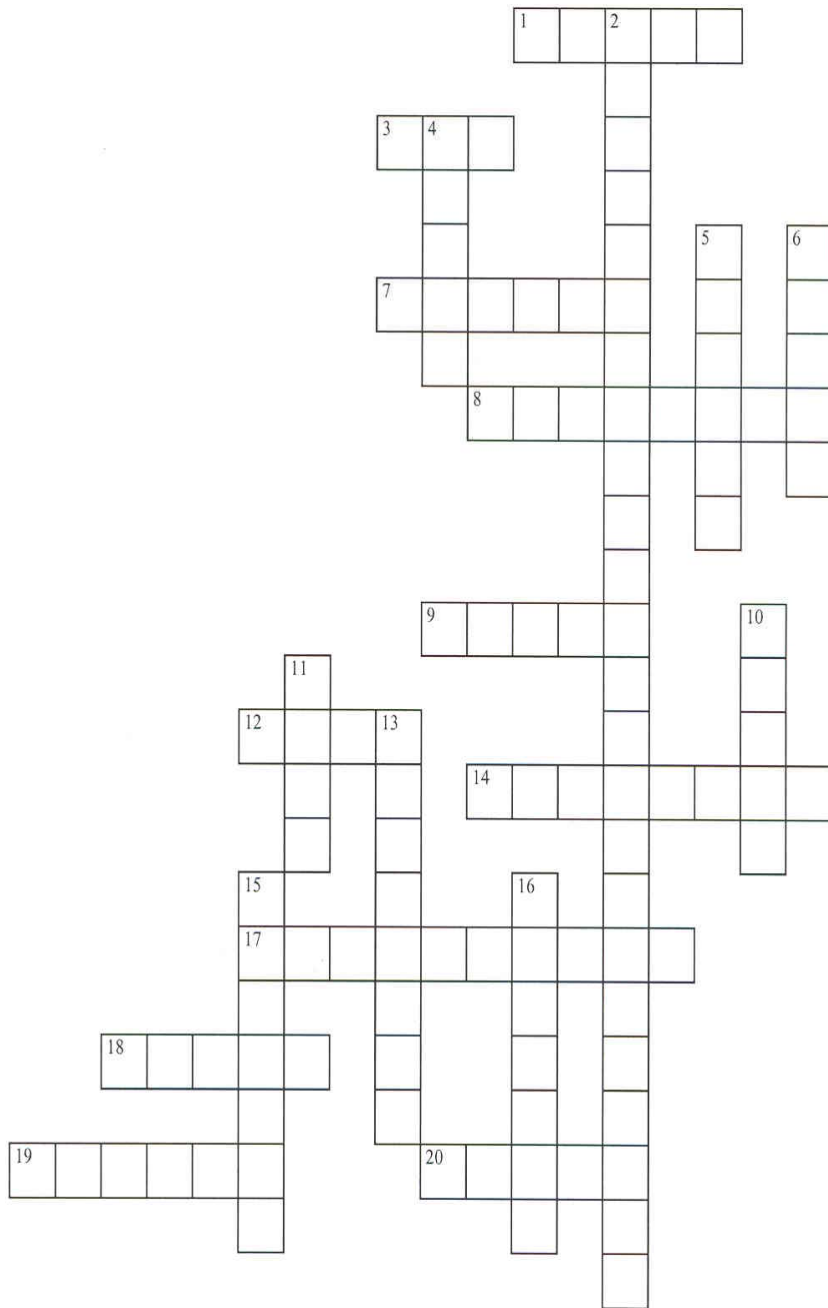
Handouts of passage and the word puzzle.
Overhead copy of the passage.

Instructions:

Read the passage either in groups or as a class:

INTEGRATED PEST MANAGEMENT (IPM) is the use of chemical, cultural, and biological control methods to suppress insect pest species, such as mosquitoes. **Chemical control** strategies include insecticide sprays. Many of these insecticides are sprayed from trucks or airplanes. However, the over-use of insecticides with time can result in their not being able to suppress mosquito populations. As a result, we will have larger populations of mosquitoes. **Cultural control** can be defined as anything you can do to prevent mosquito populations from growing. Any object that can hold water is a potential place for mosquitoes to develop. Some habitats for mosquito development include ponds, lake edges, swamps, tree holes, tunnels, hoof imprints, irrigation ditches, tires, cans, pet dishes, pools, boat covers, bird baths, gutters, septic tanks. **Biological control** can be defined as using what Nature already has provided to control mosquito populations. Examples of biological control include frogs and birds that eat mosquitoes.

Using an **integrated pest management (IPM)** approach to suppress mosquito populations is the best way to decrease current mosquito populations.



Questions or statements:

ACROSS

- 1 Mosquitoes are _____
- 3 Mosquitoes have this many wings
- 7 The sugar source used by male and female mosquitoes is found in plant _____.
- 8 These methods for controlling mosquitoes result in changing the environment so mosquito populations will not grow.
- 9 Mosquito larvae turn into _____.
- 12 Female mosquitoes are attracted to their hosts by _____.
- 14 These methods use insecticides to control mosquitoes.
- 17 These methods use what Nature has provided to control mosquitoes for example, frogs and birds.
- 18 Female mosquitoes feed on _____.
- 19 Eggs hatch into _____.
- 20 Mosquitoes have _____ body regions.

DOWN

- 2 This method should be used to control mosquito populations. Biological, chemical and cultural methods together make up this method.
- 4 Mosquitoes lay their eggs in _____.
- 5 The wings of the mosquito are found on this body part.
- 6 Mosquito pupae turn into _____.
- 10 Male mosquitoes feed only on _____.
- 11 The mouthparts of the mosquito are found on this body part.
- 13 Mosquito pupae are also called _____.
15. The stomach of the mosquito is found in this body part.
16. Flies are in the order _____.

Word Bank

| | | |
|----------|----------------------------|--------|
| Flies | Diptera | Pupae |
| Tumblers | Blood | Head |
| Thorax | Nectar | Sugar |
| Heat | Three | Larvae |
| Chemical | Cultural | Two |
| Chemical | Integrated Pest Management | Water |
| Abdomen | Adult | |

Wrap Up:

1. What does IPM mean? **IPM stands for integrated pest management.**
2. What are some ways to reduce mosquito populations? **We can reduce mosquitoes by cleaning gutters, changing water in bird bathes and pet dishes at least once a week, emptying water in buckets and cans, removing standing water on boat covers, etc.**
3. What are some predators of mosquitoes? **Birds and frogs are predators of mosquitoes.**
4. Is the use of chemicals the only way to reduce mosquito populations? **No, we can remove standing water found in and around our area and encourage natural enemies to inhabit our area.**

Vocabulary Words

Aedes spp.: Any of a genus (*Aedes*) of mosquitoes including the vector of yellow fever, dengue, and other diseases.

Culex spp.: Any of a large cosmopolitan genus (*Culex*) of mosquitoes that includes the common house mosquito (*C. pipiens*).

DEET: Colorless oily liquid insect repellent C₁₂H₁₇NO.

Haltere: One of a pair of club-shaped organs in a Dipteran insect that are the modified second pair of wings and function as sensory flight stabilizers.

Labium: A liplike structure, such as that forming the floor of the mouth of certain invertebrates, especially insects.

Palpi: A segmented usually tactile or gustatory process on an arthropod mouthpart.

Proboscis: Any of various elongated or extensible tubular processes (as the sucking organ of a butterfly) of the oral region of an invertebrate.

*Definitions from Merriam-Webster Online Dictionary, 2005.