

River Features & Function



David Restivo, NPS (CC BY 2.0)

Flathead Lake Biological Station

Flathead River

The image depicts the Flathead River as it enters the North side of Flathead Lake.

©2017 FLBS, UM

Legend

• Feature



Kalispell

Creston

Firemens Isl

Somers

Where would you expect to find adult, juvenile, and fry (baby) fish?

Google Earth

Bigfork



1 mi

Swan River

The image depicts the Swan River as it enters the Northeastern side of Flathead Lake.

©2017 FLBS, UM

Legend

• Feature



Bigfork

Ferndale

Where would you expect to find adult, juvenile, and fry (baby) fish?

Google Earth



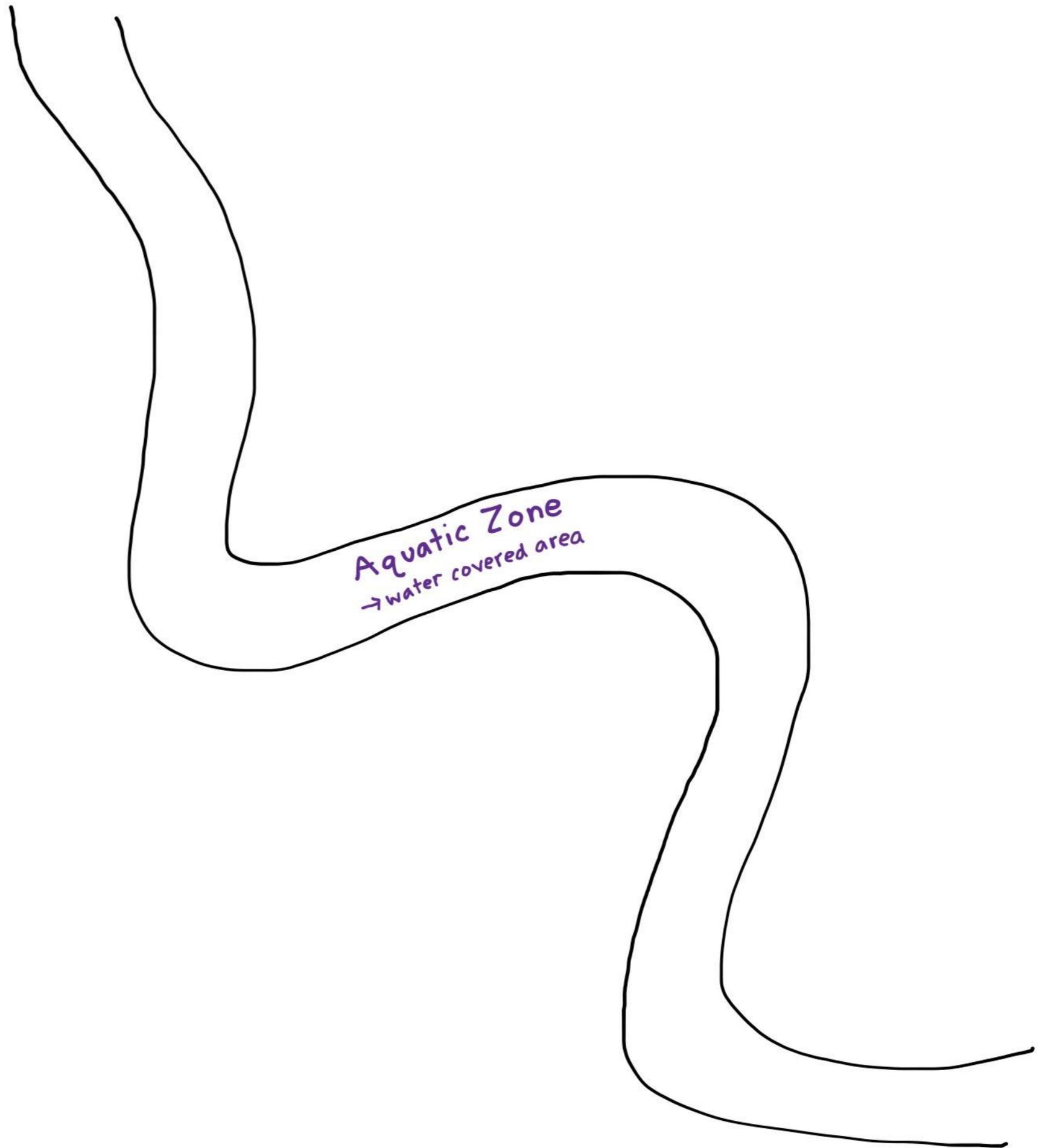
2 mi



River Features

Identify and label
the following:

- Aquatic zone

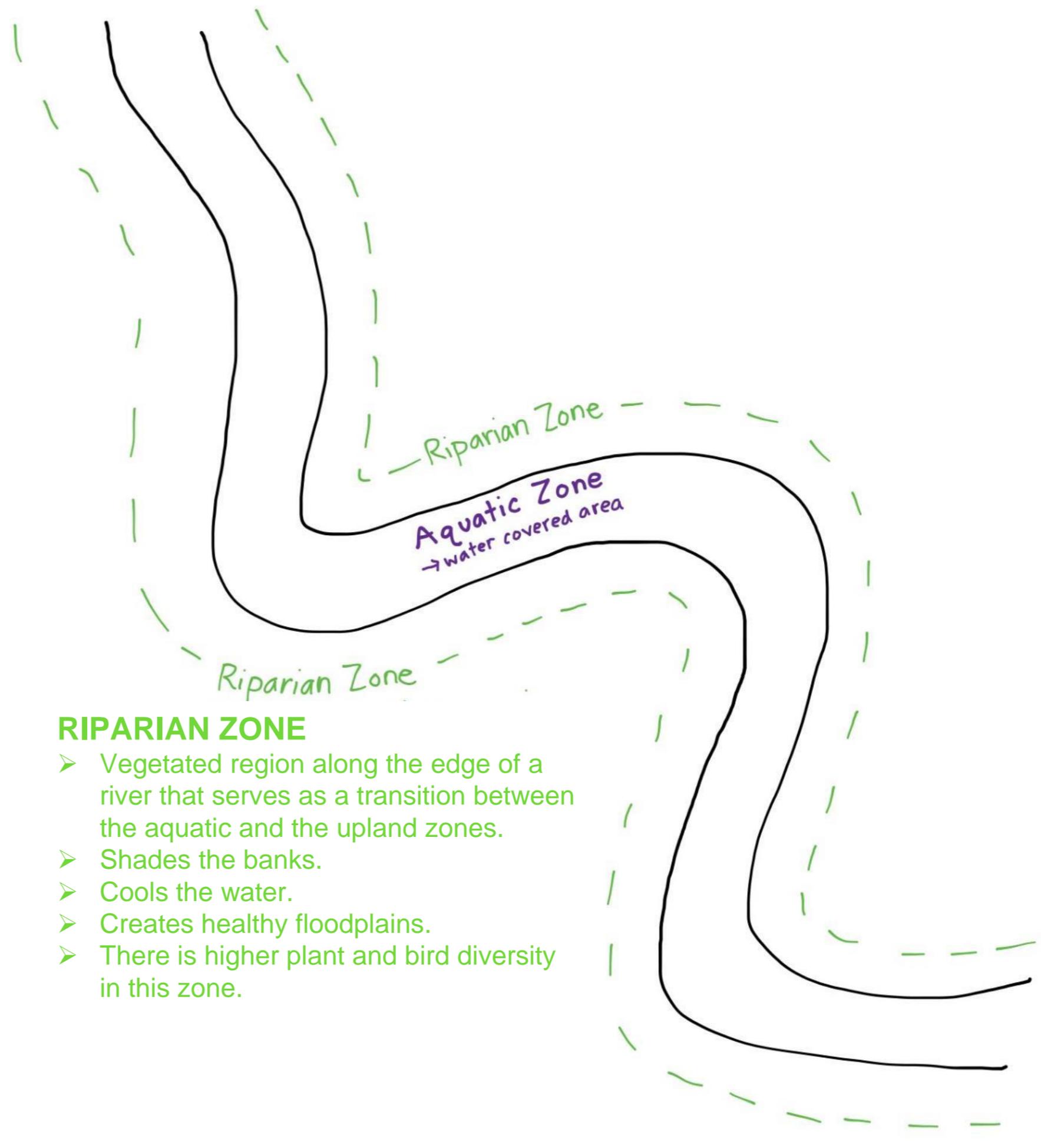




River Features

Identify and label the following:

- Aquatic zone
- Riparian zone



RIPARIAN ZONE

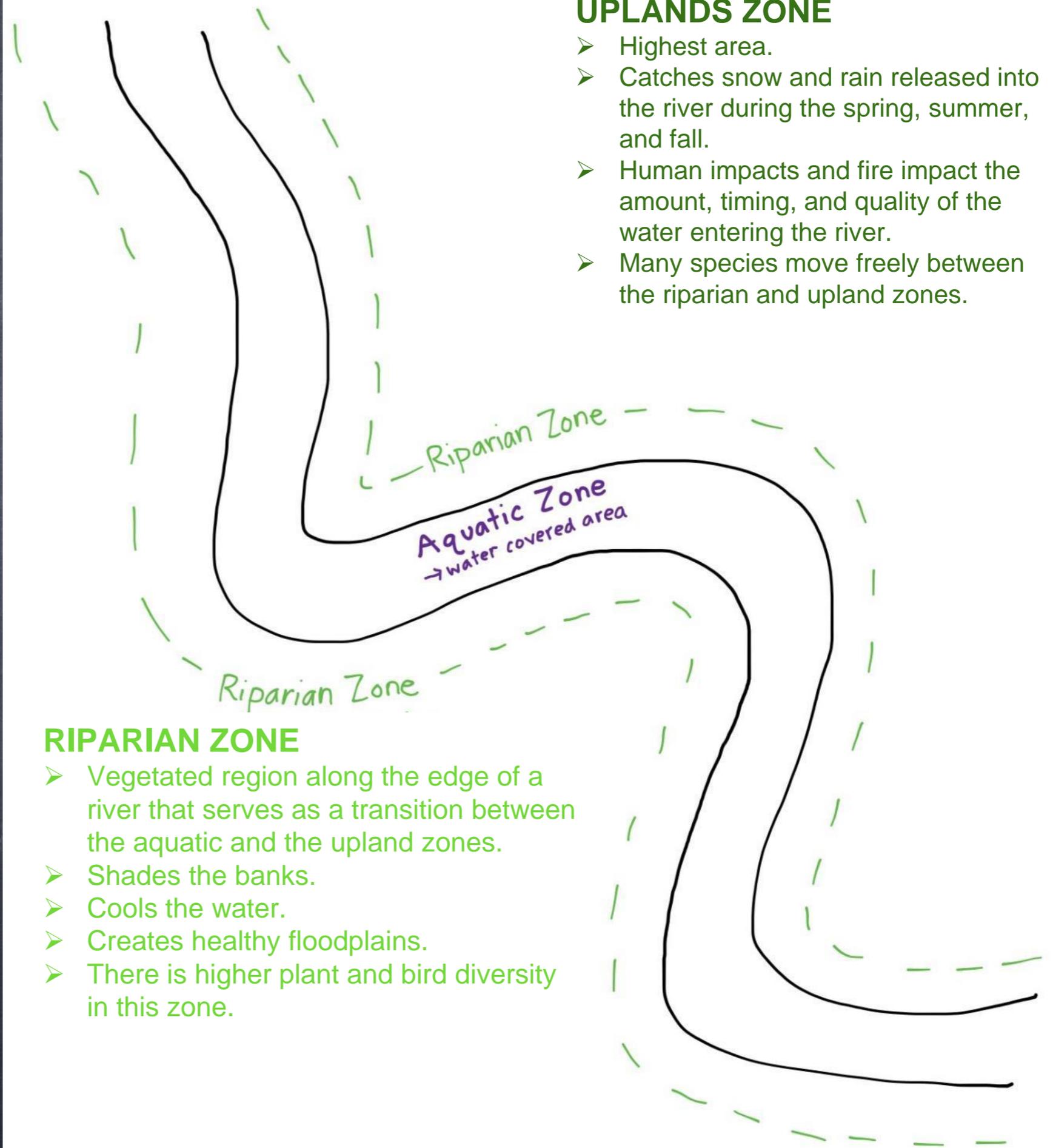
- Vegetated region along the edge of a river that serves as a transition between the aquatic and the upland zones.
- Shades the banks.
- Cools the water.
- Creates healthy floodplains.
- There is higher plant and bird diversity in this zone.



River Features

Identify and label the following:

- Aquatic zone
- Riparian zone
- Upland zone

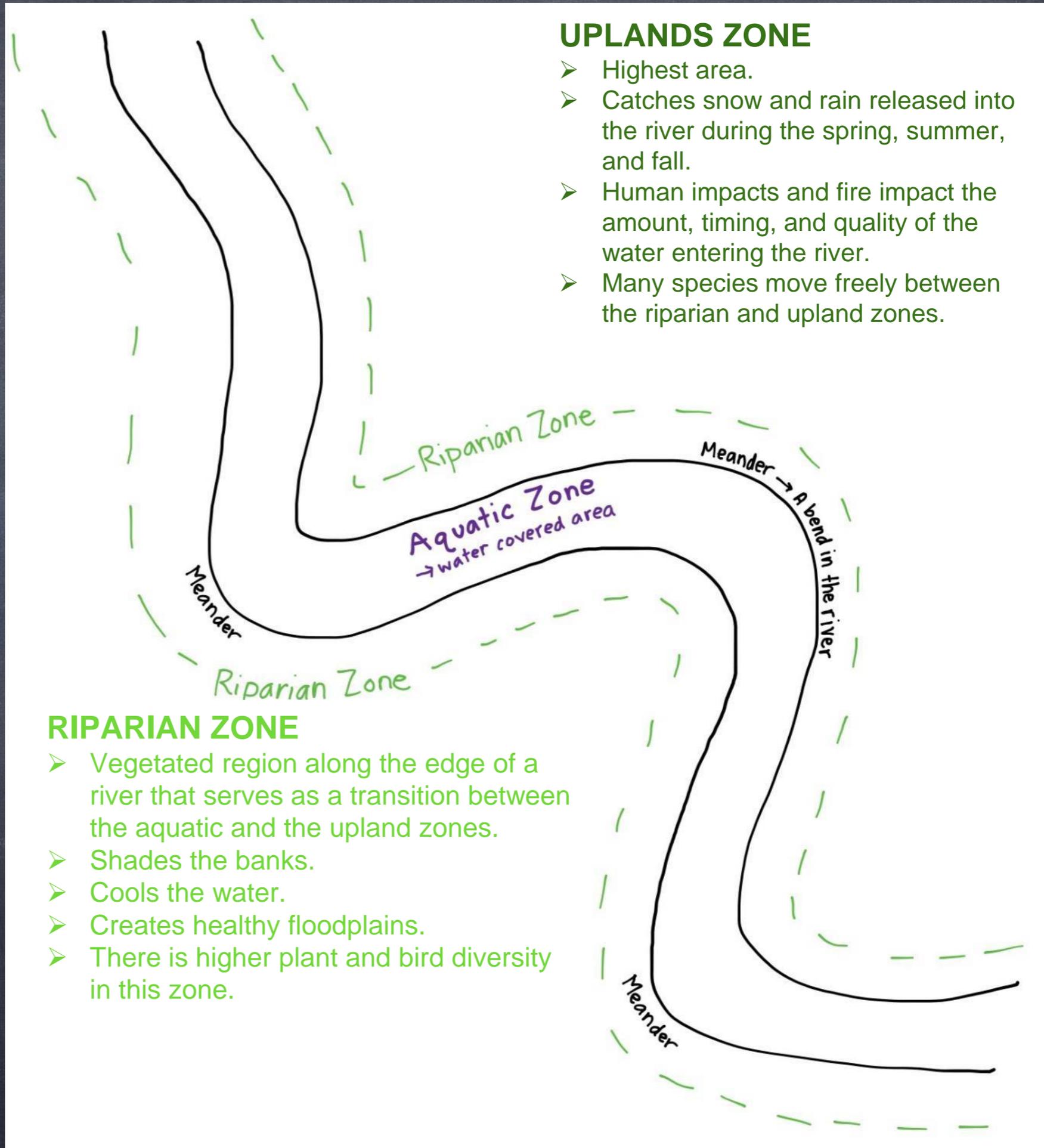




River Features

Identify and label the following:

- Aquatic zone
- Riparian zone
- Upland zone
- Meander

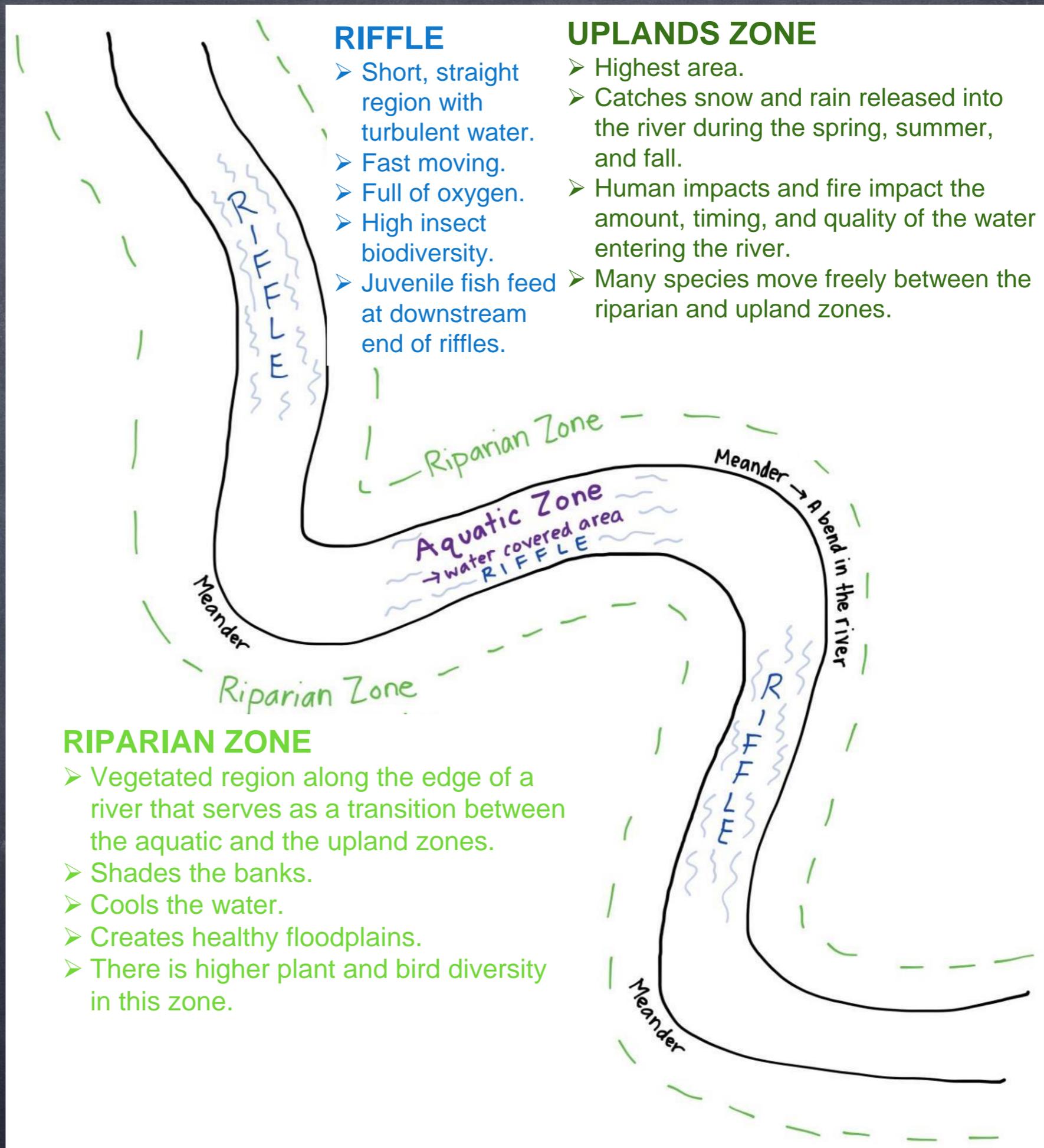




River Features

Identify and label the following:

- Aquatic zone
- Riparian zone
- Upland zone
- Meander
- Riffle

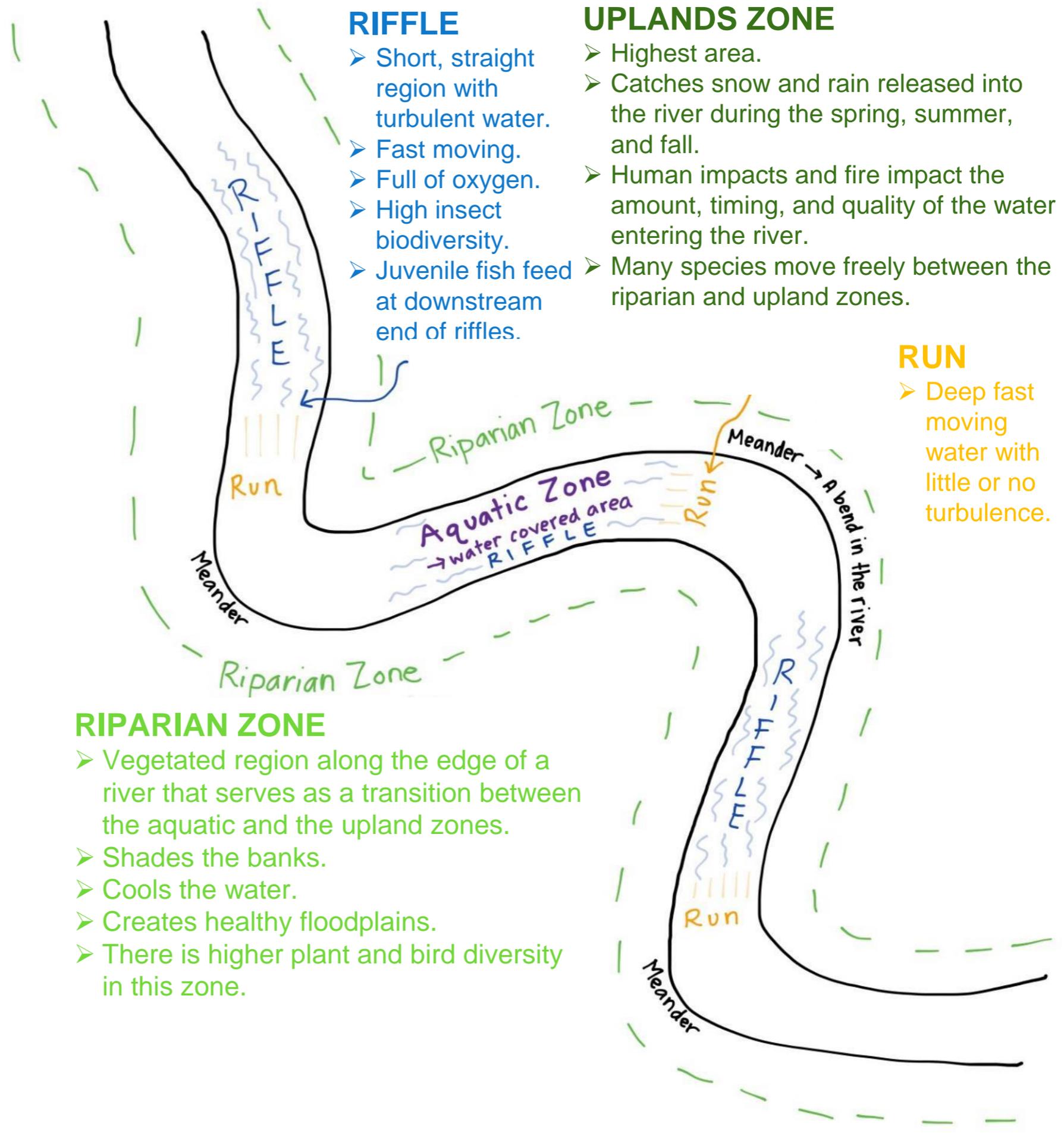




River Features

Identify and label the following:

- Aquatic zone
- Riparian zone
- Upland zone
- Meander
- Riffle
- Run

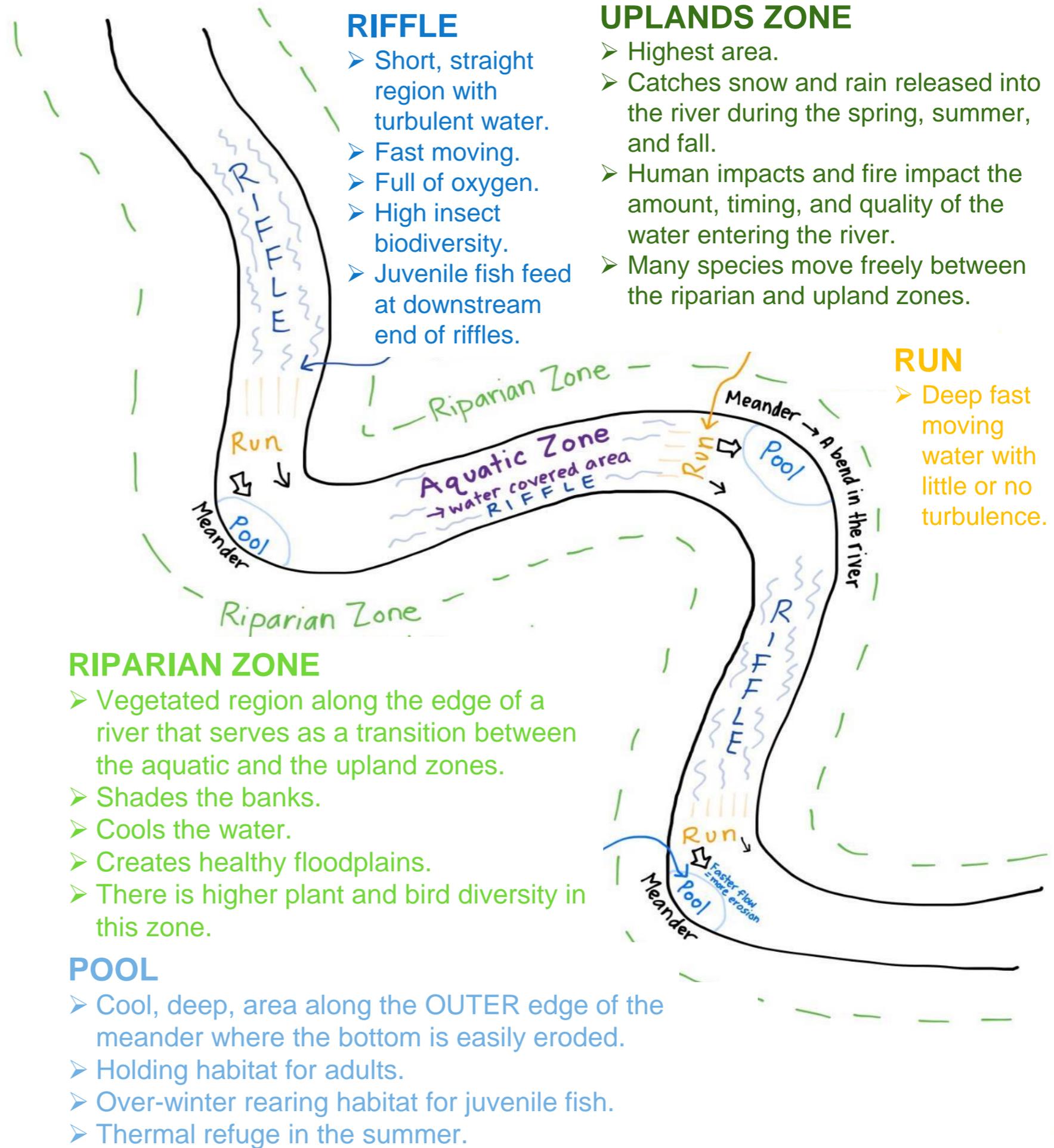




River Features

Identify and label the following:

- Aquatic zone
- Riparian zone
- Upland zone
- Meander
- Riffle
- Run
- Pool

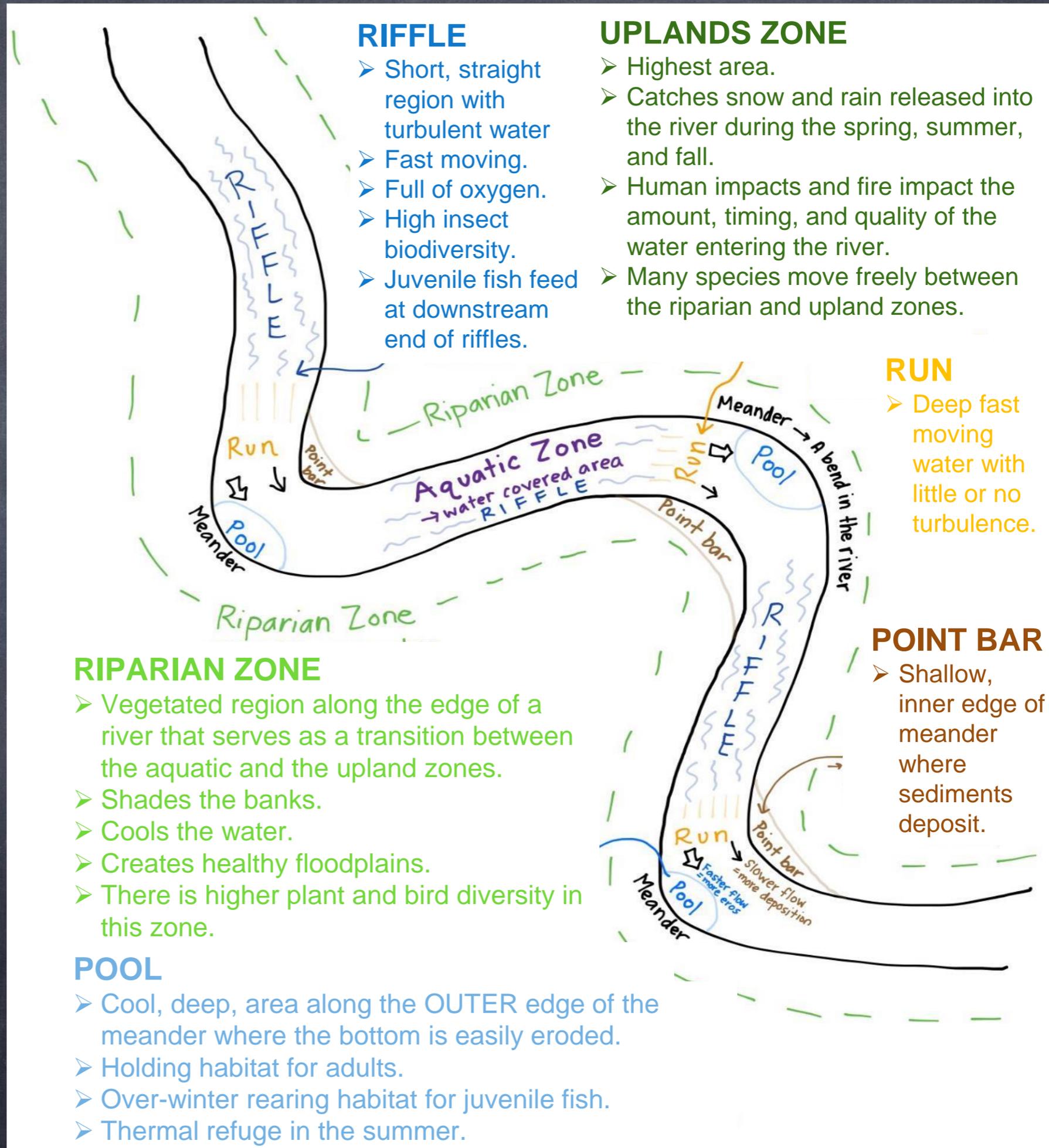




River Features

Identify and label the following:

- Aquatic zone
- Riparian zone
- Upland zone
- Meander
- Riffle
- Run
- Pool
- Point bar





River Features

Identify and label the following:

- Aquatic zone
- Riparian zone
- Upland zone
- Meander
- Riffle
- Run
- Pool
- Point bar
- Glide

GLIDE

- Shallow zone with little turbulence.
- Spawning sites.
- Oxygen-rich water flow over and through the gravel.

RIFFLE

- Short, straight region with turbulent water.
- Fast moving.
- Full of oxygen.
- High insect biodiversity.
- Juvenile fish feed at downstream end of riffles.

UPLANDS ZONE

- Highest area.
- Catches snow and rain released into the river during the spring, summer, and fall.
- Human impacts and fire impact the amount, timing, and quality of the water entering the river.
- Many species move freely between the riparian and upland zones.

RUN

- Deep fast moving water with little or no turbulence.

POINT BAR

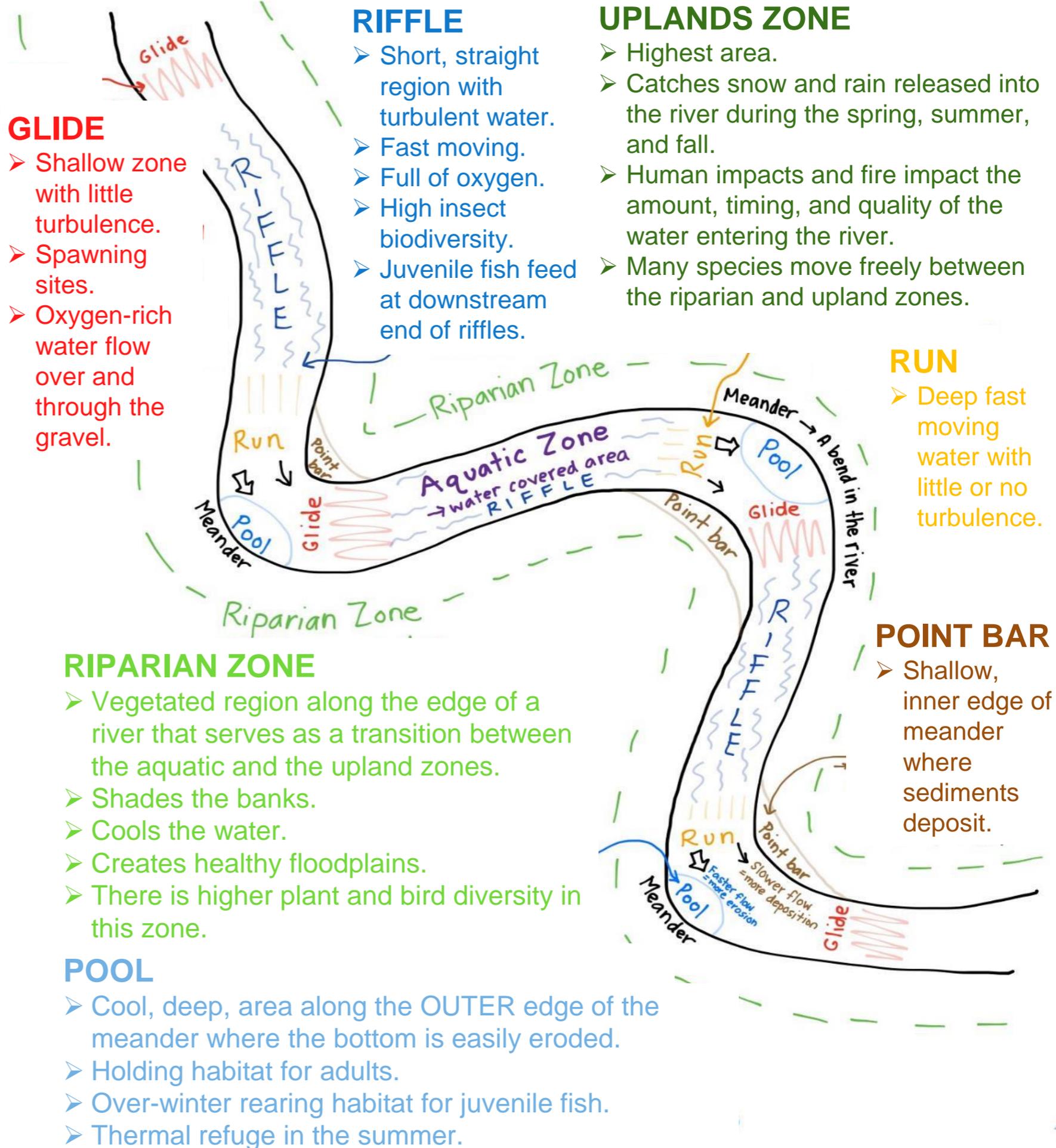
- Shallow, inner edge of meander where sediments deposit.

RIPARIAN ZONE

- Vegetated region along the edge of a river that serves as a transition between the aquatic and the upland zones.
- Shades the banks.
- Cools the water.
- Creates healthy floodplains.
- There is higher plant and bird diversity in this zone.

POOL

- Cool, deep, area along the OUTER edge of the meander where the bottom is easily eroded.
- Holding habitat for adults.
- Over-winter rearing habitat for juvenile fish.
- Thermal refuge in the summer.



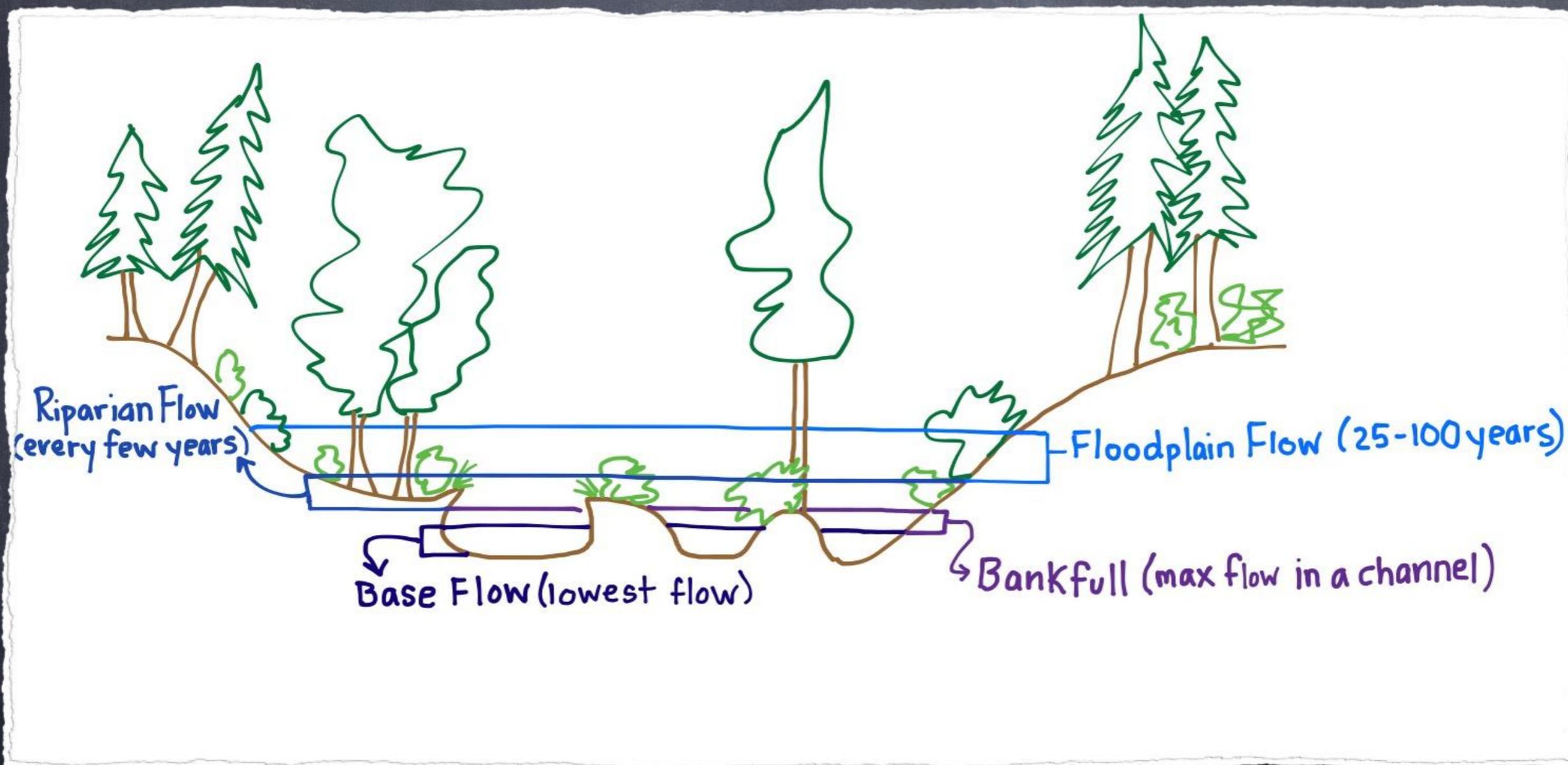


Eight Characteristics of a Healthy River

Complete the worksheet as you learn about the eight characteristics that help to keep a river in a healthy state.



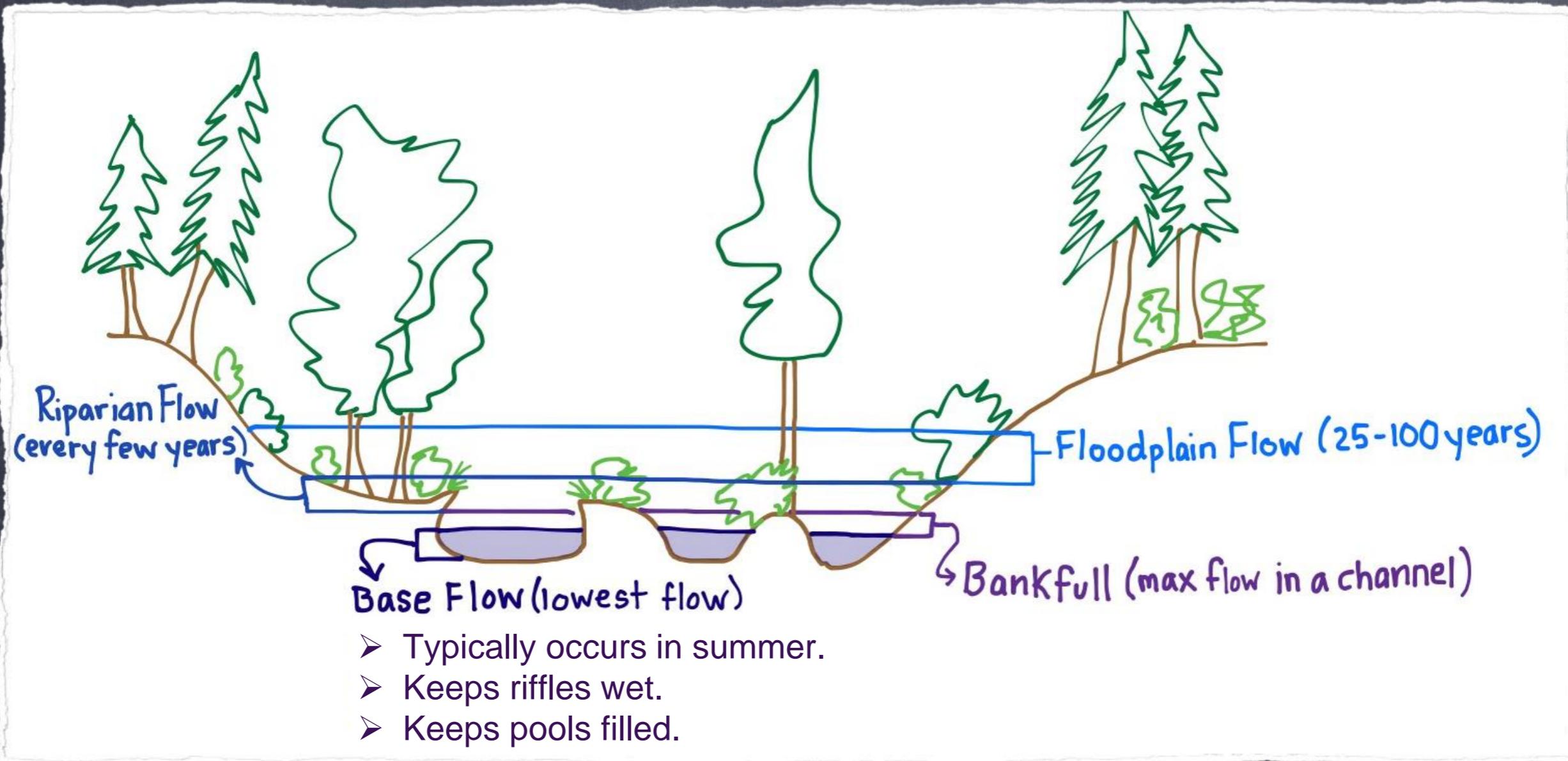
Eight Characteristics of a Healthy River



#1 . ALL FLOWS HAVE AN IMPORTANT FUNCTION AND ARE NECESSARY FOR A HEALTHY ECOSYSTEM.



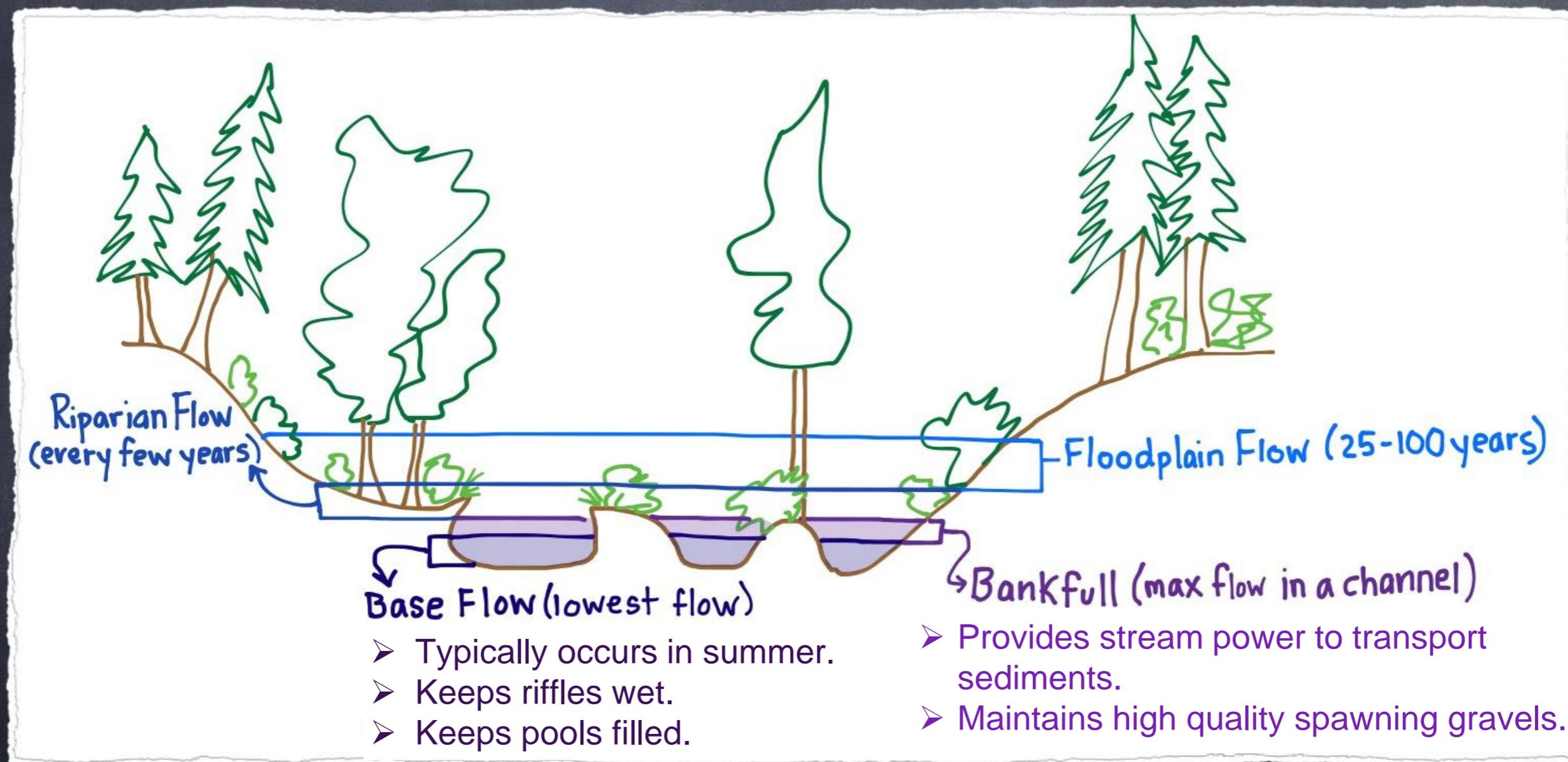
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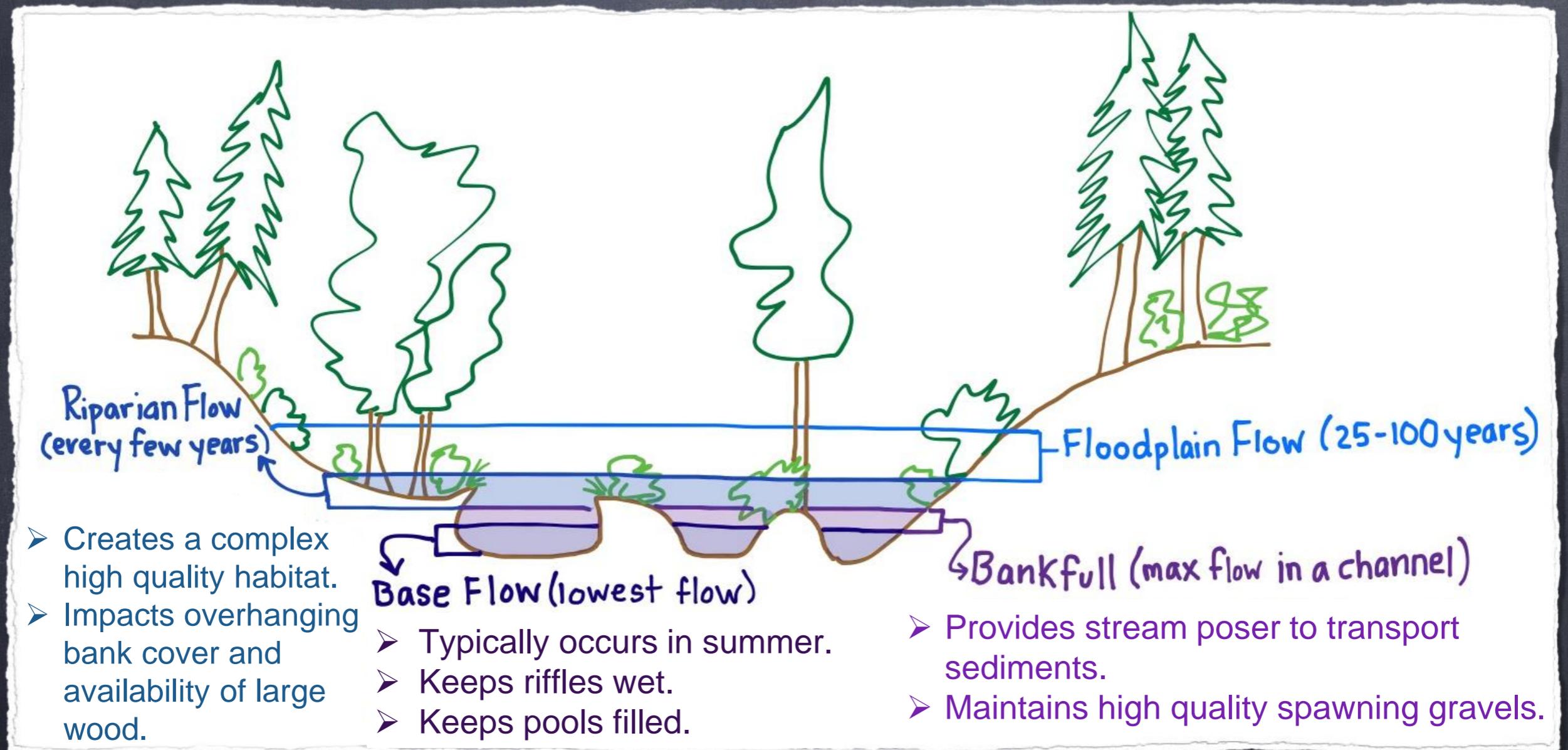
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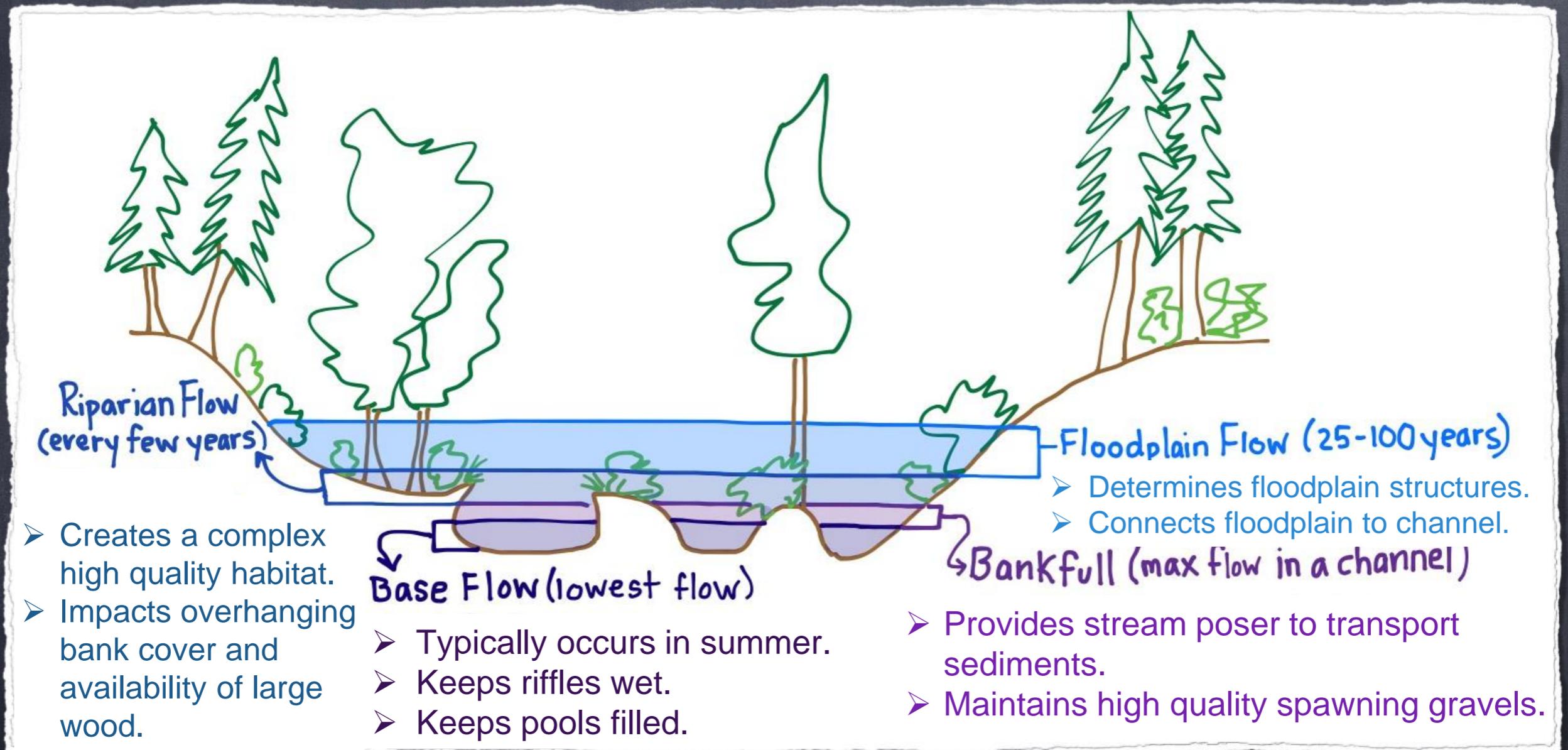
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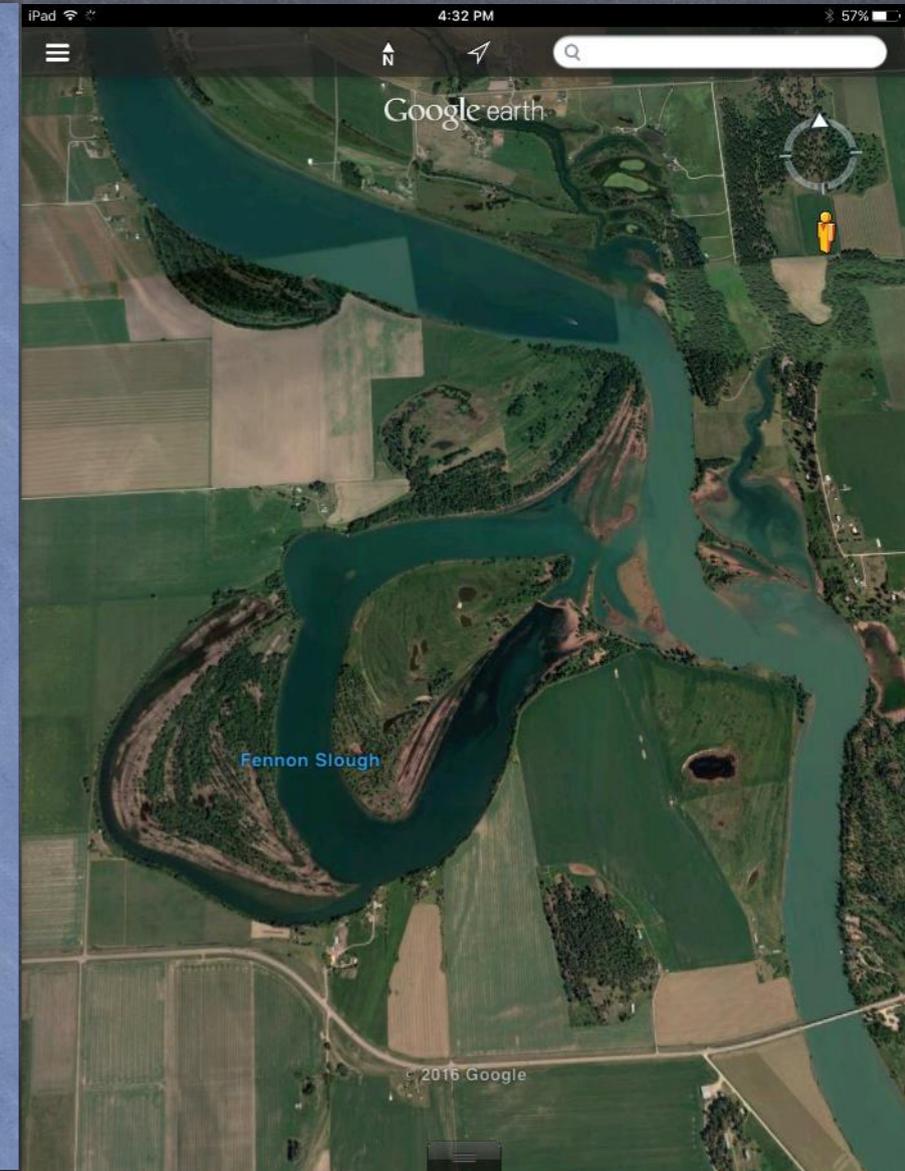
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Eight Characteristics of a Healthy River



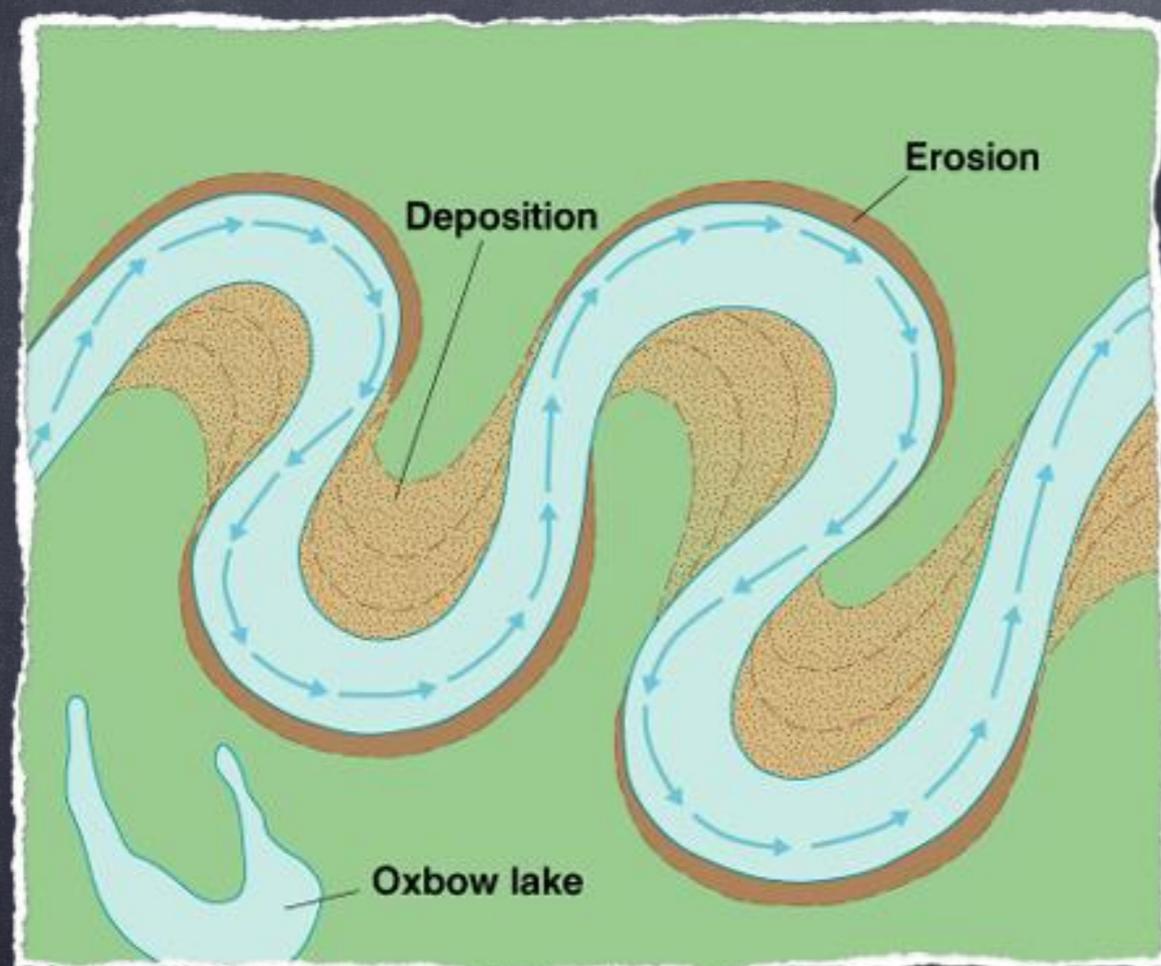
Shifting meanders deposit nutrients in the riparian zone, which promotes growth & revitalizes the riparian plant communities.



#2. FLOODS PERIODICALLY SHIFT THE MEANDERS AND REARRANGE THE POINT BARS.



Eight Characteristics of a Healthy River



Shifting meanders create side channels, oxbow lakes, and sloughs that provide important rearing areas for juvenile fish.

#2. FLOODS PERIODICALLY SHIFT THE MEANDERS AND REARRANGE THE POINT BARS.



Eight Characteristics of a Healthy River

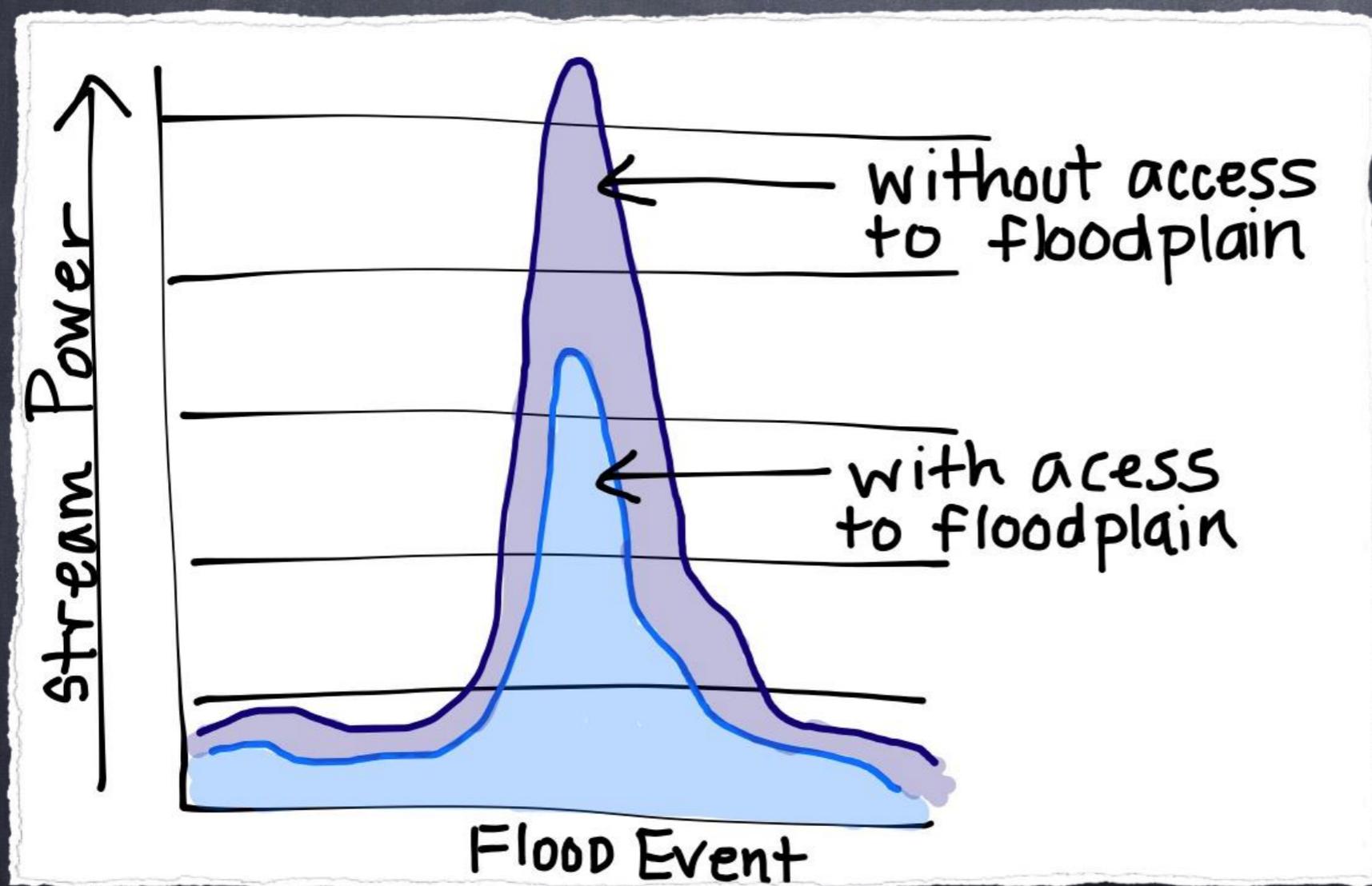


Shifting point bars improve the quality of habitat for fish by collecting driftwood and other debris, which create shaded, cool, and protected areas for the fish and insects.

#2. FLOODS PERIODICALLY SHIFT THE MEANDERS AND REARRANGE THE POINT BARS.



Eight Characteristics of a Healthy River



The flood becomes more destructive when the river does not have access to its floodplain

#3. A HEALTHY RIVER HAS ACCESS TO ITS FLOODPLAIN.



Eight Characteristics of a Healthy River

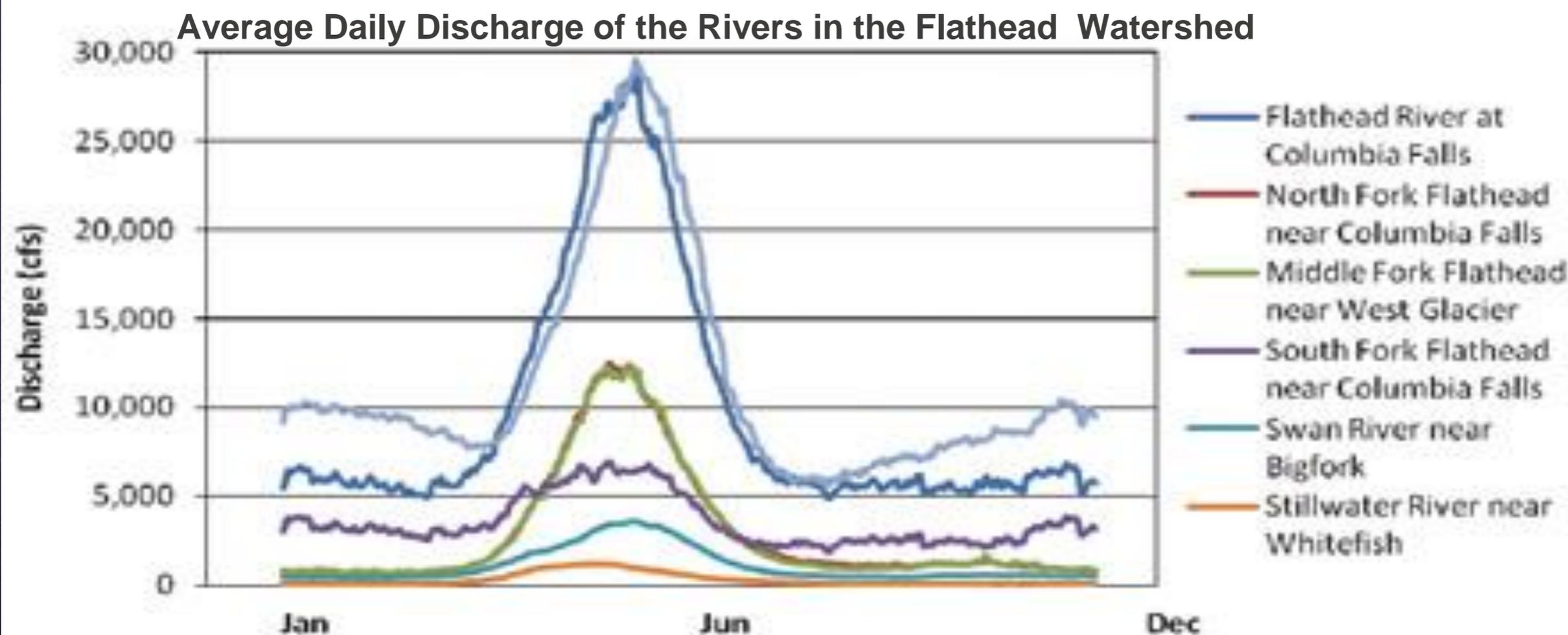
River Has Access	River Does Not Have Access
➤ Decreases strength of flood flow	➤ Increases strength of flood flow
➤ Decreases velocity, depth, & slope of the flood flow	➤ Increases erosion
➤ Leads to channel migration	➤ Creates deeper channels
➤ Creates varied habitats	➤ Destabilizes the banks
➤ Fertilizes the floodplain	➤ Fills in the pools
➤ Promotes regeneration and growth of plants	➤ Channel braiding occurs

#3. A HEALTHY RIVER HAS ACCESS TO ITS FLOODPLAIN.



Eight Characteristics of a Healthy River

Rising flows in the spring due to snow melt move sand, gravel, cobbles, & larger materials



(Kendall, Flathead National Forest)

#4. RIVERBED MATERIALS MOVE PERIODICALLY.



Eight Characteristics of a Healthy River

BASEFLOW

= little or no movement of material



30-40% Bankfull

= sand in pools move downstream



75-85% Bankfull

= gravel in pool tails move downstream



Bankfull

= gravel in riffles move downstream



> Bankfull

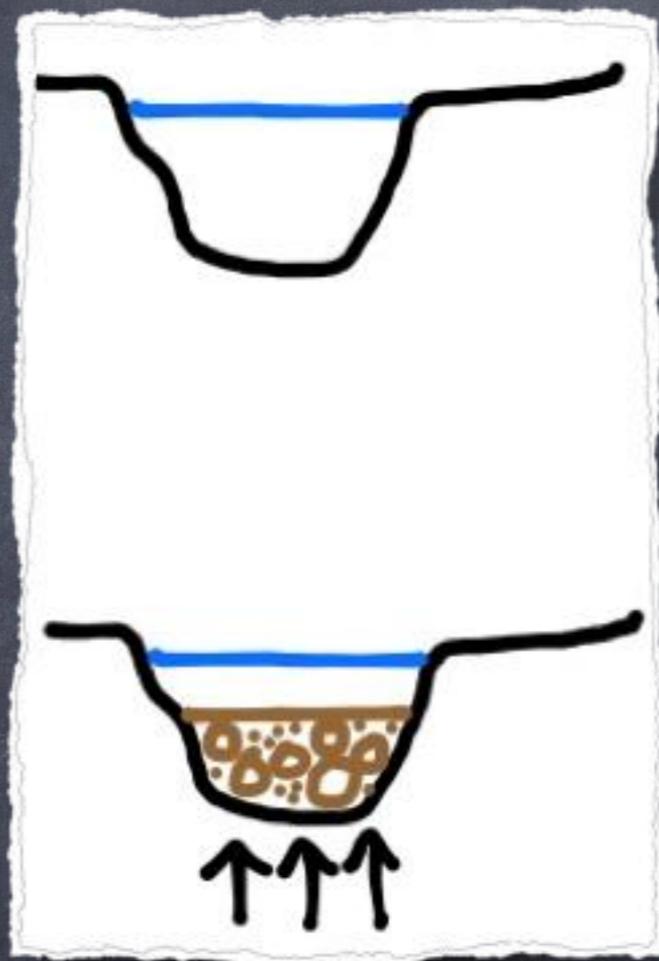
= cobbles or greater move downstream

#4. RIVERBED MATERIALS MOVE PERIODICALLY.

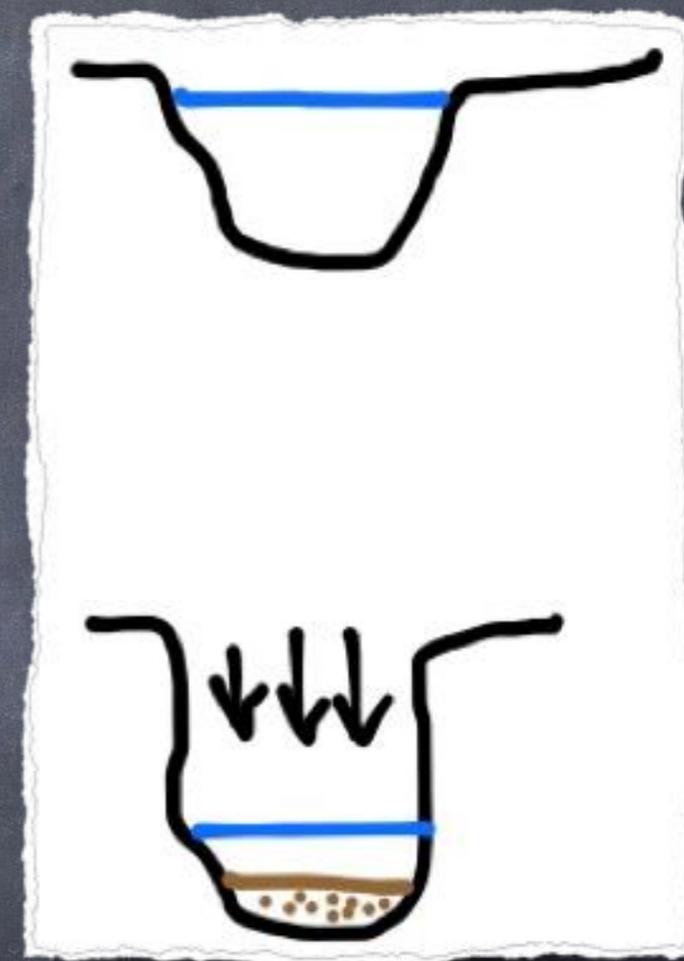


Eight Characteristics of a Healthy River

If the sediment size or amount of sediment **INCREASES** the river channel **FILLS IN**



If the sediment size or amount of sediment **DECREASES** the river channel **DEEPENS**

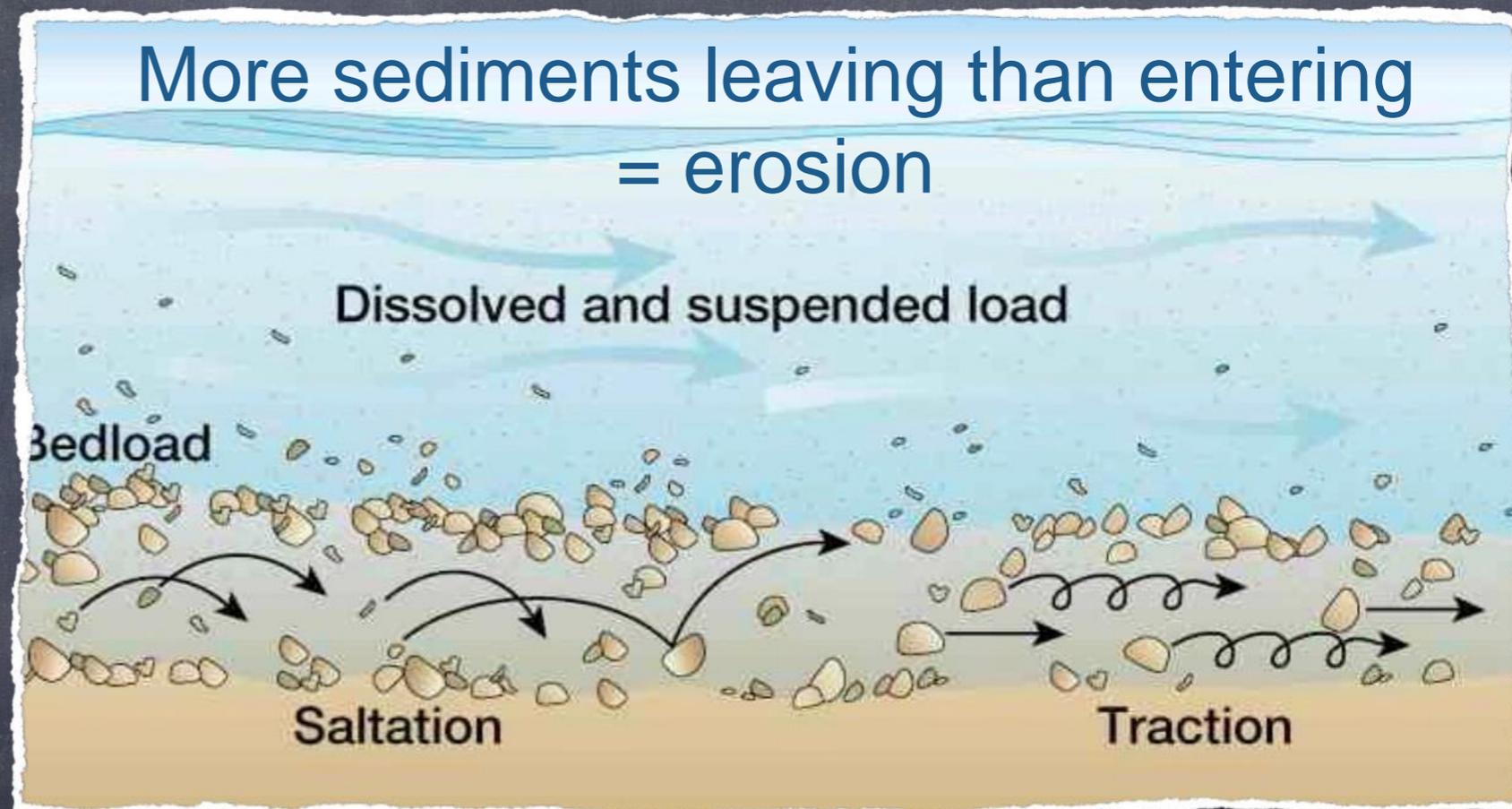


#5. THE SEDIMENT ENTERING THE RIVER EQUALS THE SEDIMENT LEAVING THE RIVER.



Eight Characteristics of a Healthy River

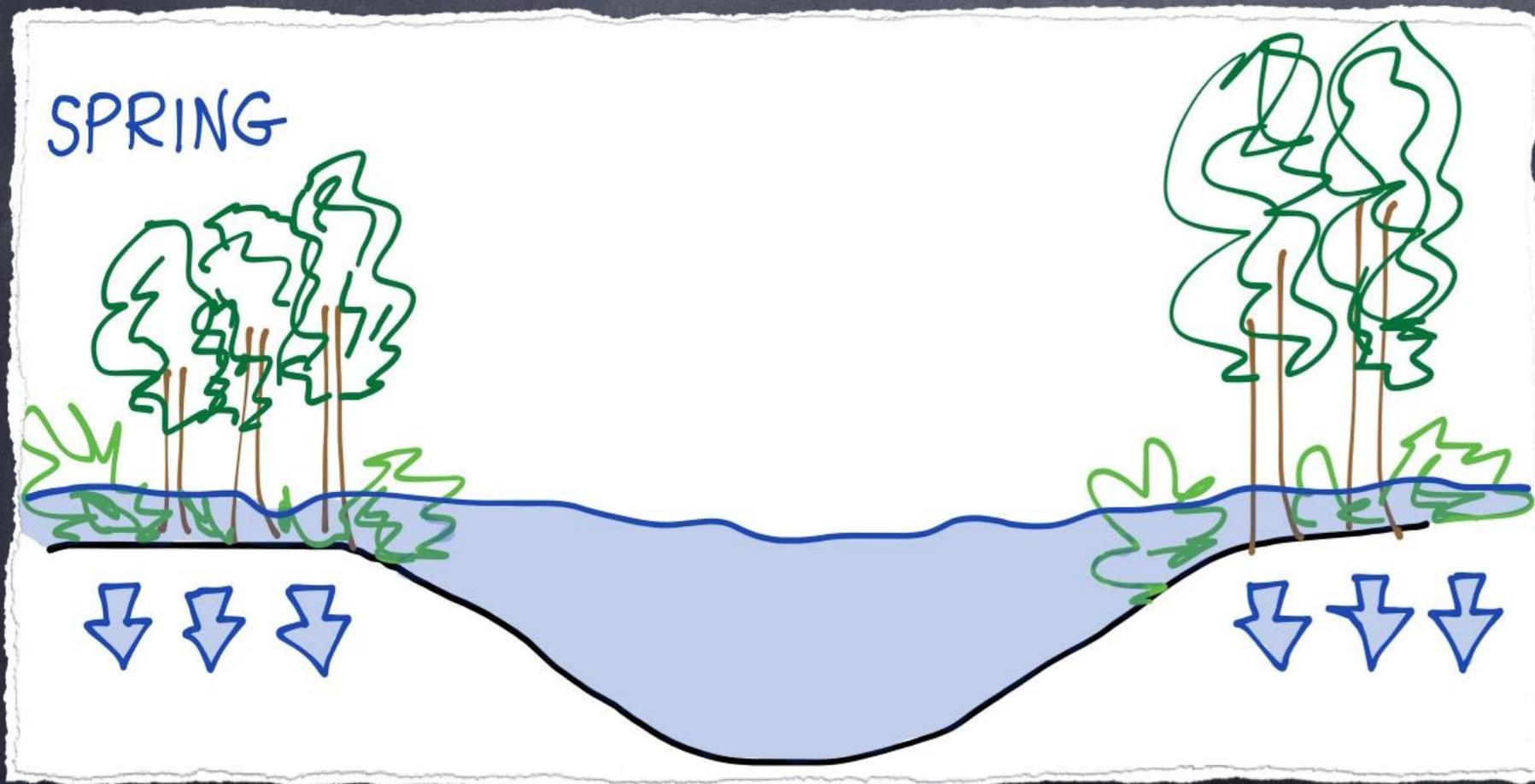
Floods clean out the pools, shift the channels, and rearrange the point bars to restore the balance.



#5. THE SEDIMENT ENTERING THE RIVER EQUALS THE SEDIMENT LEAVING THE RIVER.



Eight Characteristics of a Healthy River

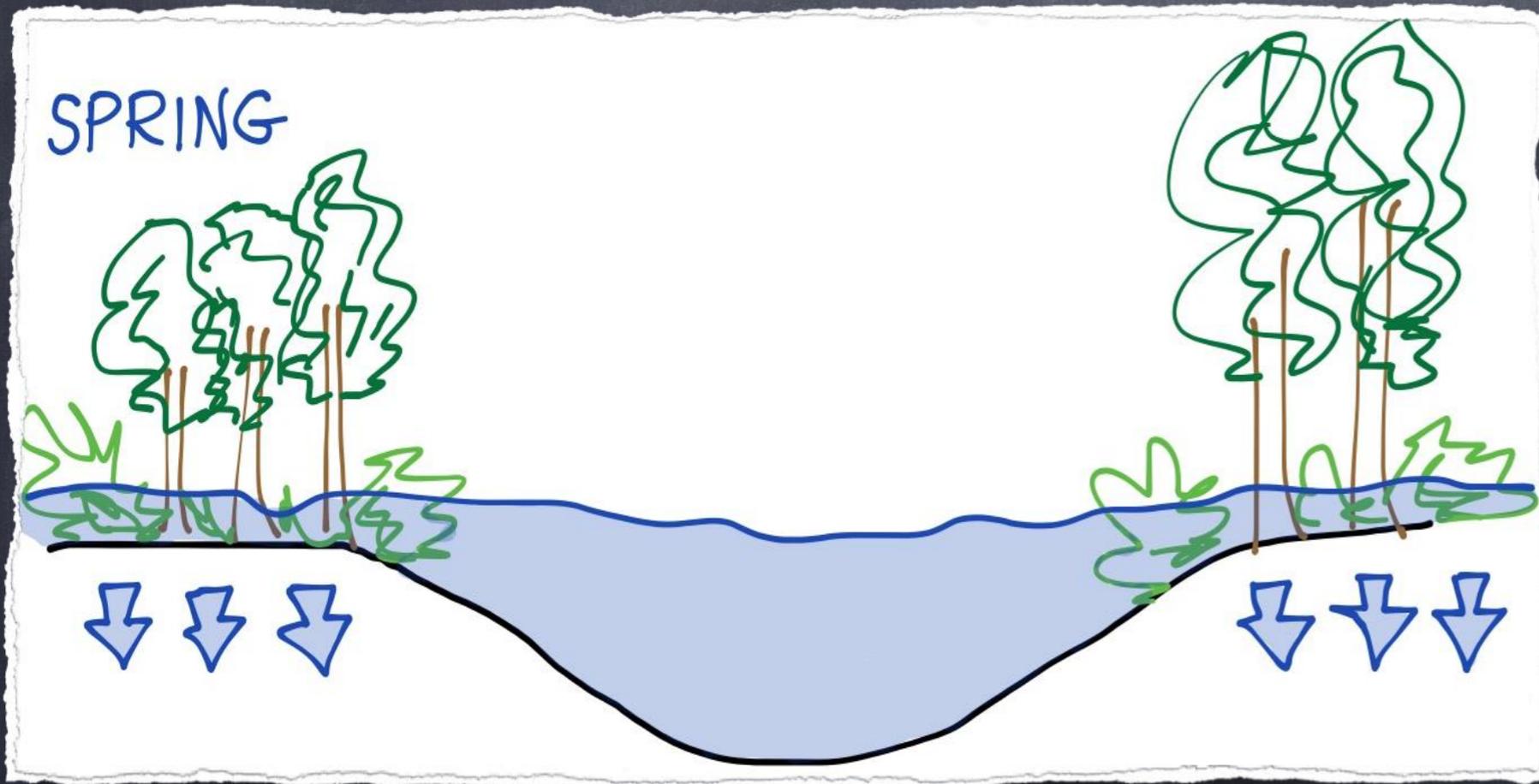


Floodplains have porous soil that soaks up the water like a dry sponge.

#6. HEALTHY (VEGETATED & UNDEVELOPED) FLOODPLAINS SOAK UP THE WATER, REPLENISH GROUNDWATER AQUIFERS, PREVENT DOWNRIVER FLOODING, AND CYCLE NUTRIENTS THROUGH THE RIPARIAN ZONE.



Eight Characteristics of a Healthy River

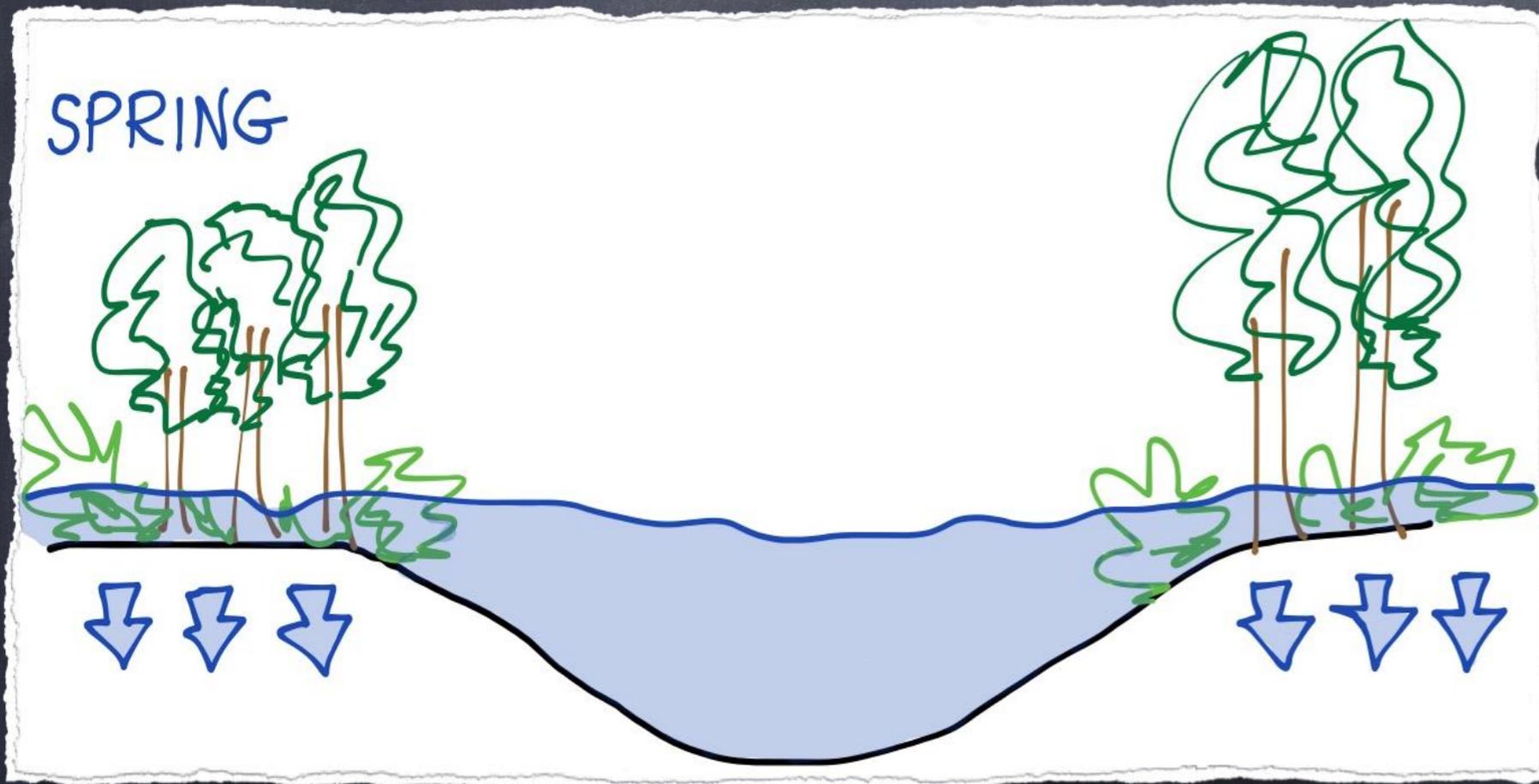


Riparian plant roots keep the pores in the soil open, which makes the rate of water absorption 2-3x faster.

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Riparian plants have high transpiration rates, which dries the soil & increases the amount of water absorption.

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(wordpress.com, 2013)

Riparian plant roots anchor the soil which slows erosion.

Look at the result of deforestation along a river in the Amazon.

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(Curtis Jerome Hayne, 2016)

The more TIME the water sits over the floodplain, the more water can soak into the ground aquifers!

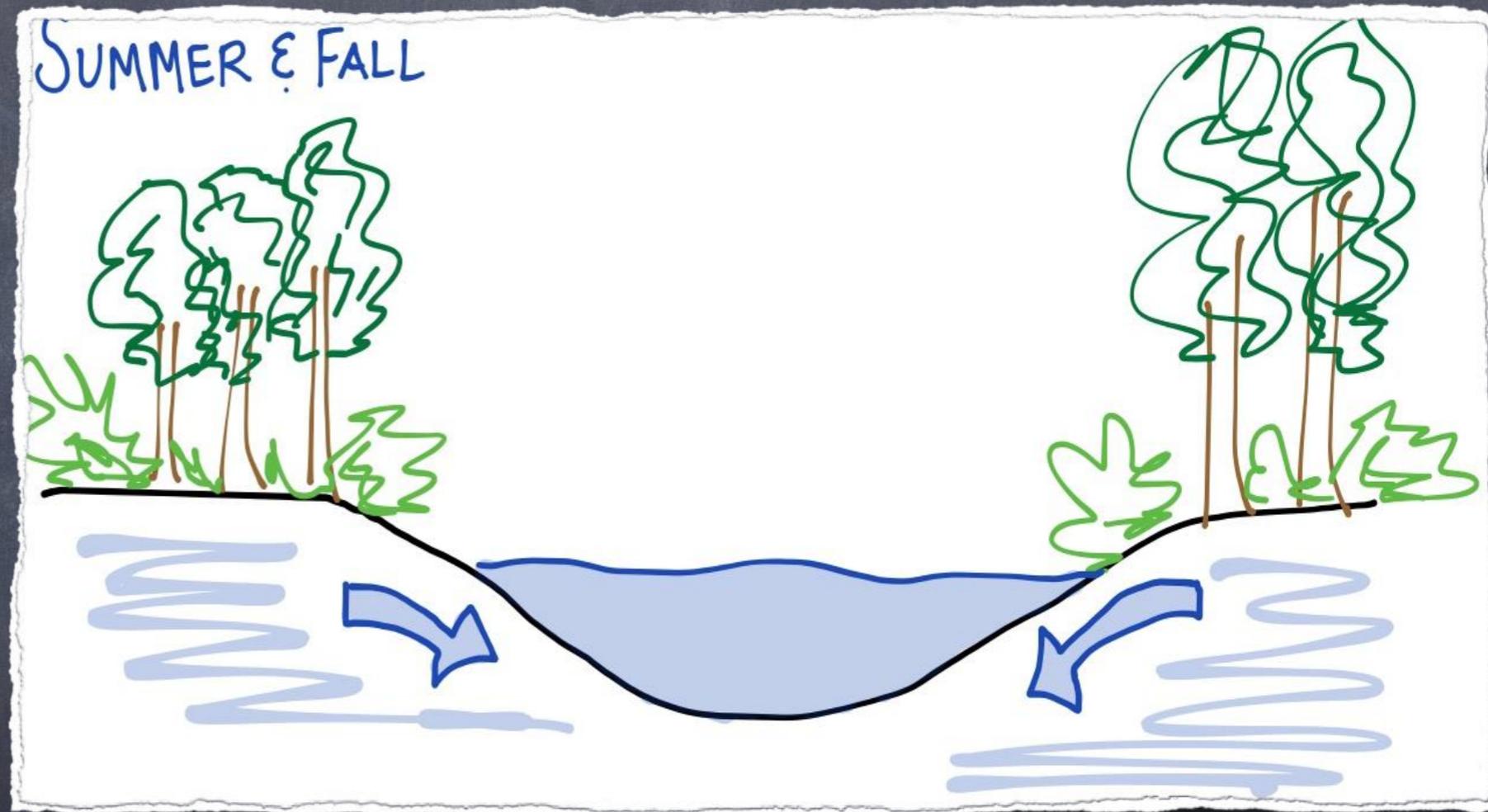
E.g. Farmers in California are flooding their orchards to recharge the ground table.

#6. HEALTHY (VEGETATED & UNDEVELOPED) FLOODPLAINS SOAK UP THE WATER, REPLENISH GROUNDWATER AQUIFERS, PREVENT DOWNRIVER FLOODING, AND CYCLE NUTRIENTS THROUGH THE RIPARIAN ZONE.



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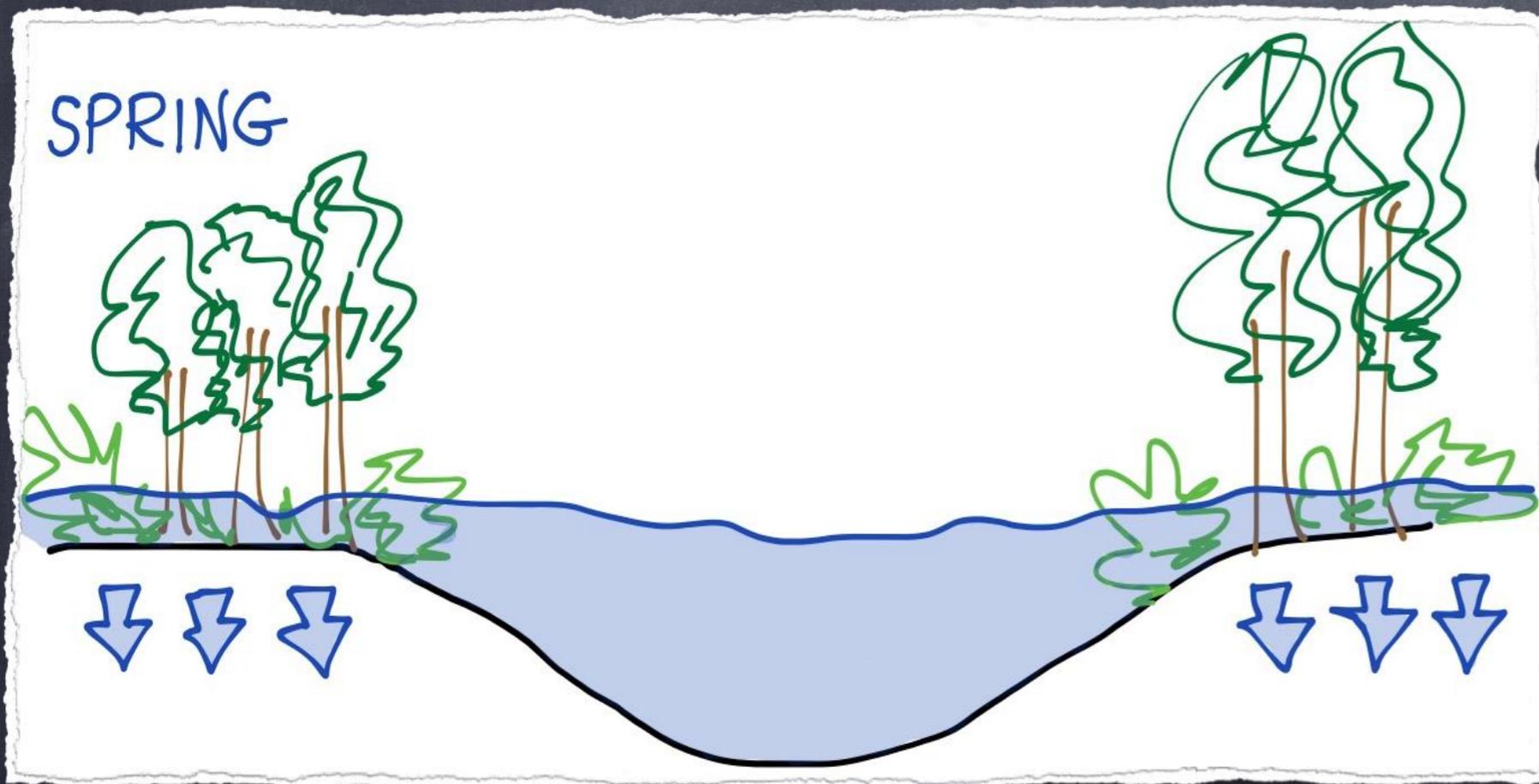
The cool, clean ground water seeps into the river during the summer and the fall...
providing a thermal refuge.



#6. HEALTHY (VEGETATED & UNDEVELOPED) FLOODPLAINS SOAK UP THE WATER, REPLENISH GROUNDWATER AQUIFERS, PREVENT DOWNRIVER FLOODING, AND CYCLE NUTRIENTS THROUGH THE RIPARIAN ZONE.



Eight Characteristics of a Healthy River



Riparian plants slow the rate of runoff, which leads to less down river flooding.

#6. HEALTHY (VEGETATED & UNDEVELOPED) FLOODPLAINS SOAK UP THE WATER, REPLENISH GROUNDWATER AQUIFERS, PREVENT DOWNRIVER FLOODING, AND CYCLE NUTRIENTS THROUGH THE RIPARIAN ZONE.



Eight Characteristics of a Healthy River

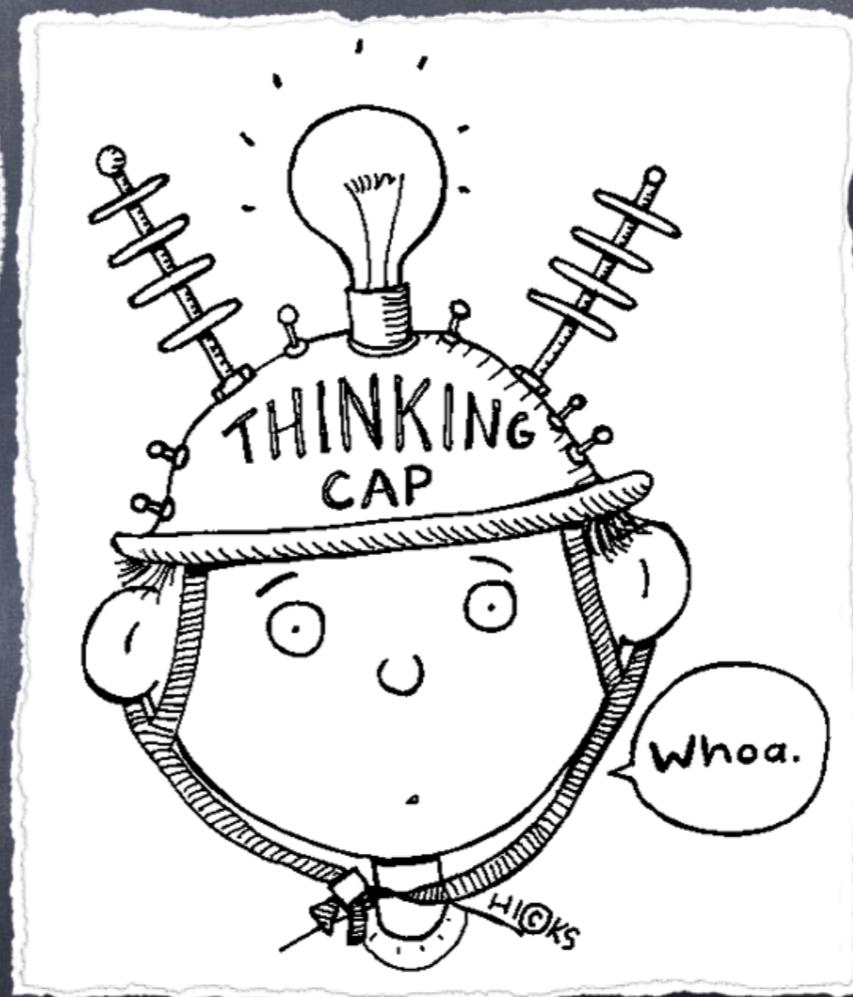
- ★ Reshapes/redirects meanders
- ★ Moves main river channels
- ★ Rejuvenates riparian zones
- ★ Forms & maintains side channels
- ★ Scours floodplains
- ★ Maintains off-channel wetlands

#7. LARGE 10-20 YEAR FLOODS CREATE A COMPLEX RIVER HABITAT.



Eight Characteristics of a Healthy River

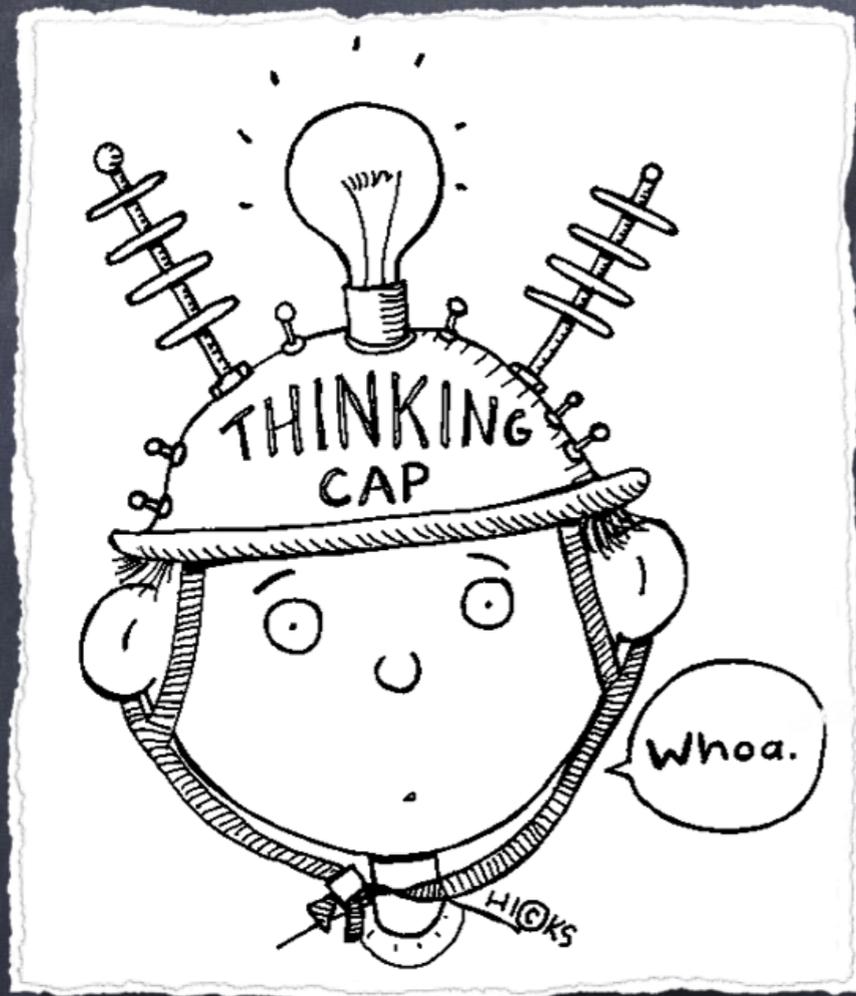
True or False
Riparian plants cannot adapt to the constantly changing conditions



#8. NATURAL FLOWS LEAD TO DIVERSE RIPARIAN COMMUNITIES OF PLANTS AND ANIMALS.



Eight Characteristics of a Healthy River



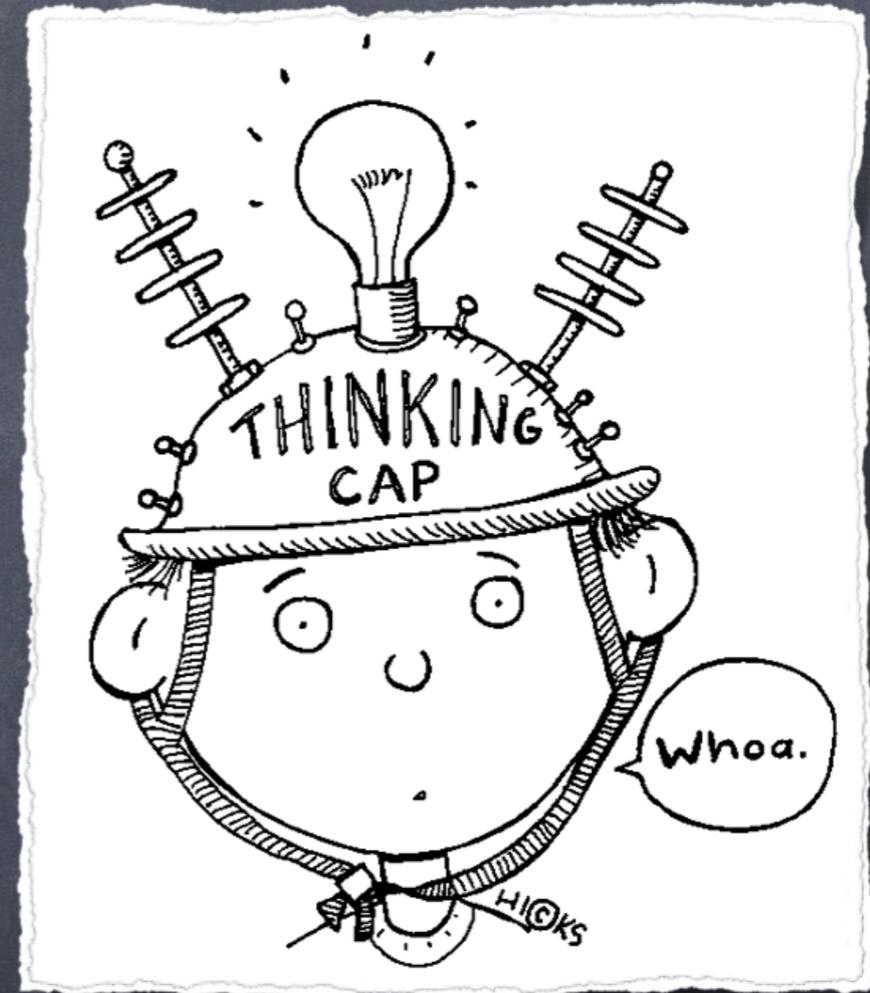
True or False
Riparian plant communities will be more diverse if all of the flows occur regularly.

#8. NATURAL FLOWS LEAD TO DIVERSE RIPARIAN COMMUNITIES OF PLANTS AND ANIMALS.



Eight Characteristics of a Healthy River

True or False
When floods occur
there are fewer
habitats available for
the plants.



#8. NATURAL FLOWS LEAD TO DIVERSE RIPARIAN COMMUNITIES OF PLANTS AND ANIMALS.



Eight Characteristics of a Healthy River

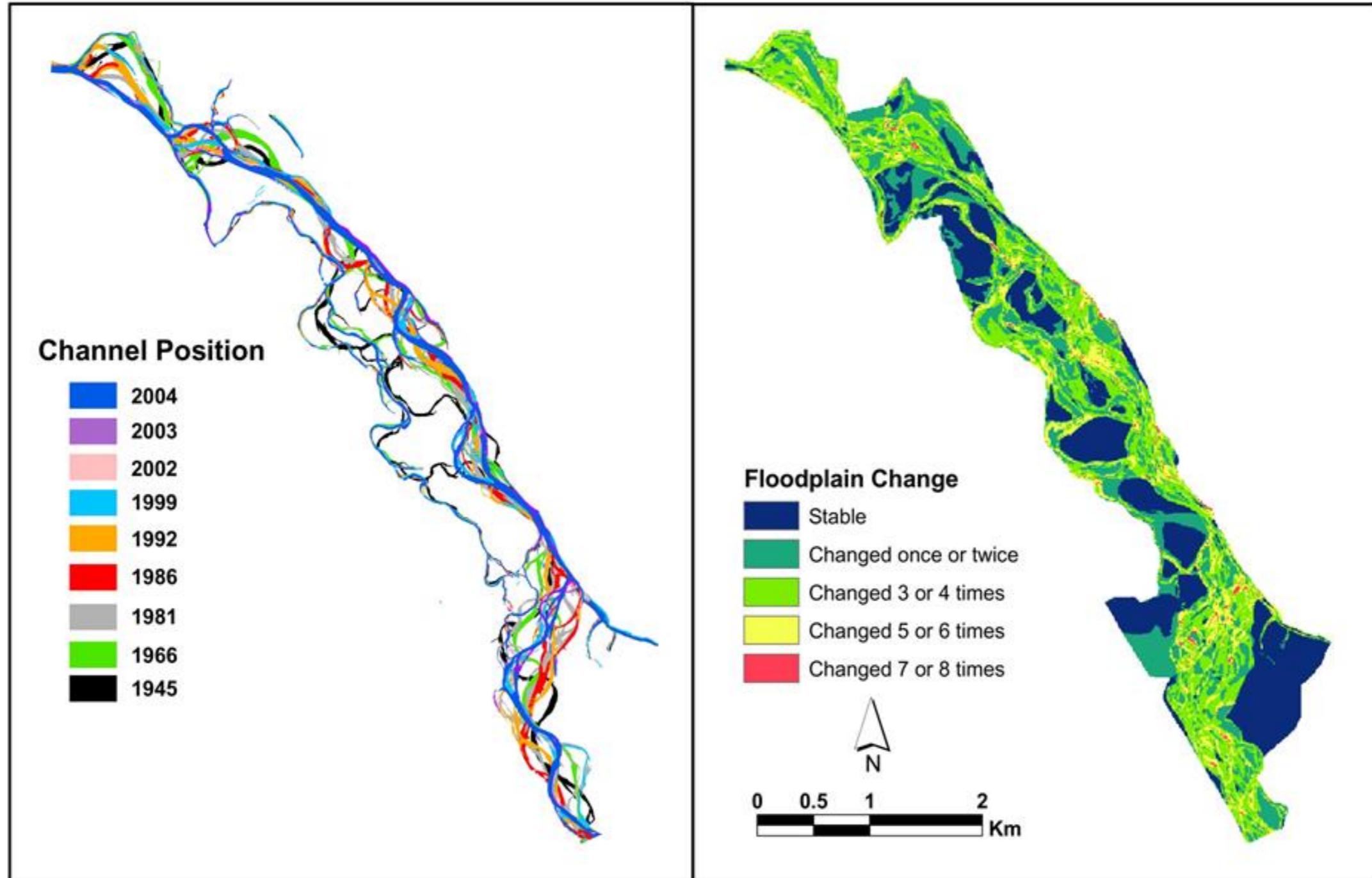
habitat simple complex large wood shade

The riparian zone is _____ in physical structure. Forested riparian areas provide _____ along the river bank, _____ _____ in the river channel, and varied _____ for mammals, birds, amphibians, fish, and insects.

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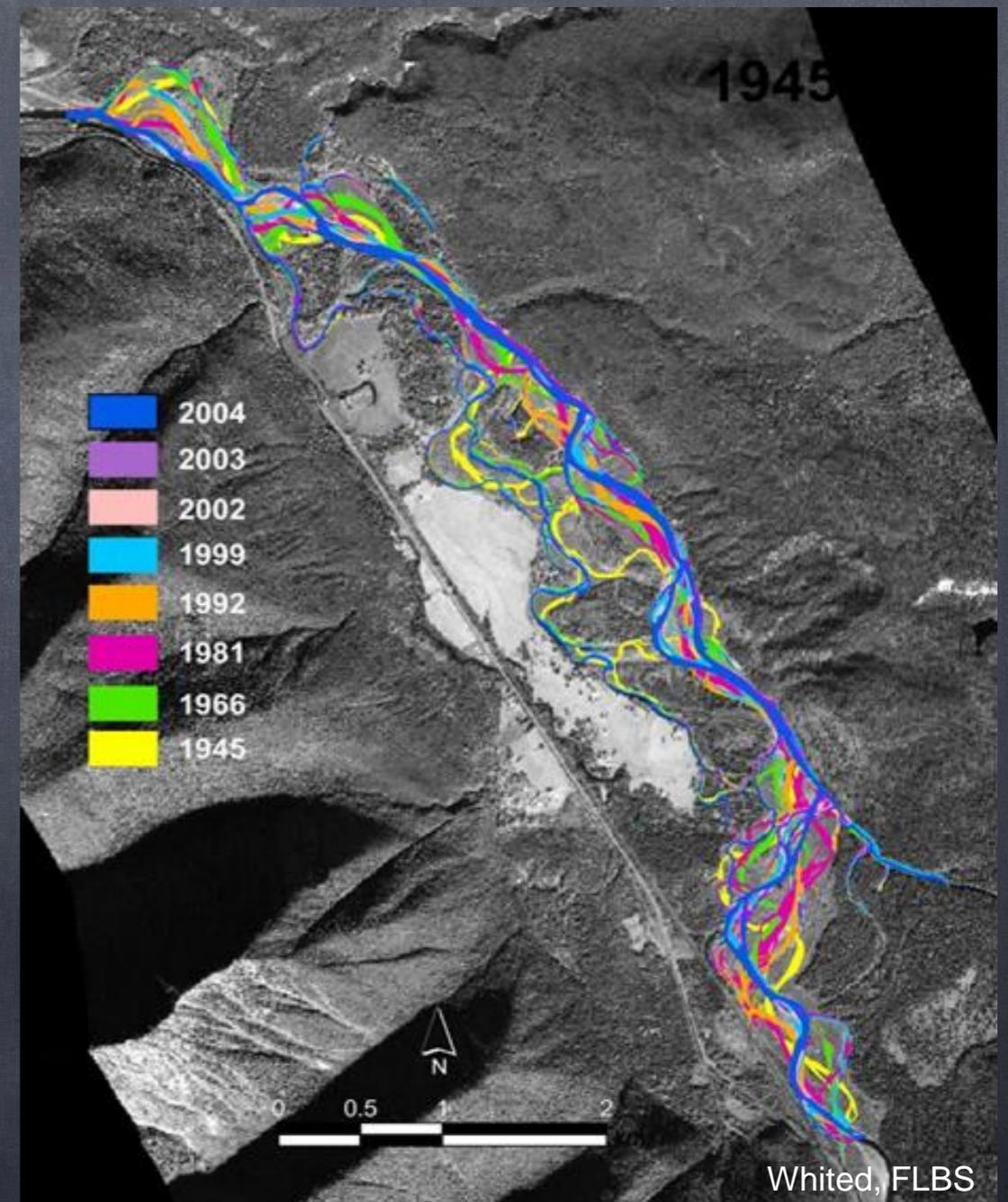
How does the river and floodplain habitat change over time?





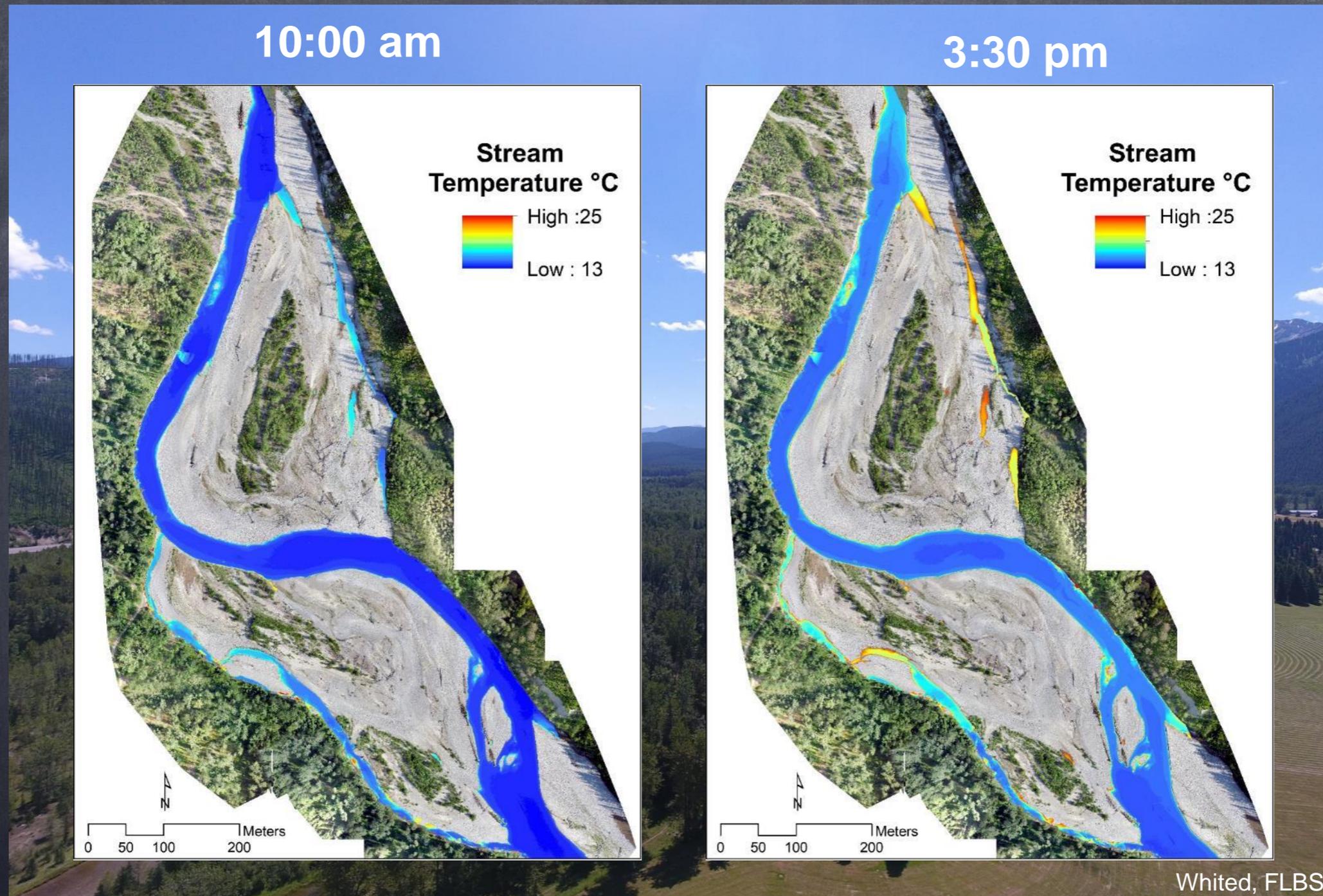
How does the river and floodplain habitat change over time?

- Habitat patches are dynamic in river ecosystems
- Disturbances (flooding) create new habitats over time
- They may move in space but the relative abundance of these habitats stay the same.





How does the river and floodplain habitat change over time?



Stream Temperature Changes through out the day



Explore with Google Earth

Use Google Earth on your computer or tablet to zoom in and examine a local river.

First identify the meanders, glides, riffles, runs, pools, point bars, and side channels of the river.

Next answer the questions on your worksheet.



Brainstorm with a Partner

Partner up with your closest neighbor.

Do a QUICK 3-minute brainstorm on whether you think rivers in the region are in a natural or healthy state.

Record your thoughts and ideas on your worksheet.

Be prepared to share one idea.



Apply what you have learned!

Stop...think...and write!

List one **SPECIFIC** example of how humans have impacted the natural features of a local river.

What is a solution to this problem?



Reflect and explain

How do the eight characteristics of a healthy river impact the river's water quality, water flow, amount of erosion, and availability of diverse habitats?