# Insects – Presented to the Master Gardeners

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#### Virginia has over 20,000 species of insects

227 species of fish

9 species of lizards and 41 species of snakes

84 different species of amphibians

472 species of birds

25 different species of rodents, 17 species of bats, 12 species of shrews and moles, 13 species of "carnivores," 4 of rabbits and hares, 2 native species of even-toed, hoofed animals, and 1 species of marsupial

Some mammals are doing well; there are over 50,000 Coyotes in Virginia, and over 16,000 Black Bears

Source: DGIF & DCR



## What is a <u>Dichotomous Key - a tool to ID organisms</u>

Is the Organism worm-like with no legs?

YES – then go to Section I

NO – it has legs, then go to Section II

Section I. If it has no legs and is worm-like, it is some kind of worm

Section II. How many legs does the organism have?

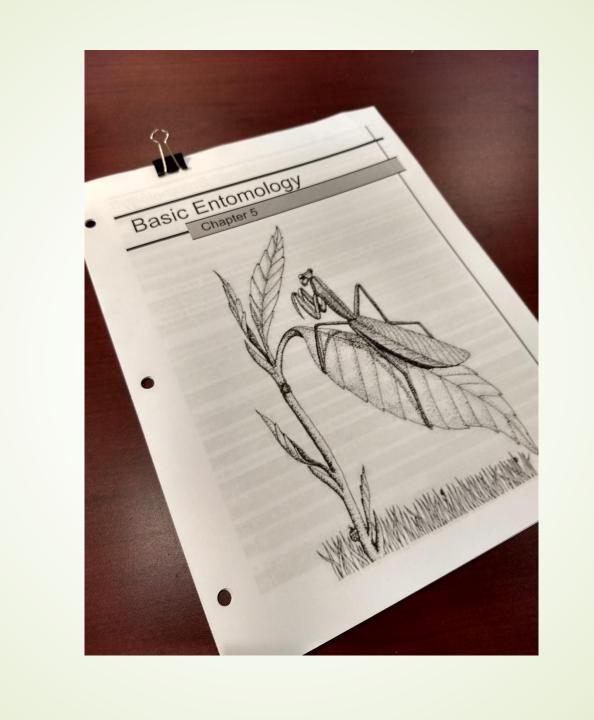
If it has more than eight legs, go to Section A - Myriapods

If it has eight legs or less, go to Section B – Spiders or Insects

## Morphology & Metamorphosis

The study of the shapes and arrangement of parts of organisms, in order to determine their function, their development, and how they may have been shaped by evolution.

The process of transformation from an immature form to an adult form in two or more distinct stages.



# Insects that Damage Plants

Aphids



Japanese Beetle

Beetle Grub

Stink Bug









Bagworm



### Controls to use

Chemicals

Biological

**Predators** 

**Crop rotation** 

Planting sequence

World's insects threatened by a "catastrophic collapse of nature's ecosystems", according to the first global scientific review.

More than 40% of insect species are declining and a third are endangered, the analysis found. The rate of extinction is **eight** times faster than that of mammals, birds and reptiles.

The total mass of insects is falling by a precipitous 2.5% a year, according to the best data available, suggesting they could vanish within a century.

Source: Biological Conservation
Volume 232, April 2019, Pages 8-27

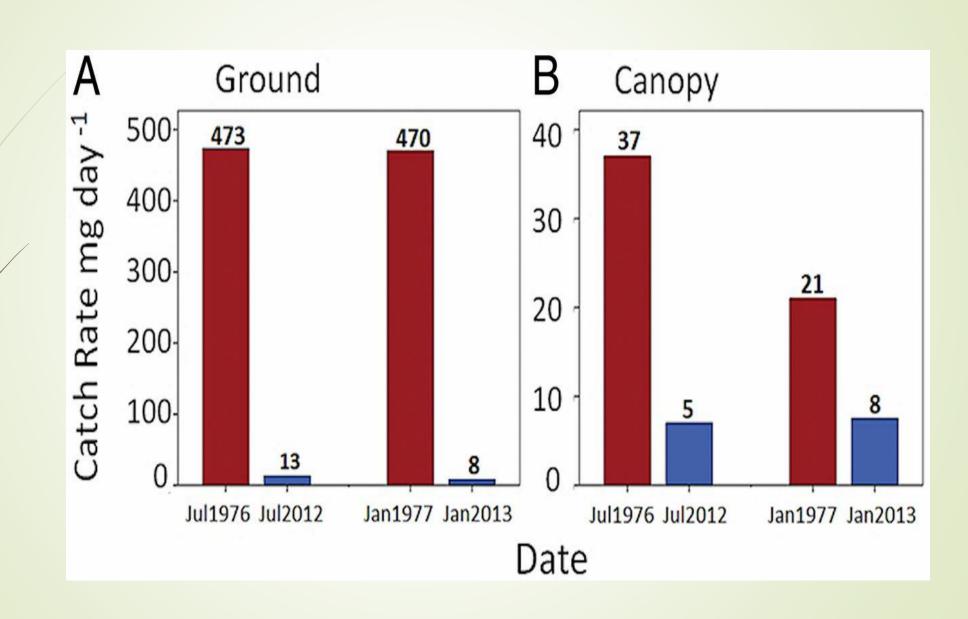
WHY?

Habitat loss by conversion to intensive agriculture is the main driver of the declines.

**Agro-chemical pollutants** 

**Invasive species** 

**Climate change** 



Group	2005 Endangered Species (Sp.)	2017 Endangered Sp.	2005 Threatened Sp.	2017 Threatened Sp.
Mammals	60	68	8	27
Birds	75	81	15	20
Reptiles	14	16	21	28
Amphibians	9	20	7	15
Fishes	70	92	40	72
Mollusk	61	75	8	14
Arachnids	5	12	0	0
Insects	28	74	9	11
Flowering plants	539	735	132	163
Plant totals	567	774	135	168

Source: U.S. Fish & Wildlife Service





#### **Plants & Pollinators**

"Insect pollinators are vital to the existence of almost **90** percent of the world's flowering plants, including a large portion of food products. Blueberries and cherries, for instance, depend on honey bee pollination.

But pollinator populations are falling amid what has been termed an "insect pollinator health crisis." (National Resource Defense Council 2011)

#### A few of food plants that need or use pollinators (Wikipedia):

Watermelon Blueberries

Squash Raspberries

Pumpkins Blackberries

Cucumbers Strawberries

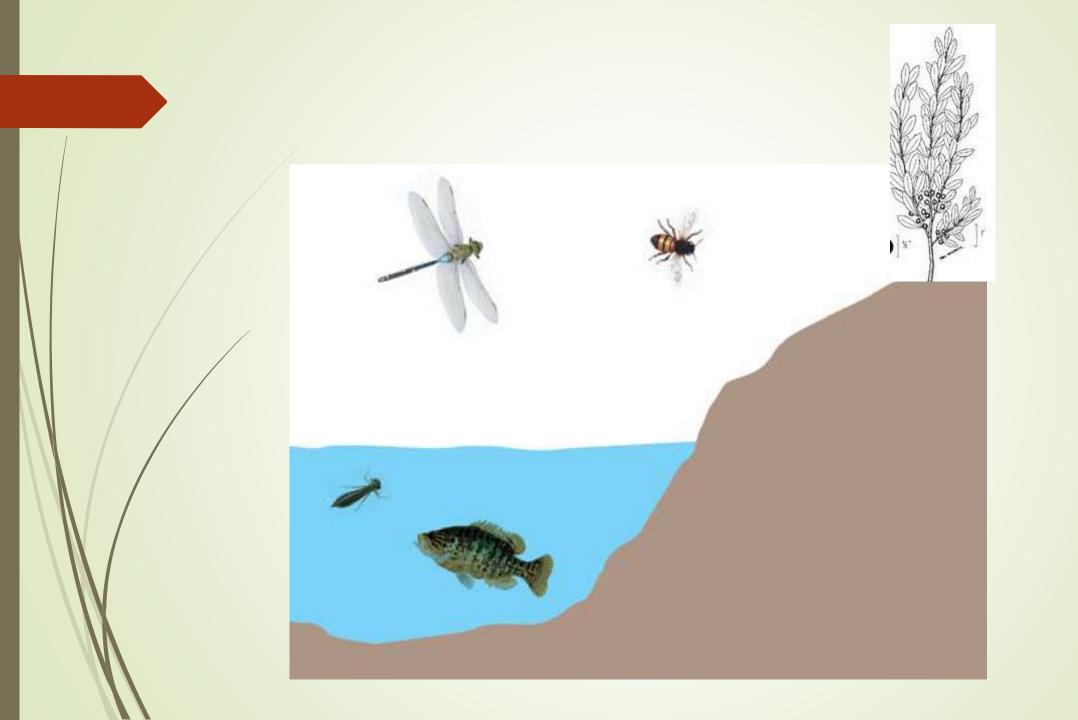
Apples Almonds

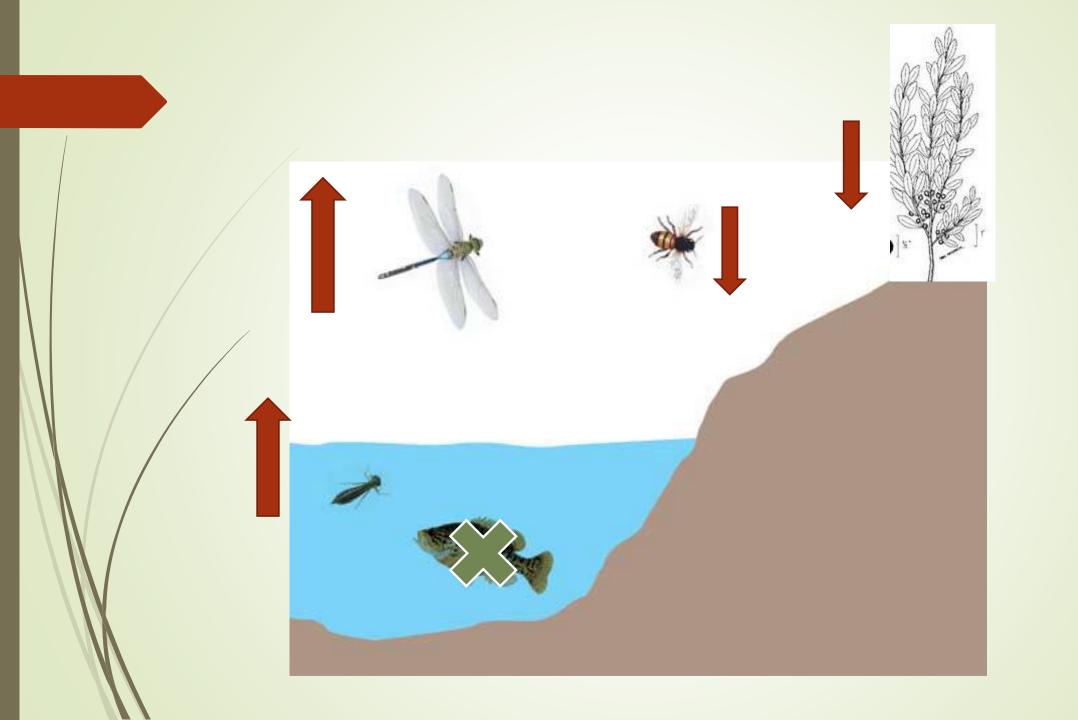
Pears Cashews

Peaches Broccoli

Plums Carrots

Grapes





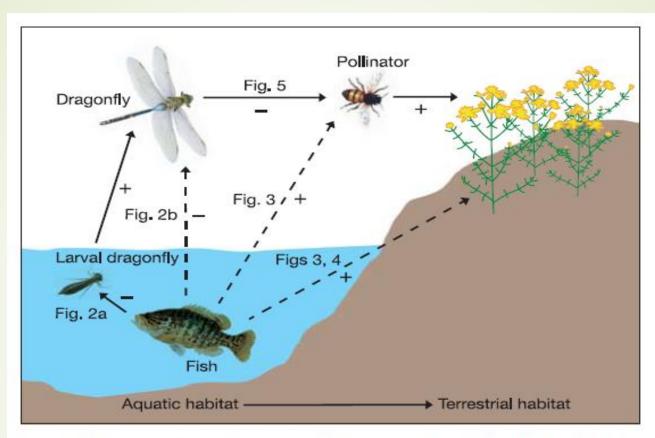
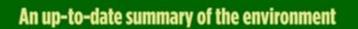
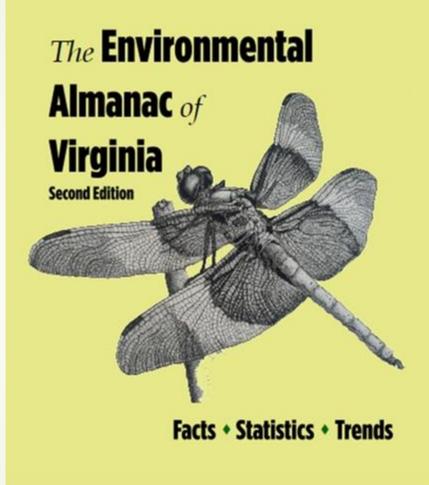


Figure 1 | Interaction web showing the pathway by which fish facilitate plant reproduction. Solid arrows indicate direct interactions; dashed arrows denote indirect interactions. The sign refers to the expected direction of the direct or indirect effect (see the text). Figure numbers indicate which figure presents data supporting each of the predicted effects. (Figure created by S. White and C. Stierwalt.)

Knight et al. 2005. Nature Publishing Group





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## **Questions**

