

Lesson 6 Part 3

A COLLECTION OR FIELD GUIDE:

SYSTEMS AND SYSTEM MODELS

SYSTEMS

- A system is a collection of parts which are interconnected because they continually affect each other over time in unpredictable ways.
- A system can carry out functions its individual parts cannot.
- To understand systems, the relationships between or among the parts must be examined.
- Thinking of a natural feature as a system helps us think about the impacts and interactions that lead to changes we can observe.
- Studying systems is about studying the **interconnections** and **relationships** between things.

SYSTEM MODELS

- Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems.
- Models are limited in that they only represent certain aspects of the system under study.
- Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability.

How to Study Systems and System Models

Ask yourself these questions when you are doing an observation:

- What are the parts of this system?
- What are the boundaries?
- How does the system work?
- How do the parts of the system interact?
- What would happen if a part was removed?
- What would happen if a part were added?





Examples of Systems and System Models

- **A “Tiny World”**
 - Things on a lawn
 - Under rocks or a log
 - On a rotting log
 - In puddles
- **Populations of organisms (a herd, a hive)**
- **Parts of one organism (Parts of a plant)**
- **Communities of different organisms (An oak woodland)**
- **An ecosystem (A pond, a forest, a prairie)**

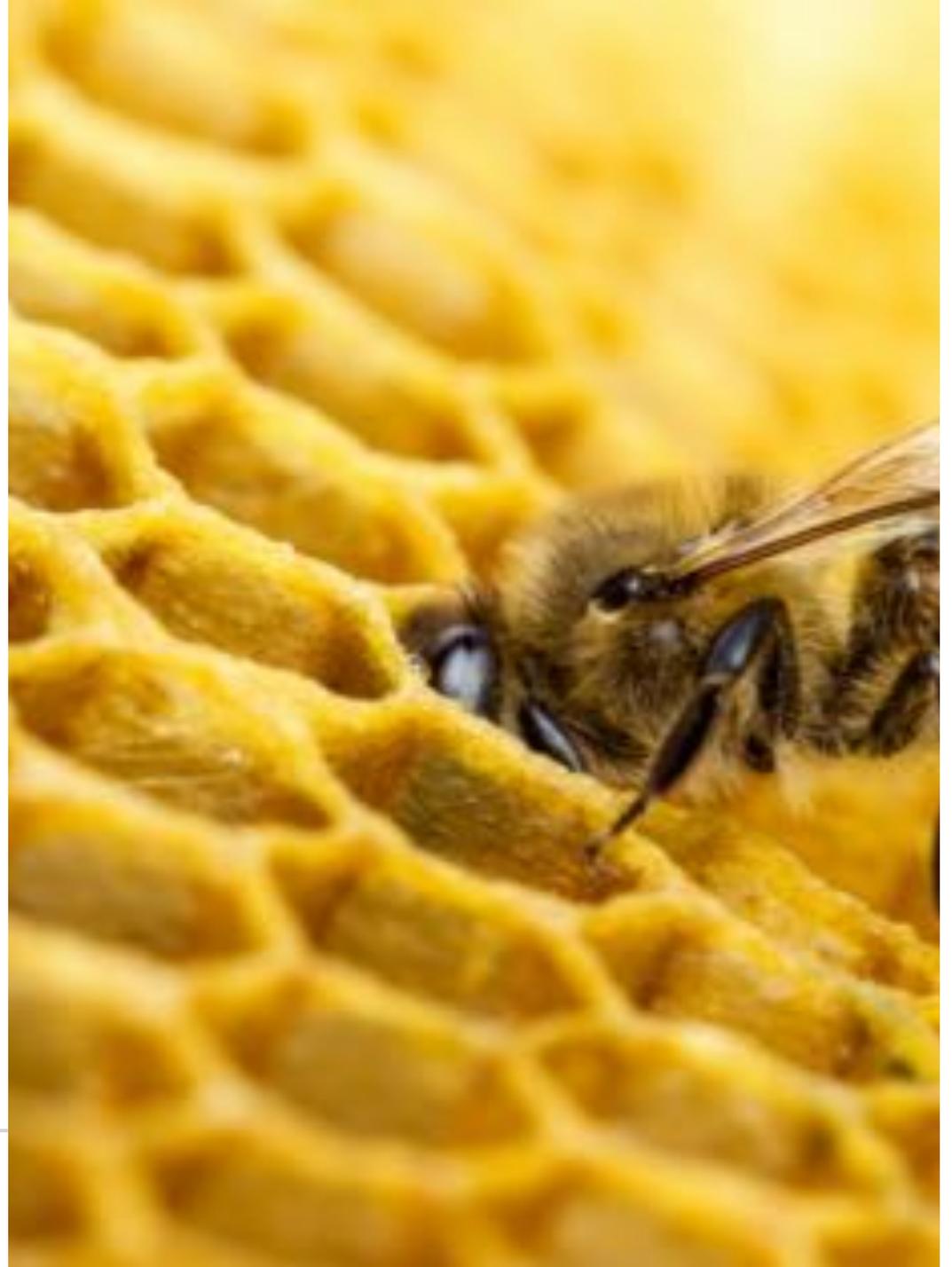


Natural systems and their interconnections can be investigated by:

- looking at the **adaptations of the species** living there; (e.g. the hawk can fly and has superb vision to locate the rabbit)
- examining the **flow of energy** through the system(s); (e.g. apple tree gets energy from sun and some is stored in the apple which you and the ants eat, and which gives nourishment)
- exploring the **networks** or webs of relationships; (e.g. the grass that took up the water did so through a network of roots)
- understanding the **cycling** of water, air and other nutrients; (The apple core is broken down by bacteria which make the nutrients in it available for the grass to use.)

Your Turn

1. Make a field guide of your chosen subject that shows **Systems and System Models**.
 2. Include three to five things in your field guide.
 1. This could be the parts of a “tiny world” or
 2. 3-5 examples of similar systems such as plants showing their parts).
 3. Arrange the page so that you show a drawing with words and numbers next to it.
 4. Record observations with words, pictures, and numbers, paying attention to similarities and differences and evidence of **Systems and System Models**.
-



Remember to begin with your metadata



Date, Day, Time



Location, habitat



Weather

Temperature

Wind

% Cloud cover

Plan your page



Heading first
Then Title



Create enough space to show all 3 to 5 subjects.



Remember to include ABC's, 123's and drawing/sketch/diagram for each subject.



Use the next page for your reflection questions/paragraph.



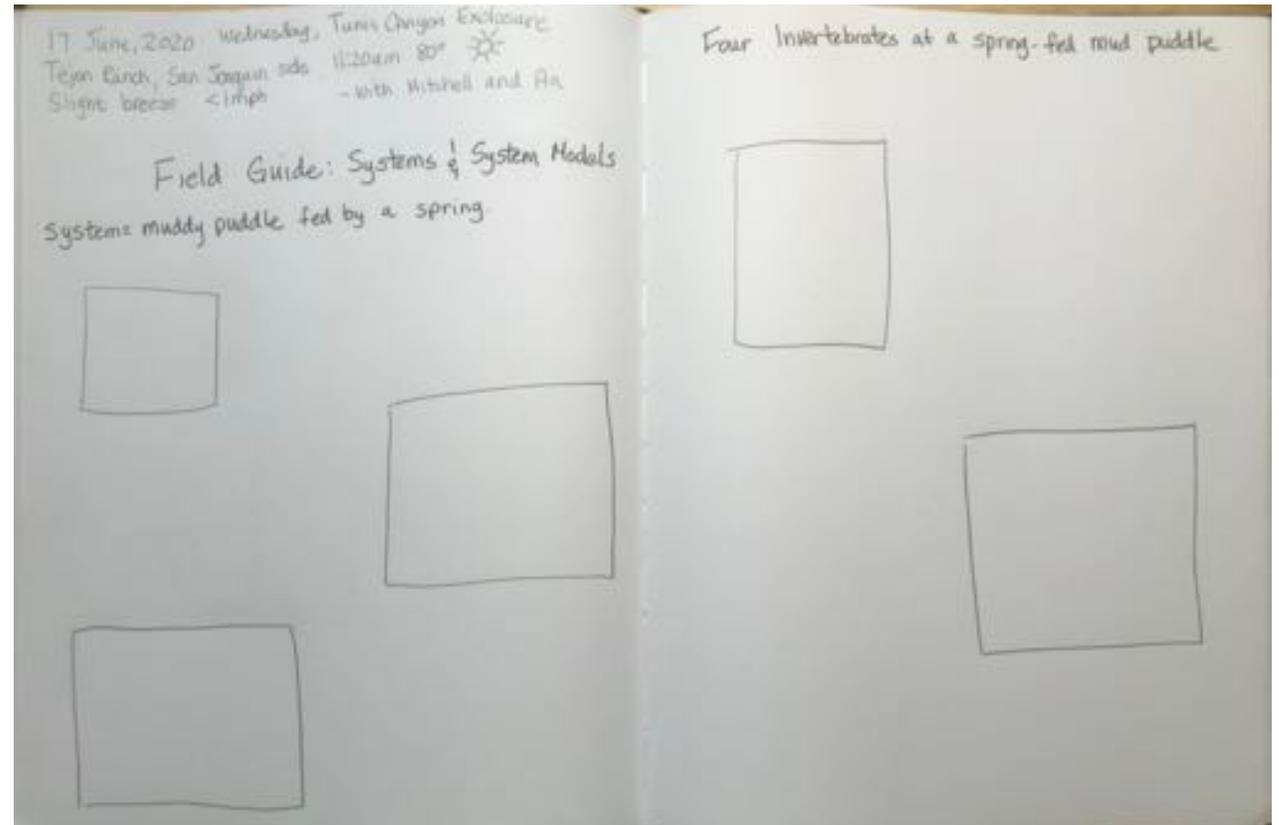
Remember

For each “I wonder”, Write one or two hypotheses by completing the sentence frame:

“Could it be...”

Plan your layout the way you want it.

- Here's mine:
 - Two pages
 - Metadata top-left
 - Title under metadata
 - Sub-title top right
 - 5 boxes with space for writing
 - The top-left box is for a mini landscape
 - Landscapes give a sense of place



17 June, 2020 Wednesday, Junis Canyon Enclosure
Tejon Ranch - San Joaquin side 11:20 AM 80° *
Slight breeze < 1 mph with Mitchell and Pia

Field Guide: Systems & system Models

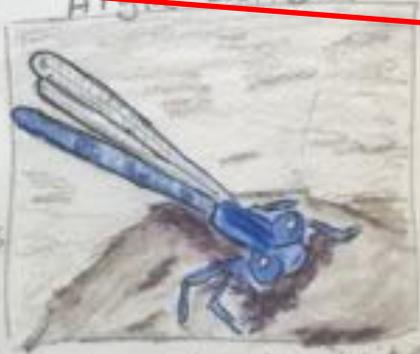
System = muddy puddle fed by a spring



I wonder: IF The Conservancy didn't put in this enclosure, would the seep even exist?

muddy puddle
Comanche Dancoe
Argia barretti

38-43mm



abdomen 31-34mm
hind wing 22-25mm

one of the most easily recognized
and largest bright blue damselflies

Habitat: Rivers and streams

~~Eubonia~~ this species has a light blue
Club tail

Notice the blue/black stripes on its back
I notice the legs seemingly come out of its head

I wonder what it eats.
Could it be this seep
provides its food?

I wonder
what the female
looks like, could it
be the gray one nearby to blue?

I notice
the legs and
abdomen are
firmly
segmented

Petiole



I wonder what the purpose
of the thin part is.
could it be an adaptation to allow
it to be more flexible?

23-25 cm long. ♀ larger than ♂
I wonder what they eat.
could it be they find their food

Sceliphron caementarium

I wonder what the thin part between the
thorax and abdomen is called

females capture spider prey by paralyzing
them and put it in their nest - up to 25 spiders

Notice:

*Metadata

*Title

*I identified the system I studied

*I draw a mini-landscape circling the area of study

*Because this is about systems AND system models, I wrote an important "I wonder" question that ponders what would happen if there was a change in the model.

*I continued on to the second page.

*I included a sub-title that connects with the title on the previous page.

*When I got home, I did some research to identify the animals I saw and to answer some of my questions. I added that information to my journal pages including my source of information.

Four Invertebrates at a spring-fed mud puddle

These four invertebrates were among several others frequenting the muddy patch on the road below the Tunis enclosure.

This is a native bee,
Not a European Honeybee

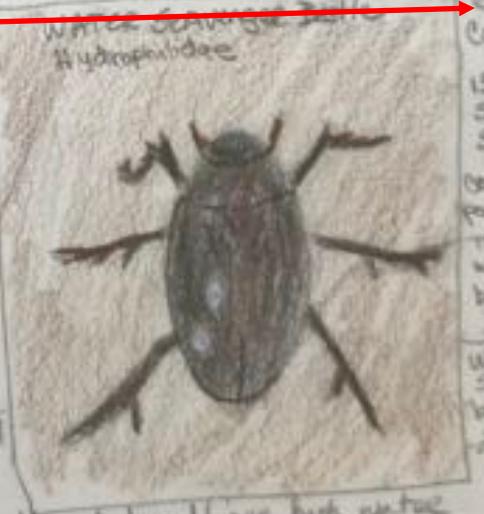


I notice this bee is very fuzzy
I notice its wings appear short for its body
I wonder if this is a native bee
could it be a digger bee?
~ 3cm long
I wonder if leaf-cutting bees are part of this family

According to helpbee.org @ UC Berkeley - could be Diadasiinae sp - picture shows metal colors - very fuzzy. I notice its wings constantly moving - sitting in the mud that has some algae in it

Diadasiinae have the common name Sunflower bee because of what it likes to eat. 25 subspecies. Ground nesting

Water Beetle - Oval shape
~ 3/4 inch long - spikes on legs
I notice it moves very quickly in the water
I wonder if it is able to leave the water
could it be it has the same ability as the water boatman to leave the water and fly.
I wonder if this organism is capable of handling high water



ORDER Coleoptera
1578 species in So. CAL
could it be part of the whirligig beetle group?
Water Scumbug beetle?
2535 species

Temperature
I notice it hides in mud and debris. I notice the bubble of water on its belly
Reminds me of diving bell spiders

Now do your
own field
guide.
Focus on
SYSTEMS AND
SYSTEM
MODELS



Take about 1 hour to work on all
your studies, about 15-20
minutes each.



Come back and do your
reflection questions on your
next page.

REFLECTION

Question/Answer

Question/Answer form (Put as many words from the question into your answer.)

Answer

Answer all questions, then put them in an order that makes sense for a paragraph.

Topic Sentence

Begin with a topic sentence ("I created a field guide focusing on SYSTEMS AND SYSTEM MODELS.")

Closing Sentence

End with a closing sentence ("It was fun to hypothesize about the SYSTEMS AND SYSTEM MODELS of my subjects.")

REFLECTION QUESTIONS

- What are the different things you found?
- Did you see any interactions or evidence of interactions between different organisms, or between the organisms and the environment?
- What are some other interactions you imagine might occur? (This is predicting using a system model.)
- What are the nonliving factors that affect the organisms you saw?
- How might the organisms or the interactions between them be impacted if some of these environmental conditions were to change? (This is also predicting using a system model.)



Looking Forward

Next time, we'll
create a field guide
focused on **Structure
and Function.**

Start looking around
for interesting
subjects.



White-faced Ibis

BYE FOR NOW.

THANKS FOR
JOINING ME.

