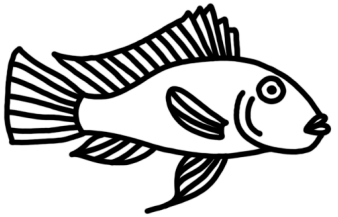
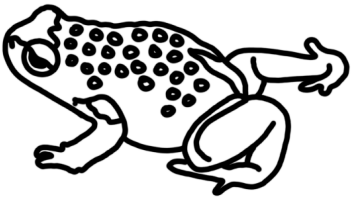
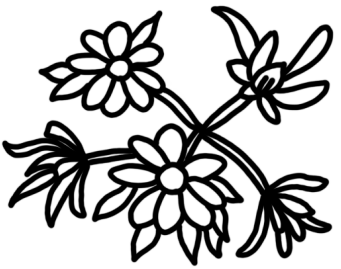
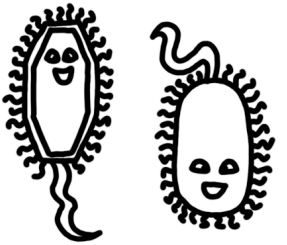
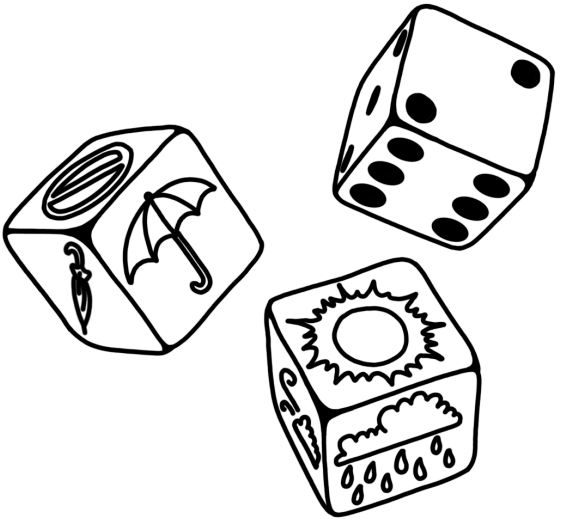





BET HEDGING

How plants, animals, and microbes survive the unexpected



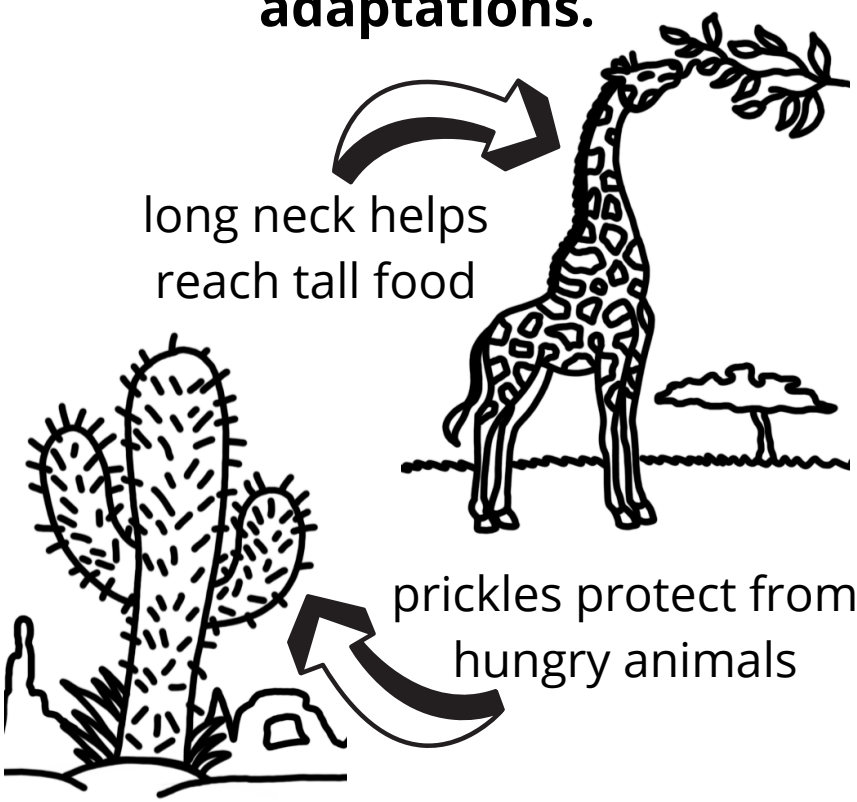
by Maya Weissman

WORD SEARCH

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

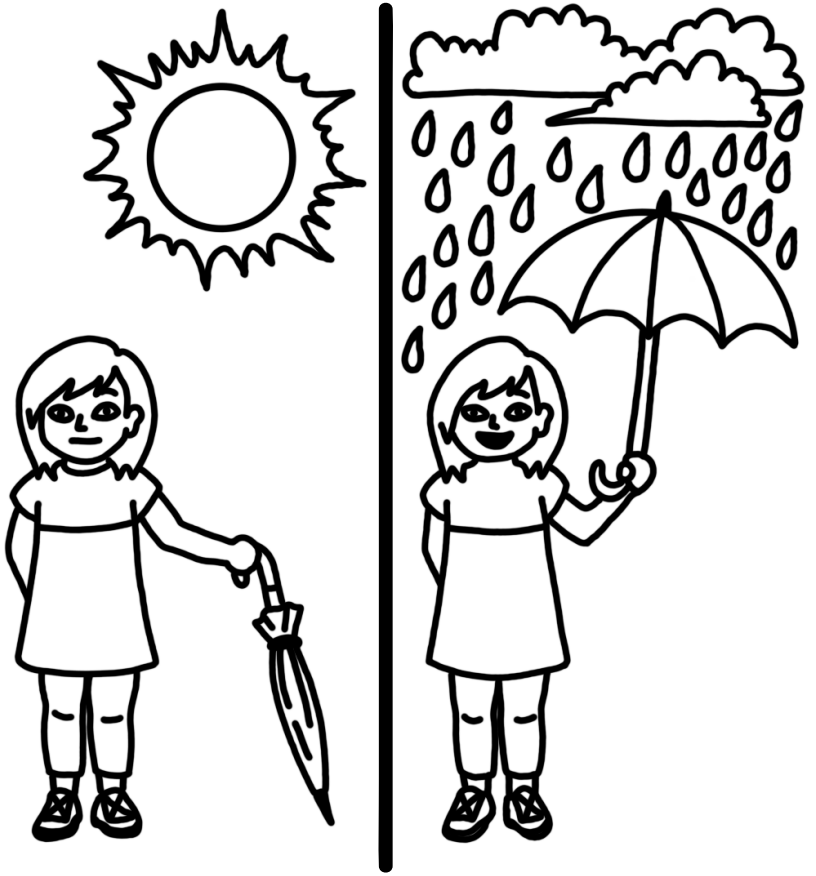
ORGANISM
TRAIT
ADAPTATION
BET HEDGING
ENVIRONMENT
RISK
UNPREDICTABLE
COST
CONSERVATIVE
DIVERSIFIED
STRATEGY
INDIVIDUAL
MOUTHBROODING
PERSISTENCE

Scientists call plants, animals, and microbes **organisms**. Each one has many **traits**. Traits that help an organism survive better are **adaptations.**



When **environments** change unpredictably, it can be hard to predict what **adaptation** will help best.

Imagine you are getting dressed, and you don't know if it will be sunny or rainy.



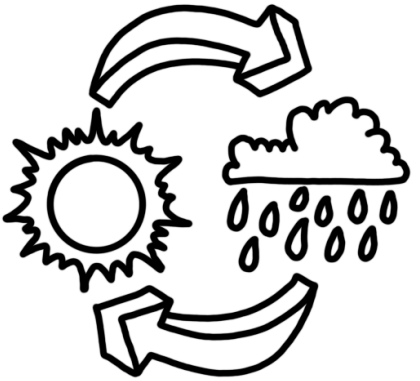
Should you bring an umbrella just in case? You'll have to carry the umbrella if it is sunny, but at least you'll be prepared if it rains!

Whenever you prepare for the unexpected, you are **bet hedging.**

Bet hedging is an **adaptation** for reducing **risk** in changing **environments**. Bet hedgers **adapt** to prepare for the unexpected, even though it comes at some **cost**.

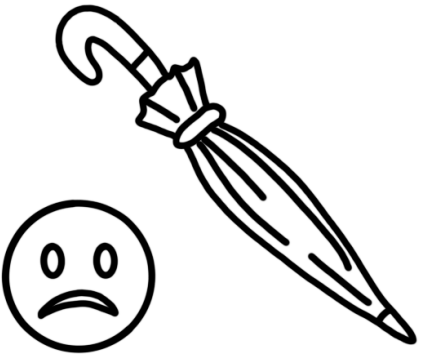
Bet hedging is defined by three things:

1: The environment must change **unpredictably**.



2: The adaptation must reduce **risk** in the worst environment.

3: The adaptation must have a **cost** (or not always be good).

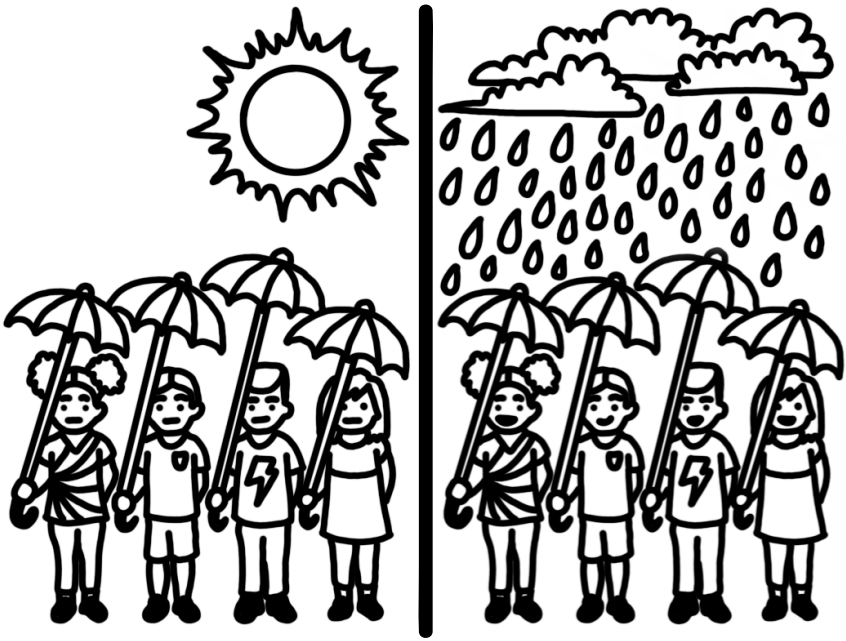


There are two types of **bet hedgers**:

Conservative & **Diversified**

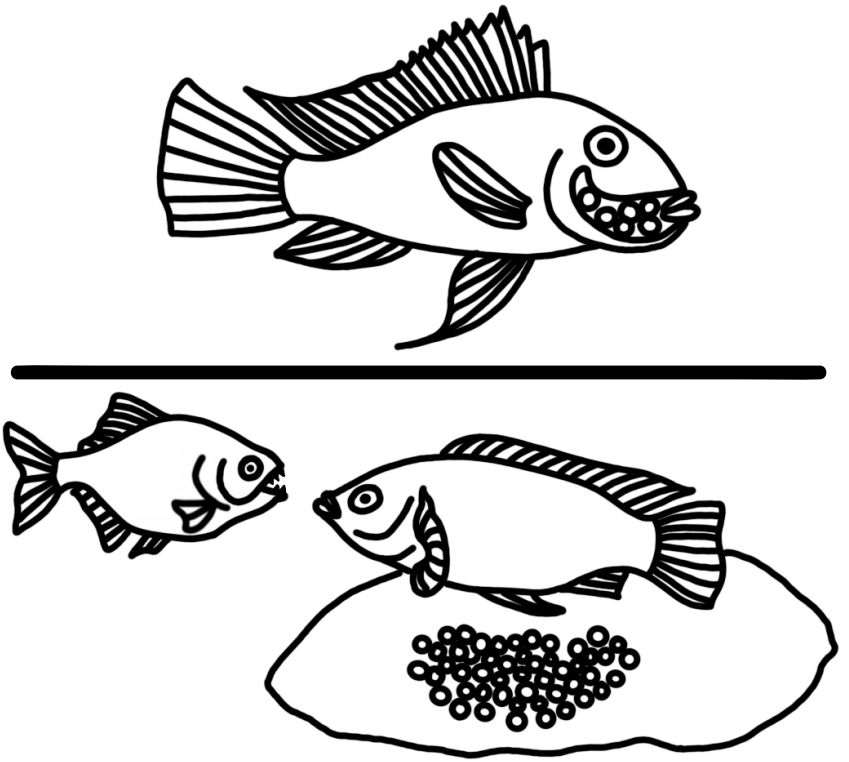
Bet hedgers are sorted as conservative or diversified based on which strategy **individuals** in the group use.

Conservative bet hedgers reduce **risk** by having all **individuals** prepare for the worst.



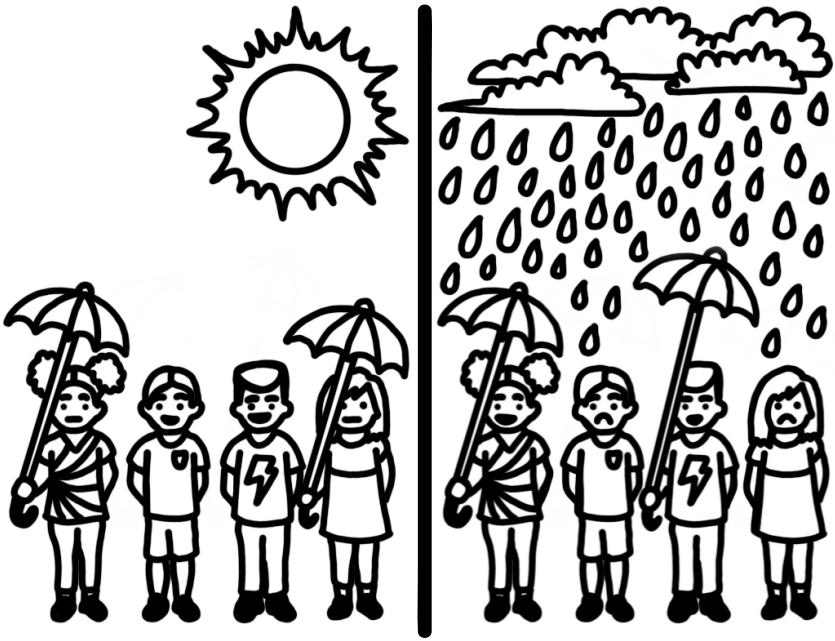
This would be like everyone always carrying an umbrella. When it's sunny, everyone is less happy about carrying a useless umbrella. But when it rains, everyone is prepared!

One real example of **conservative bet hedging** is **mouthbrooding** in fish.



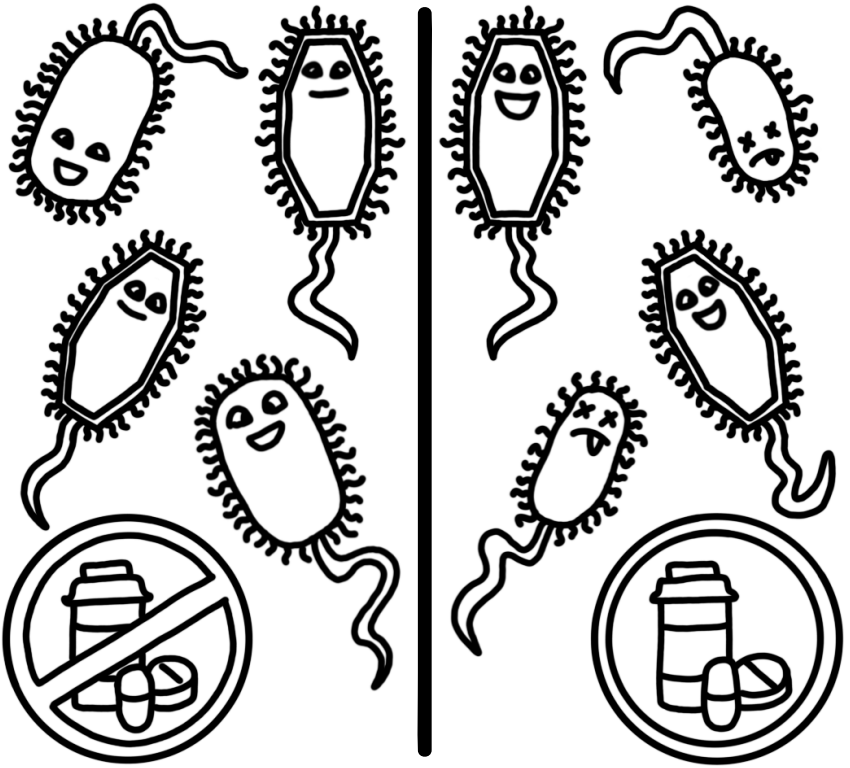
Mouthbrooders keep their eggs in their mouths. Because mouths are small, mouthbrooders have fewer eggs. But mouthbrooders can better protect their eggs from predators and other **risks**.

Diversified bet hedgers reduce **risk** by having **individuals** in the same group randomly show different **traits**.



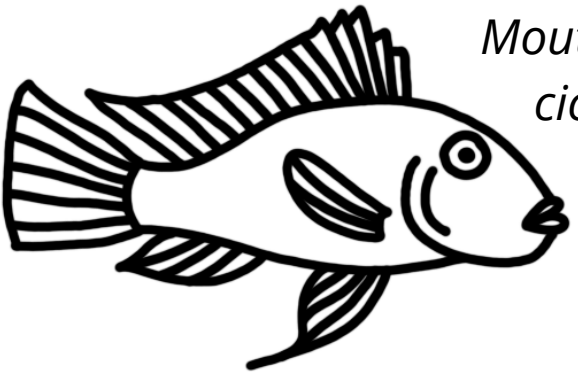
Imagine if half the people carried umbrellas and half didn't. Sun or rain, half the population will be unhappy. But there will always be half who are best suited for that environment.

A real example of **diversified bet hedging** is **bacterial persistence**.



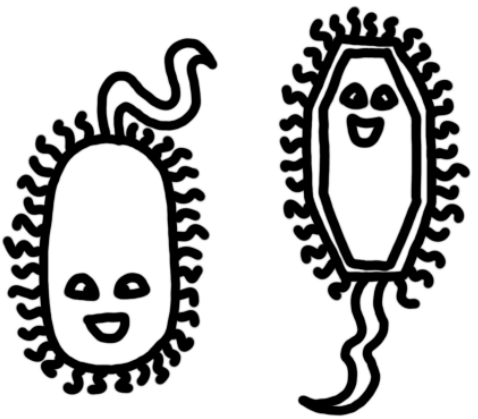
Some bacteria can randomly switch between growing fast but being easily killed by antibiotics and growing slowly but being able to resist antibiotics.

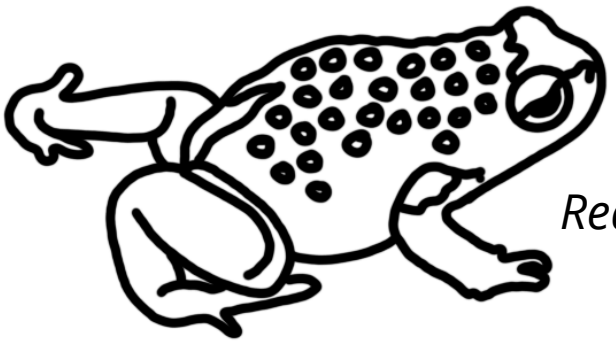
Bet hedgers in the real world come in all shapes and sizes:



Mouthbrooding cichlid fish

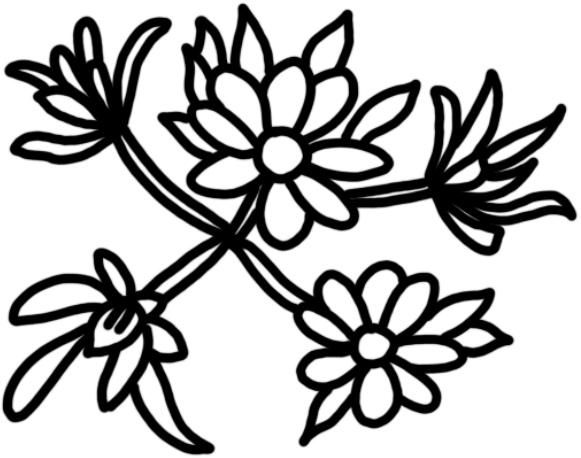
Persister bacteria

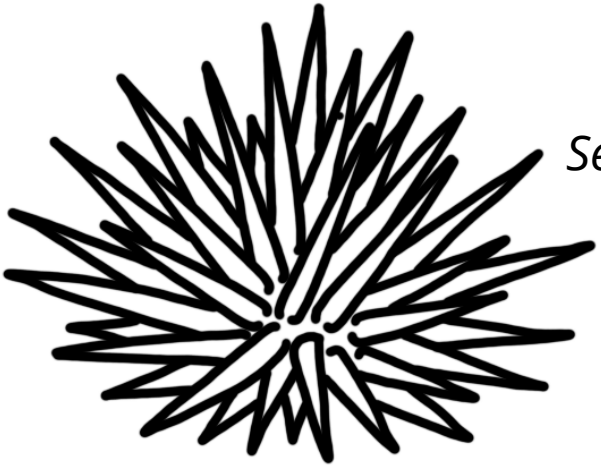




Red-crowned toadlet

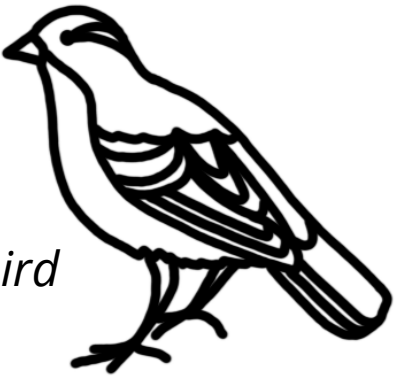
Mojave desert star flower





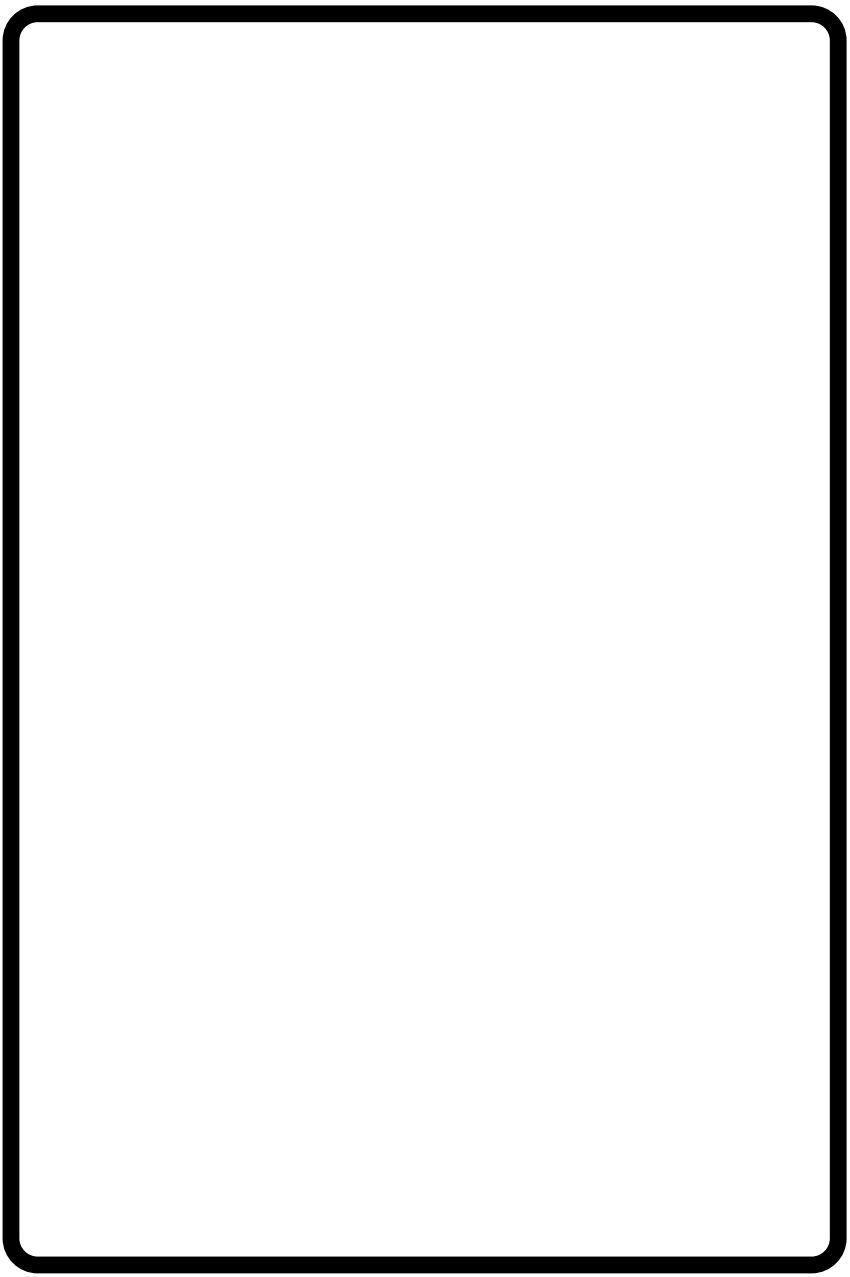
Sea urchin

White-browed sparrow-weaver bird



... and many more!

Can you think of an example of a **bet hedger**? Draw them here!



What does your bet hedger's **environment** look like?

How does their adaptation reduce **risk**?

What **cost** does their adaptation have?

As a kid, Maya loved math and exploring nature. Now, she gets to combine those two passions as a scientist who studies **bet hedging**!

You can learn more about Maya and find even more coloring books at www.sciencemaya.com