STREAM PATTERNS

LEARNING LOG 3

NAME: _____ **DATE:** _____

Imagine that you are a scientist studying streams in Hawai'i. Your field work takes you to some wet and wild places! And the information you gain from your work helps the state to manage our streams.

In 2004, three scientists conducted a study of nine streams on O'ahu. The purpose of their study was to describe how different land uses affect stream life. The scientists were looking for connections between land use, habitat characteristics, and the number and kinds of invertebrates (animals without backbones, including shrimp, prawns, insects, worms and snails) in the stream. What are the connections?

Land Use → **Habitat Characteristics** → **Invertebrates**

(forest, mixed, urban) (shade, temperature, oxygen, etc.) (How many? What kind?)

Land Use

The scientists compared streams in three types of settings: forest, mixed land-use, and urban. The mixed land use sites were areas with homes and farms.

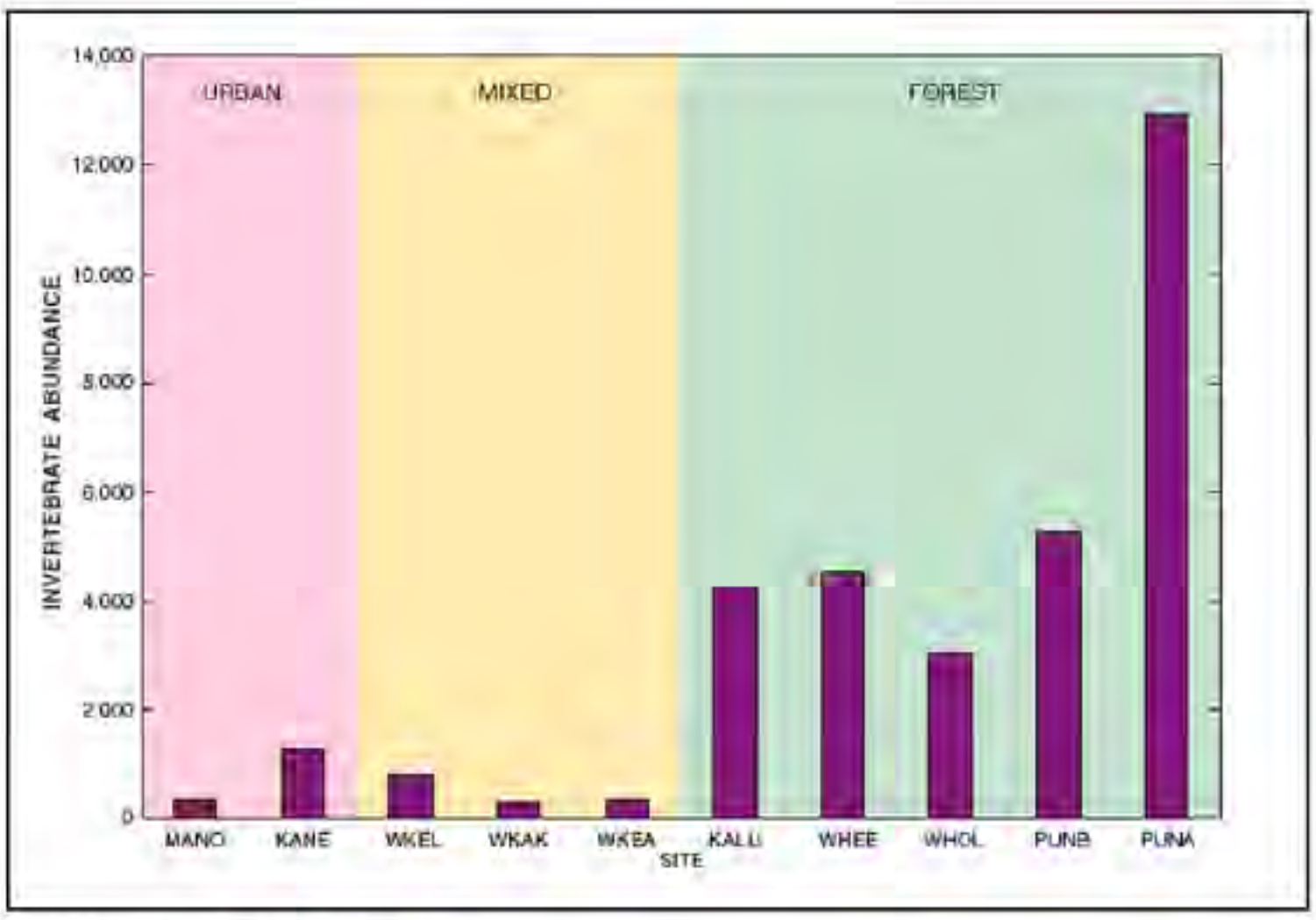
Habitat

How do you think the stream habitats in two of these settings were different? Make a check in the column for the land use you predict would have the following:

Habitat Characteristics	Urban	Forest
Most shade		
Highest water temperature		
Most dissolved oxygen		
Fastest stream flow		
Most large boulders		
Clearest water		

Invertebrates

Review the bar graph about abundance (total number of invertebrates) from the scientists' data. The sites are abbreviated names for nine streams on Oʻahu, including Kane (Kāneʻohe), Whee (Waiheʻe) and Puna (Punaluʻu).



(Source: Brasher et al., 2004)

We will take a field trip to compare a forested stream site with an urban stream site. Based on the scientists' data, predict the setting where you think you will find the following:

Make a check in the column to match your prediction.

Stream Invertebrates	Urban 	Forest 
Highest abundance (total number of individuals)		
Most native species		
Highest number of species (diversity)		

STREAM PATTERNS

STREAM LIFE DATA SHEET

HUI: _____ **DATE:** _____

Following instructions from your field site leaders, carefully collect stream organisms and place them in buckets of water for observation. Use the stream life cards to identify both native and non-native species. Record the names of the species in the big column and the numbers of individuals and species in the small columns for each site.

	Urban 	**Forest** 
INVERTEBRATES	#	#
Native species		
Total number of **species** for each site		
Non-native species		
Record the total number of **species** for each site.		
FISH		
Native species		
Record the total number of **species** for each site.		
Non-native species		
Record the total number of **species** for each site.		

STREAM PATTERNS PERCENT SHADE COVER ***HUI* 1 DATA SHEET**

STUDENT NAMES: _____

DATE: _____ **TIME:** _____ **WEATHER CONDITIONS:** _____

OUR HYPOTHESIS:

_____

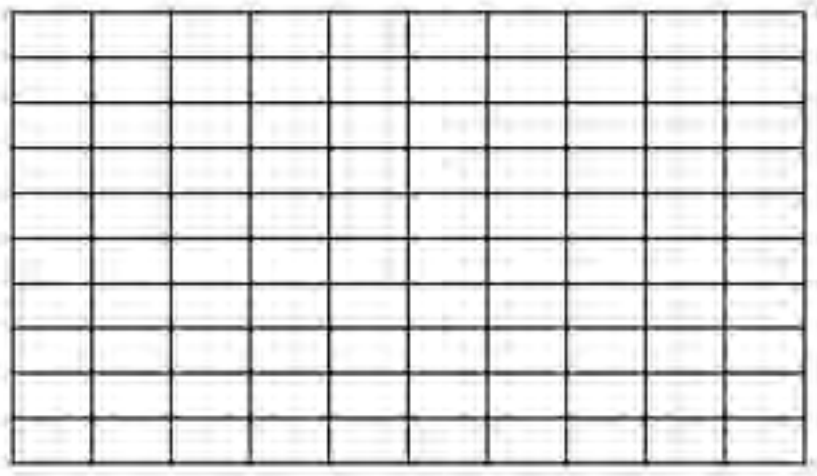
_____

_____

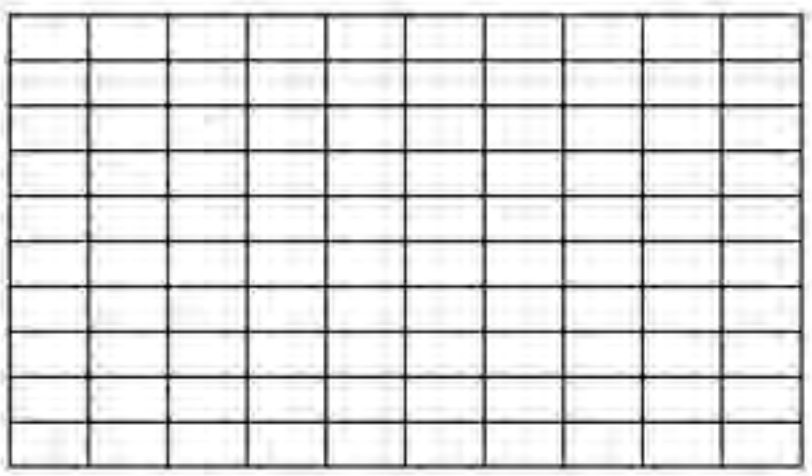
Look closely at the study area between the boundary markers. Imagine that the 10 x 10 square grids below represent three areas: 1) the area over the stream by the first boundary marker; 2) the area over the stream by the second boundary marker; and 3) the area over the stream in the middle of your study site. Color in the blocks to represent the amount of shade over each site. Then count the total number of blocks you have colored. That is the percent of shade cover over the area of the stream. For example, coloring 20 of the 100 squares would be equal to 20 percent (%) shade cover.

Urban Stream Site

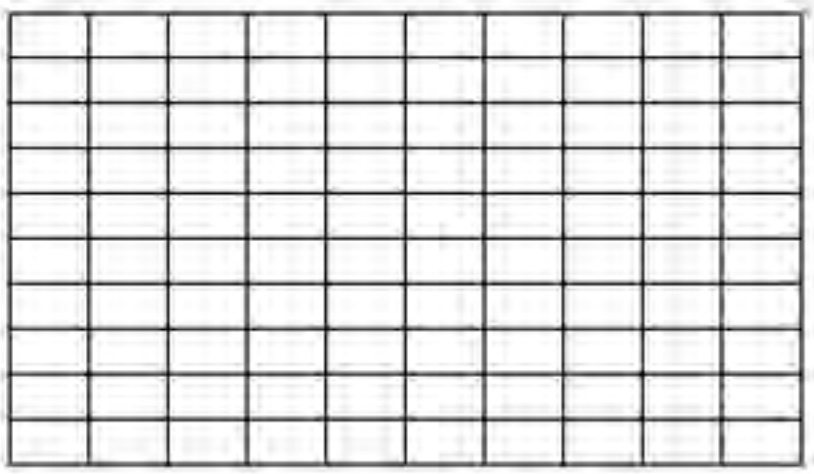
First Boundary Marker
Percent Shade Cover: _____



Middle of Study Area
Percent Shade Cover: _____



Second Boundary Marker

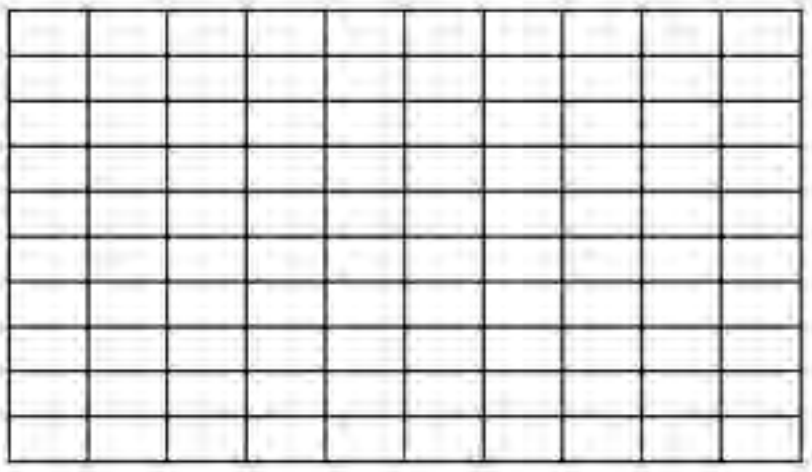


Percent Shade Cover: _____

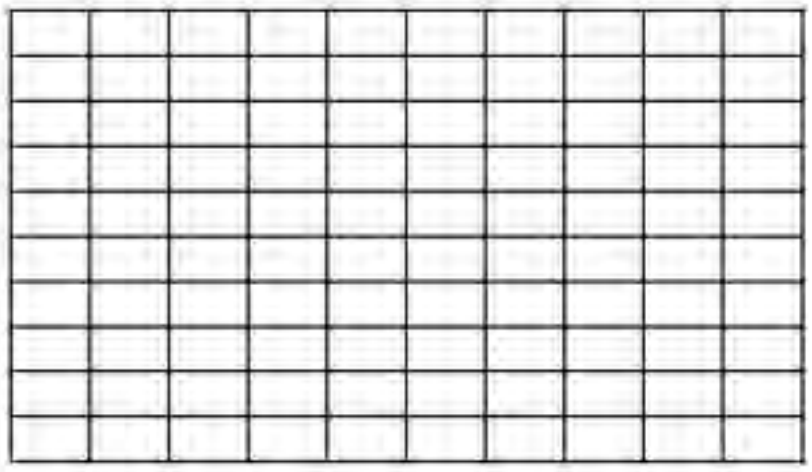
STREAM PATTERNS PERCENT SHADE COVER ***HUI* 1 DATA SHEET - 2**

Forest Stream Site

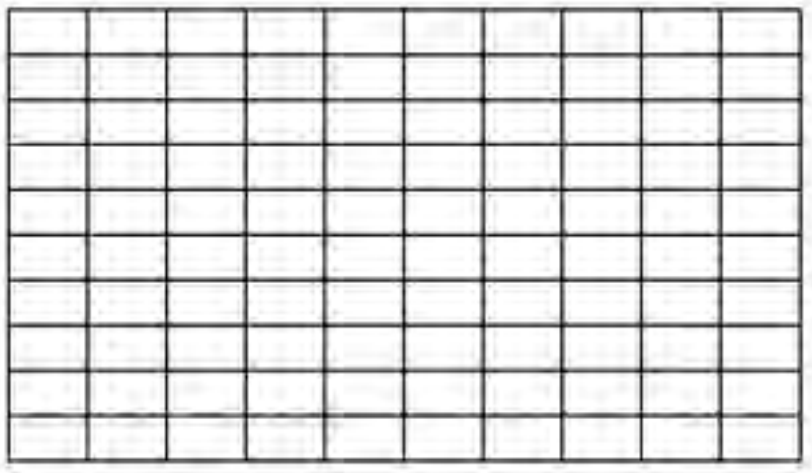
First Boundary Marker
Percent Shade Cover: _____



Middle of Study Area
Percent Shade Cover: _____



Second Boundary Marker
Percent Shade Cover: _____



What **variables** does your group need to control when you compare the percent shade cover at the two sites? Why?

_____

_____

_____

_____

Observations

Use the **observation sheet** to record your observations of the area around and in the stream at the urban and forested stream sites. What are the banks of the stream like? What's on the stream bottom--boulders, cement, gravel, silt?

STREAM PATTERNS WATER TEMPERATURE ***HUI* 2 DATA SHEET**

STUDENT NAMES: _____

DATE: _____

TIME: _____ **WEATHER CONDITIONS:** _____

OUR HYPOTHESIS:

_____

_____

_____

What **variables** does your group need to control when you compare the water temperature at the two sites? Why?

_____

_____

_____

_____

Testing Procedure: Record the temperature at 3 places in your group's study area. Wear gloves and carefully follow directions about where to record the temperature of the water. Hold the thermometer so that the bottom is submerged 4 inches under the water. Keep the thermometer in the water until the temperature reading stops changing.

Results

Water Temperature	**Urban Stream** 	**Forest Stream** 
Site 1		
Site 2		
Site 3		

Observations: Use the **observation sheet** to describe the conditions in the areas where you test the water temperature.

STREAM PATTERNS DISSOLVED OXYGEN ***HUI* 3 DATA SHEET**

STUDENT NAMES: _____

DATE: _____ **TIME:** _____ **WEATHER CONDITIONS:** _____

OUR HYPOTHESIS:

Dissolved oxygen is the amount of oxygen dissolved in water. Why do you think this is an important measure of how healthy the stream is?

What **variables** does your group need to control when you compare the dissolved oxygen at the two sites? Why?

Testing Procedure: Wear safety goggles and carefully follow the directions on the water test kit. Record the dissolved oxygen for 3 different places in your group's study area.

Results

Dissolved Oxygen	Urban Stream	Forest Stream
Site 1		
Site 2		
Site 3		

Observations: Use the **observation sheet** to describe the conditions in the area where you test the dissolved oxygen.

STREAM PATTERNS TURBIDITY ***HUI* 4 DATA SHEET**

STUDENT NAMES: _____

DATE: _____ **TIME:** _____ **WEATHER CONDITIONS:** _____

OUR HYPOTHESIS:

_____

_____

_____

Turbidity is a measure of how clear the water is. Water is turbid when clay, silt or other particles are suspended in the water. This makes the water cloudy or dirty.

Procedure:

1. Go to the middle of the stream to collect water.
2. Face into the current and collect a water sample about halfway down from the surface, scooping into the current and away from your body.
3. Stir the sample for about 15 seconds (to suspend all of the particles in the water).
4. Slowly pour the water into the turbidity tube until the black and white markings in the bottom of the tube just disappear from sight.
5. Record the height of water in the tube (in cm.).
6. Use the conversion chart to get the turbidity value (NTU) and record those numbers below.

What **variables** does your group need to control when you compare the turbidity at the two sites? Why?

_____

_____

_____

Results

Urban Stream	**Turbidity (cm. of water in tube) and NTU (from conversion chart)**	**Description of Water**
Test 1		
Test 2		
Test 3		

Forest Stream	Turbidity	Description of Water
Test 1		
Test 2		
Test 3		

Observations: Use the **observation sheet** to record any conditions you see upstream that could cause turbidity at either site.

TURBIDITY CONVERSION CHART

Centimeters	Approximate NTUs (transparency values)
6.4 – 7.0	240
7.1 – 8.2	185
8.3 – 9.5	150
9.6 – 10.8	120
10.9 – 12.0	100
12.1 – 14.0	90
14.1 – 16.5	65
16.6 – 19.1	50
19.2 – 21.6	40
21.7 – 24.1	35
24.2 – 26.7	30
26.8 – 29.2	27
29.3 – 31.8	24
31.9 – 34.3	21
34.4 – 36.8	19
36.9 – 39.4	17
39.5 – 41.9	15
42.0 – 44.5	14
44.6 – 47.0	13
47.1 – 49.5	12
49.6 – 52.1	11
52.2 – 54.6	10
>54.7	<10

(Chart adapted from: University of Wisconsin Extension. 2006. Water Action Volunteers – Volunteer Stream Monitoring Factsheet Series. Retrieved on 4/10/07 from: http://clean-water.uwex.edu/wav/monitoring/WAV2006PDFs/turbidity2.pdf)

In Hawai'i, the following NTUs values are considered good for streams:

- During *kau wela* (hot, dry season) the turbidity should not exceed 5.5 NTU 10% of the time, or 10 NTU 2% of the time.
- During *ho'oilo* (wet season) the turbidity should not exceed 15.0 NTU 10% of the time, or 25.0 NTU 2% of the time.

(Source: AECOS, International. http://www.aecos.com/CPIE/Turbidity.html)

STREAM PATTERNS VELOCITY OF STREAM FLOW ***HUI* 5 DATA SHEET**

STUDENT NAMES: _____

DATE: _____ **TIME:** _____ **WEATHER CONDITIONS:** _____

OUR HYPOTHESIS:

Velocity is the speed that the water is flowing through the stream. The speed of the water affects the amount of silt in the water. What **variables** does your group need to control when you compare the velocity at the two sites? Why?

Testing Procedure: Have two students measure a 10-meter area between the two boundary markers at the site. At the signal, start your stopwatch and place a small stick in the water about 2 feet from the stream bank near the upstream boundary marker from the stream bank at the upstream end of your tape measure. Stop the watch when the stick crosses the area at the downstream end of your tape measure. Record the time. Conduct the test three times.

Urban Stream Site: Distance = 10 meters.

	Time (sec.)	**Velocity m/sec. = distance ÷ time**
Test 1		
Test 2		
Test 3		

Forest Stream Site: Distance = 10 meters.

	Time (sec.)	**Velocity m/sec. = distance ÷ time**
Test 1		
Test 2		
Test 3		

Observations: Use the observation sheet to describe the conditions in the area where you test the velocity at the urban and forest stream sites.

STREAM PATTERNS

OBSERVATION SHEET

Look carefully at the area where your *hui* collects data at the two stream sites. Record your detailed observations of each site in the columns below.

 **Urban Stream**	 **Forest Stream**