OAKRIIDGE RANGER DISTRICT
STREAM SIMULATOR

We redesigned the simulator to reduce the weight and improve the accessibility of materials for construction. Everything on the supplies and materials list was purchased at local home improvement, garden, or plastic stores. This new design fits our educational needs(although we have already thought of some new ideas for our next simulator), but if your needs are different feel free to use your creativity and adjust the design to fit your needs.

T'his is our new, updated version of the stream simulator. For those of you that have one of the old drawings, you wifl see that we changed from the sheep tank to a clear high impact acrylic tank. We made the change for a number of reasons 1. It is 4" shallower than the sheep tank. (We also changed the designed of the tub display box so that it is 4" shorter.) This makes it a lot easier for the little people to see into the display. 2. The plastic is lighter, making set-up and transporting a lot mier. 3. It allowed us the opportunity to make some design changes in the drain system. For those of you who would hke to use the sheep tank, it should stifl fit on the new box design, but you wiU need to come up with a drain system. Some of the other changes we made are stainless steel hardware whenever we could.(The chlorine we use to purify the water seemed to rust the exposed metals.) A new garden fountain pump (535 gph) doubled our pump'mg capacity. With these pumps the flow can be restricted by up to 40%, allowing us to simulate a spring flush, or a late summer flow, etc. This really increases the flexibility of application in our presentations with the display.

Boy, what a challenge I had putting together these drawings. It's been 30 years since my last drafting class, so please consider this when you find that little mistake. I hope with this drawing I have captured enough informafion to enable you to construct your own simulator display.

We are also in the process of having the drawings put on Auto CAD so that we can send out a floppy disc with computer generated drawings.

If you have any quesfions please call or write:

Emie Ledbetter
Rigdon Ranger District
PO Box 1410
Oakridge Or.
97463
R06Fl8DIO
(541)782-2283

The Fish Home Improvement Stream Simulator was designed because our environmental education program needed a more successful tool to exhibit how our stream restoration projects improve habitat within the streams and riparian zones.

In the past this was communicated through photographs, field trips, monitoring reports, etc. These methods limited how many people we could reach with information about our restoration projects. Our new instrument of contact is designed to be mobile, allowing us to deliver the stream to the people.

A few examples of where our stream simulator was used last year include: three forests, five ranger districts, three private agencies/organizations, three outdoor school programs, free fishing day, DeVinci Days, the Lane County Fair, the Oregon State Fair, the High Desert Museum, the joint conference for the Oregon Science Teachers Association and The Environmental Education Association of Oregon in Portland, a regional biology workshop, and an environmental conservation fair in Eugene. In adddition the Stream Simulator spent a month in the front office at the Oakridge Ranger District. Considering all its travels we estimate the display was viewed by well over 10,000 people last year. The feedback from our audience has been very positive with the display receiving comments such as,"stimulates thought","adds variety to the presentation of the subject", and "is a fun, hands-on exhibit".

As an educational tool we find the use only limited by the exhibitors imagination. Our original plan for the exhibit was as a display tool showing techniques used in stream restoration. It has also been used as a training tool for our restoration crews, to display how stream flows interact with debris within the flood plains and how soil saturation contributes to soil erosion. It was also used to simulate large flood event effects on culverts and road fill, and the relationship of ground water to stream channel depth.

The design was originally planned with the audience being school children in grades K-6, but we found that it was really used and enjoyed by children from ages 5-89. For presentations it has been used by fisheries and wildlife biologists, soil scientists, hydrologists, and engineers.

The display is small enough that two people can easily set it up and take it down in less than half an hour, and it can be transported in a medium size pickup truck.

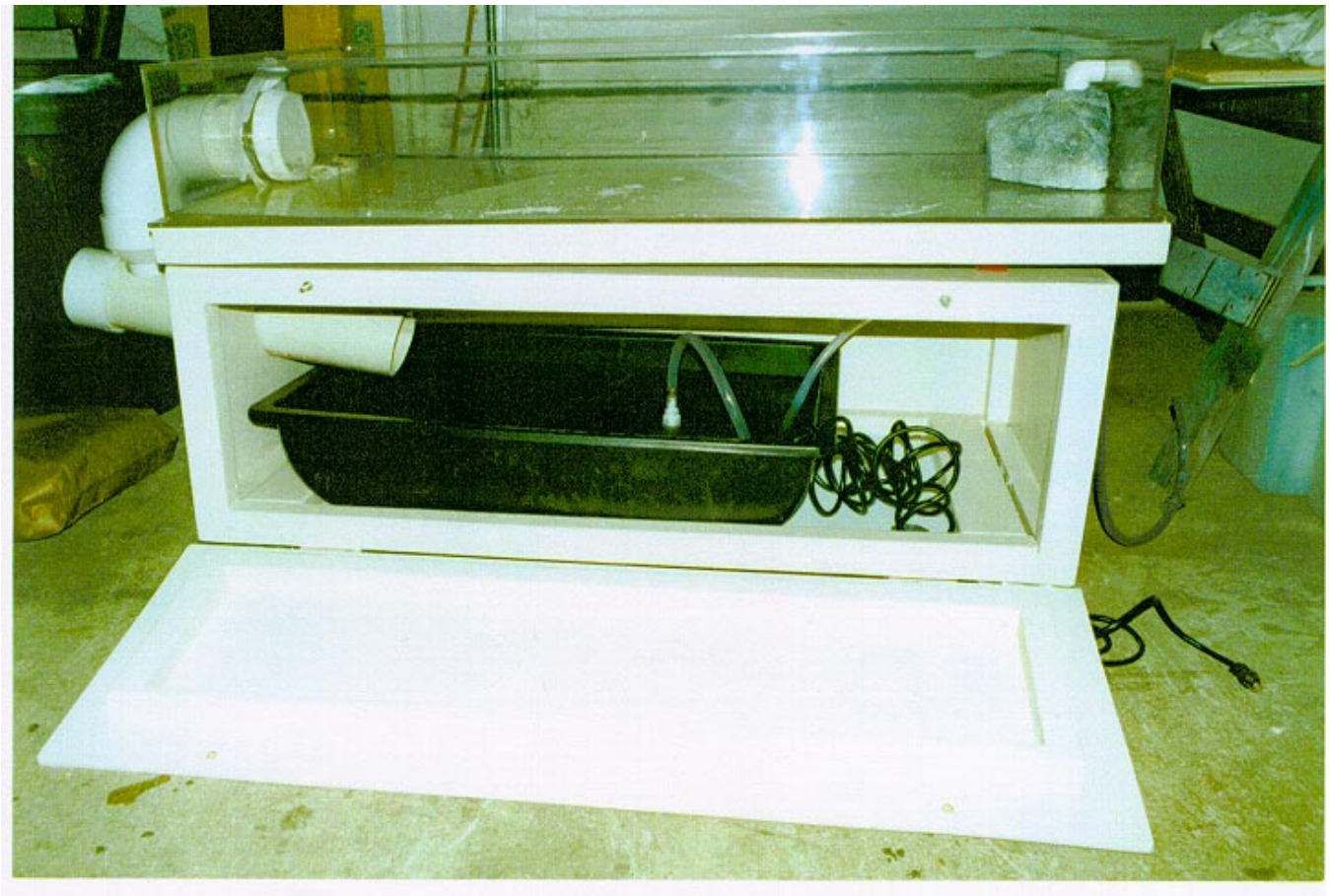
We designed the Stream Simulator so that anyone with knowledge of wood-working tools could construct one. Most supplies used for construction are available at any home improvement, hardware, and plastic supply stores. The design drawings, photos, and curriculum may be obtained by anyone upon request. Our list for requests is growing rapidly.

Comparing the old method to the new, I'm not sure how to estimate a savings of cost. I do think that if we put a dollar value on the increased environmental education to the public, the improvement would be at least 10 fold. Making the Fish Home Improvement Stream Simulator is a cost effective way to bring the stream to the people rather than the people to the stream.

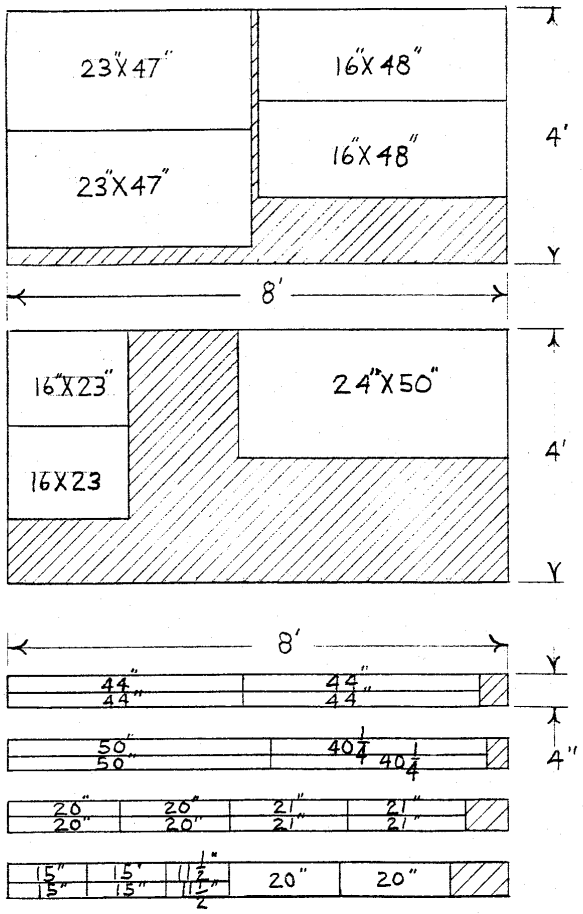
ERNIE LEDBETTER


WILLAMETTE NATIONAL FOREST
Fish
Food


FISH HOME IMPROVEMENT
WILLAMETTE NATIONAL FOREST



CUTTING INSTRUCTIONS FOR 2-SHEETS OF 4'X8'X 1/2" AC PLYWOOD AND 4-8' 2"X4"S



FINISHED SIZES OF LUMBER

QTY	SIZE/PLACEMENT
	PLYWOOD
2	23"x47" - top and bottom
2	16"x48" - back and door
2	16"x23" - ends
1	24"x50" - tub platform
	1 ½'x 1 ½" BRACING
4	15" long - back and front
4	44" long - back and front
2	11 ½" long - door
2	40 ¼" long - door
4	20" long - to connect the top bracing to the bottom
2	50" long - tub platform
4	21" long - tub platform

T00LS USED

10" table saw
jig. Saw
3/8" drill
belt and vibrator
sanders
screw drivers
counter sink
hole saws
squares
putty knife
hammer

STREAM SIMULATOR
SUPPLIES AND MATERIALS

QTY	SIZE	MATERIALS	COST
		PVC PIPE	
1	1 ½"x1 ¼"	PVC bushing - electric cord pass through	$3.49
2	1"x ¾"	PVC reducing bushing - over flow drains	5.78
1	6 ounces	PVC cement	1.25
1	2'x4'	piece of .093 ABS plastics - inside bottom of box	12.00
		TUB DRAIN SUPPLIES	
1	4"	PVC male adapter	6.12
1	4"	PVC female adapter	4.65
1	4"	PVC 90^0 st. elbow	6.29
1	4"x2"	PVC coupling DWV	5.26
1	5'x4"	PVC pipe	4.50
1	4"	PVC glue cap	4.97
		WATER INLET	
1	¾"	PVC FIP elbow	.50
1	¾"	PVC male adapter	.50
		LUMBER	
2	4'x8'x ½"	AC plywood	37.00
4	8' 2"x4"	boards	16.00
		HARDWARE	
2	¼"x2 ½"	hanger bolts - door latch	1.50
4	3 ½"x3 ½"	full mortise stainless steel door hinge	47.00
1	box #8x1 ¼"	galvanized decking screws - for box construction	3.70
2	3"	swivel casters - must be able to support 300#	16.00
2	3"	straight casters - must be able to support 300#	12.00
1	6"	adjustable hose clamp - use to clamp drain screen	2.00
2	½"	lab clamps - to vary water flow to simulator	4.00
		SIMULATOR TUB	
1	2'x4'	high impact acrylic plastic	280.00
		SUPPLIES	
2	100#	bags of roofing sand - need about 130# for stream channel	32.00
1	15 gallon	mortar mixing tub - for water reservoir in box	11.00
1	gallon	exterior primer	16.00
1	gallon	exterior satin paint	18.00
4	4"	foam paint brushes	2.50
1	6"	latex paint brush	10.00
1	6 ounce	bottle of glue - glue every joint you put together	4.12
3	5gallon	heavy duty buckets - to transport your sand	28.00
1	535gpm	Beckett submersible fountain pump	116.00
1	can	wood filler - to fill counter sunk screw holes	2.50
1	tube	water proof tub caulking - seals ABS plastic to bottom of box	3.00
10	sheets	sand paper	5.00

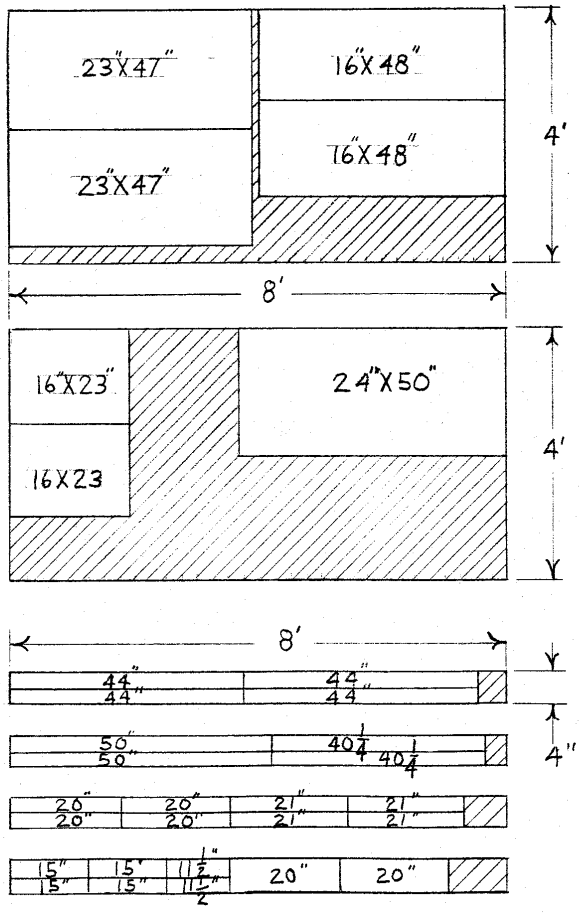
THIS DRAWING ILLUSTRATES CUTTING INSTRUCTIONS FOR THE LUMBER, AND A LIST OF SUPPIES NEEDED

SCALE: 1" = 2'	APPROVED BY:	DRAWN BY Ernie
DATE: 3 17 97		REVISED

DESIGN AND DRAWING BY ERNIE LEDBETTER
OAKRIDGE RANGER DISTRICT WILLAMETTE N.F.

DRAWING NUMBER
1 OF 4

CUTTING INSTRUCTIONS FOR 2-SHEETS OF 4'X8'X $\frac{1}{2}$" AC PLYWOOD AND 4-8' 2"X4"S



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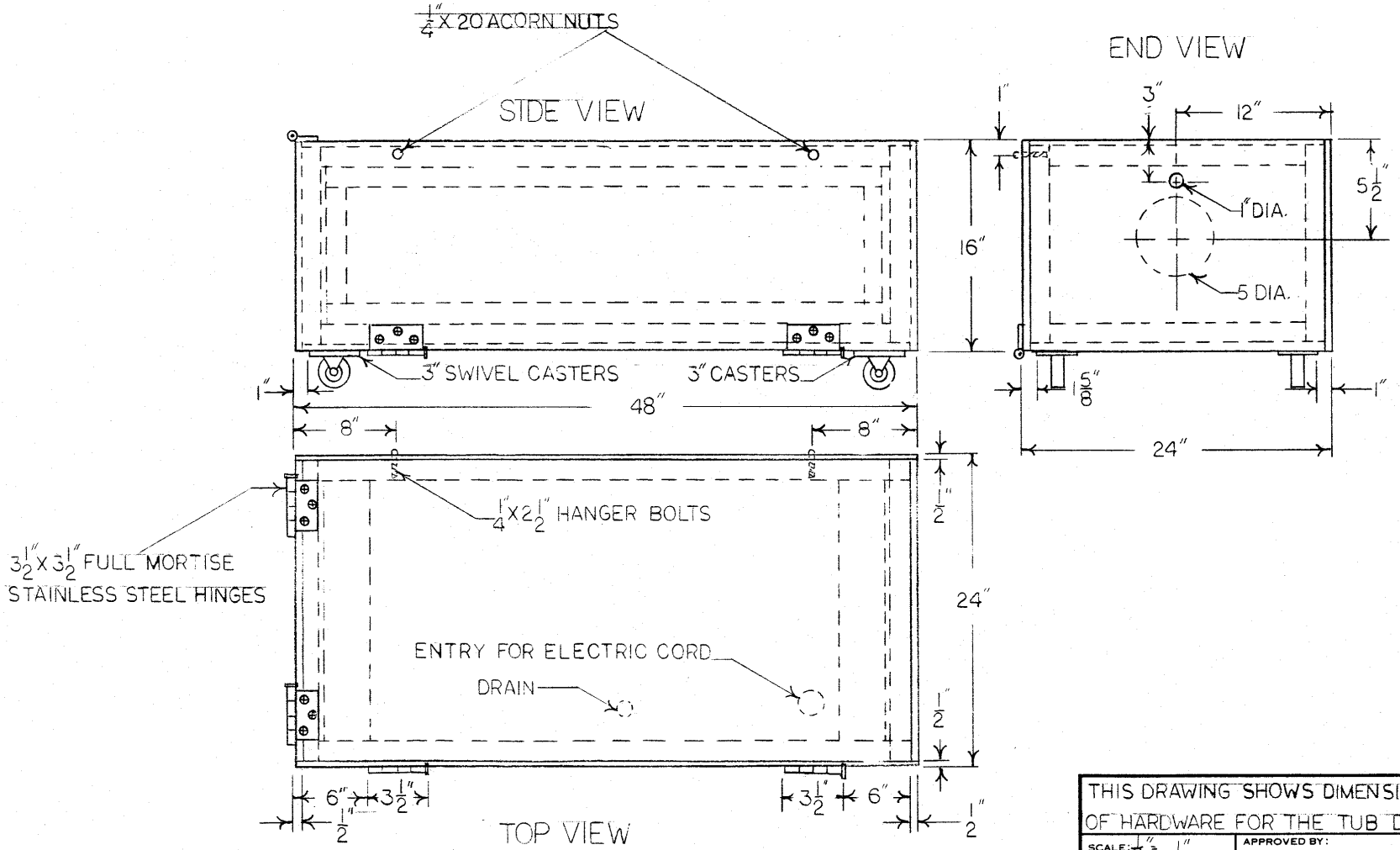
DESIGN AND DRAWING BY ERNIE LEDBETTER OAKRIDGE RANGER DISTRICT WILLAMETTE N.F.		
		DRAWING NUMBER 1 OF 4



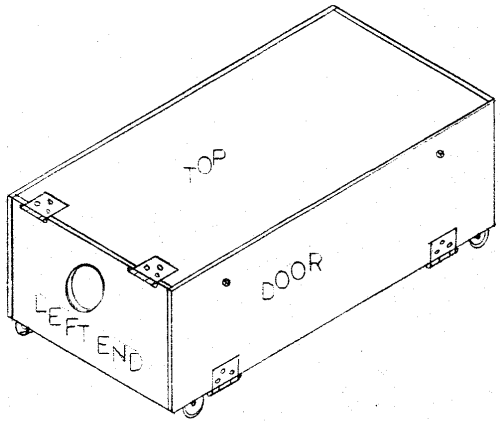
THIS DRAWING SHOWS DIMENSIONS AND PLACEMENT OF HARDWARE FOR THE TUB DISPLAY BOX

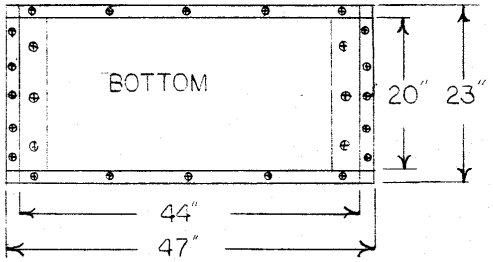
SCALE: 1/8" = 1"	APPROVED BY:	DRAWN BY Ernie
DATE: 3-17-97		REVISED

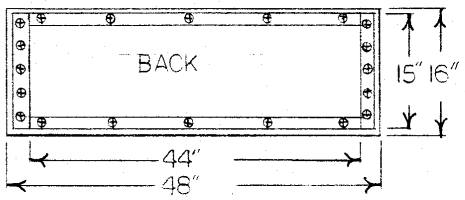
DESIGN AND DRAWING BY ERNIE LEDBETTER
OAKRIDGE RANGER DIST. WILLAMETTE N.F.

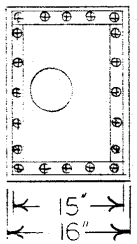
DRAWING NUMBER 2 OF 4

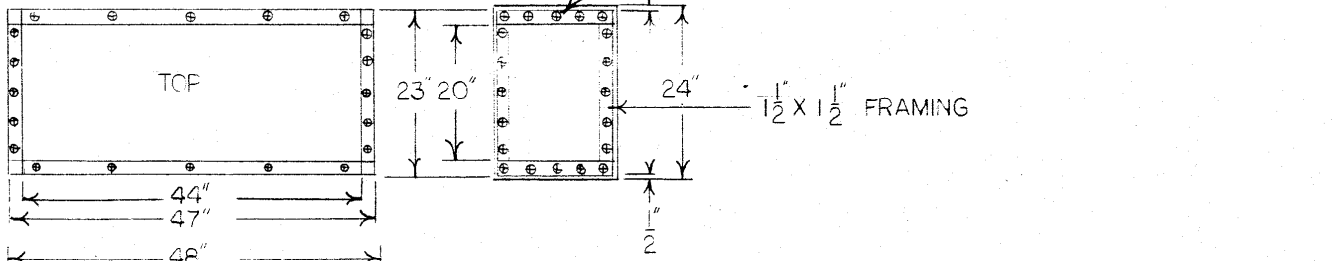
THIS IS A INSIDE VIEW OF THE DISPLAY BOX, LAYED OUT TO SHOW THE SIZE AND ANCHORING OF THE $1\frac{1}{2}$" X $1\frac{1}{2}$" FRAMING

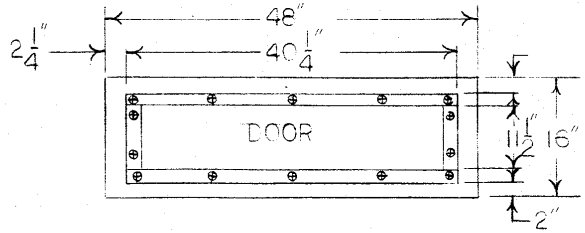










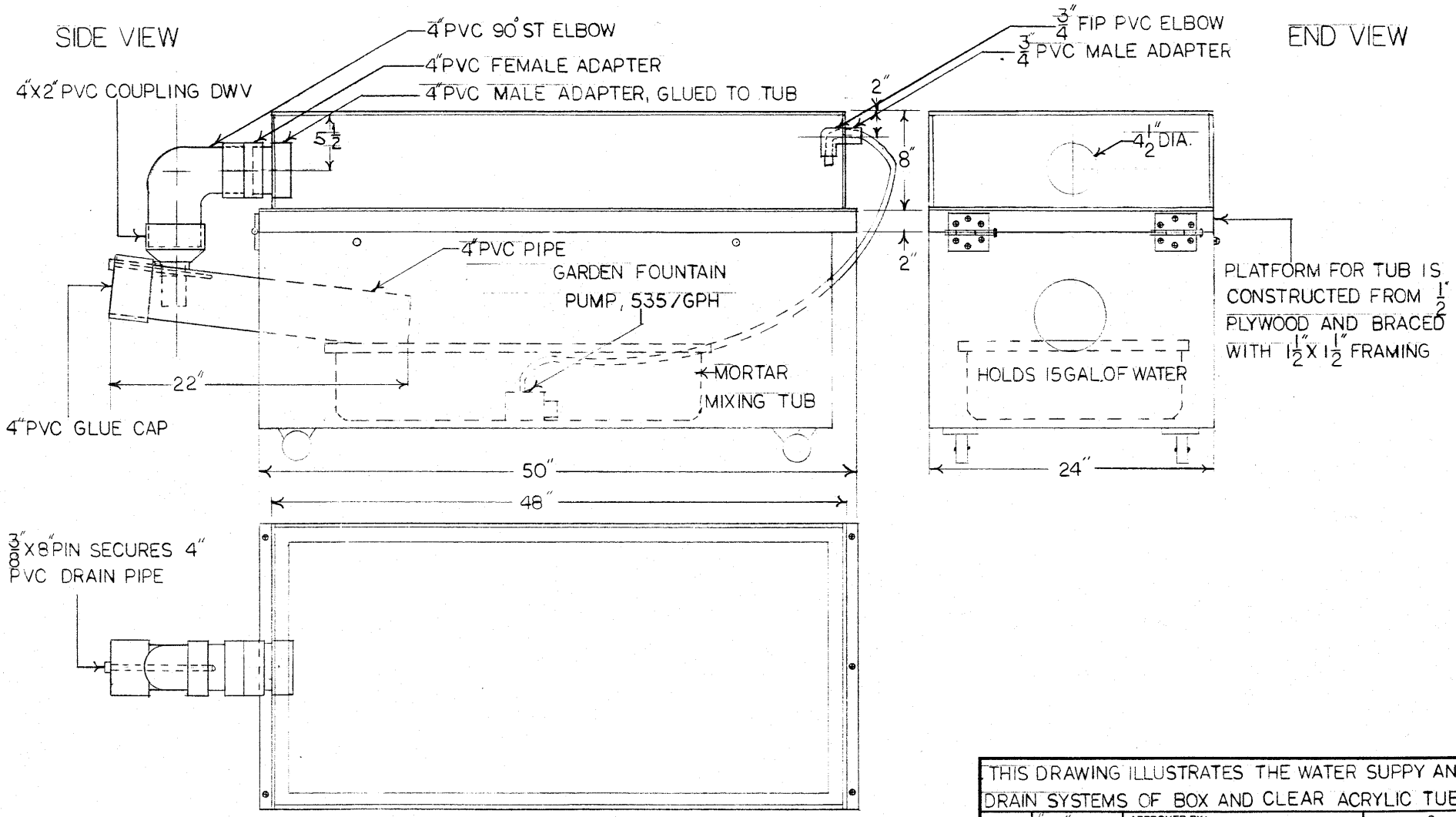


THIS DRAWING SHOWS THE FRAMING POSITION ON THE INSIDE OF EACH PIECE OF THE DISPLAY BOX

SCALE: $\frac{1}{16}$" = 1"	APPROVED BY:	DRAWN BY Ernie
DATE: 3-17-97		REVISED

DESIGN AND DRAWING BY ERNIE LEDBETTER
CAKRIDGE RANGER DIST. WILLAMETTE N.F.

DRAWING NUMBER 3 OF 4



THIS DRAWING ILLUSTRATES THE WATER SUPPY AND DRAIN SYSTEMS OF BOX AND CLEAR ACRYLIC TUB

SCALE: 1/8" = 1"	APPROVED BY:	DRAWN BY Ernie
DATE: 3-17-97		REVISED

DESIGN AND DRAWING BY ERNIE LEDBETTER
OAKRIDGE RANGER DISTRICT WILLAMETTE N.F.

DRAWING NUMBER 4 OF 4

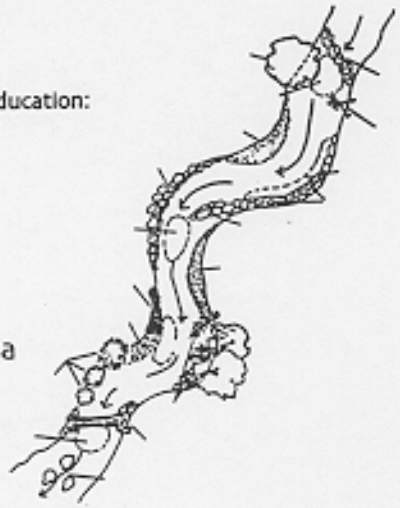
TEACHER PACKET

FISH HOME IMPROVEMENT

This activity was adapted from:

The Stream Scene
Watersheds, Wildlife and People
by Patty (Farthing) Bowers et al
Oregon Department of Fish and Wildlife
1990

For more information, contact Information and Education:
Oregon Department of Fish and Wildlife
P.O. Box 59
Portland, OR 97207



Key Concepts

- Salmonids need certain habitat components to live in a stream.
- Structures in and near streams have benefits for fish.

Teaching Information

Students should read the background material provided in the activity, analyze the stream diagram and describe how each item noted develops or provides suitable fish habitat. This activity fosters ideal small group work.

Once students have completed the activity, visit an actual stream where they can identify the stream components used in the activity. Since most hatcheries have streams on or next to the hatchery grounds, this could be done during the hatchery visit.

Materials

Copies of student sheets (Home Wet Home...)

A. Streamside Vegetation
Provides cover in addition to shade for temperature regulation. In autumn, leaves drop into stream and eventually provide food for invertebrates that are eaten by fish.

B. Rock Berm
Slows the water, traps gravel for spawning , and creates pools.

C. Root Wad
Provides shade, cover, and resting areas, and produces spot scouring.

D. Cover Logs
Provides shade, cover, and resting areas, and produces spot scouring.

E. Rip Rap (rocks or vegetation)
Protects banks from erosion.

F. Rock Wing Deflector
Redirects water flow, causes gravel deposition, and creates pools or pocket water and resting areas.

G. Shade Plantings
Provides shade for water temperature regulation and food for invertebrates when leaves fall.

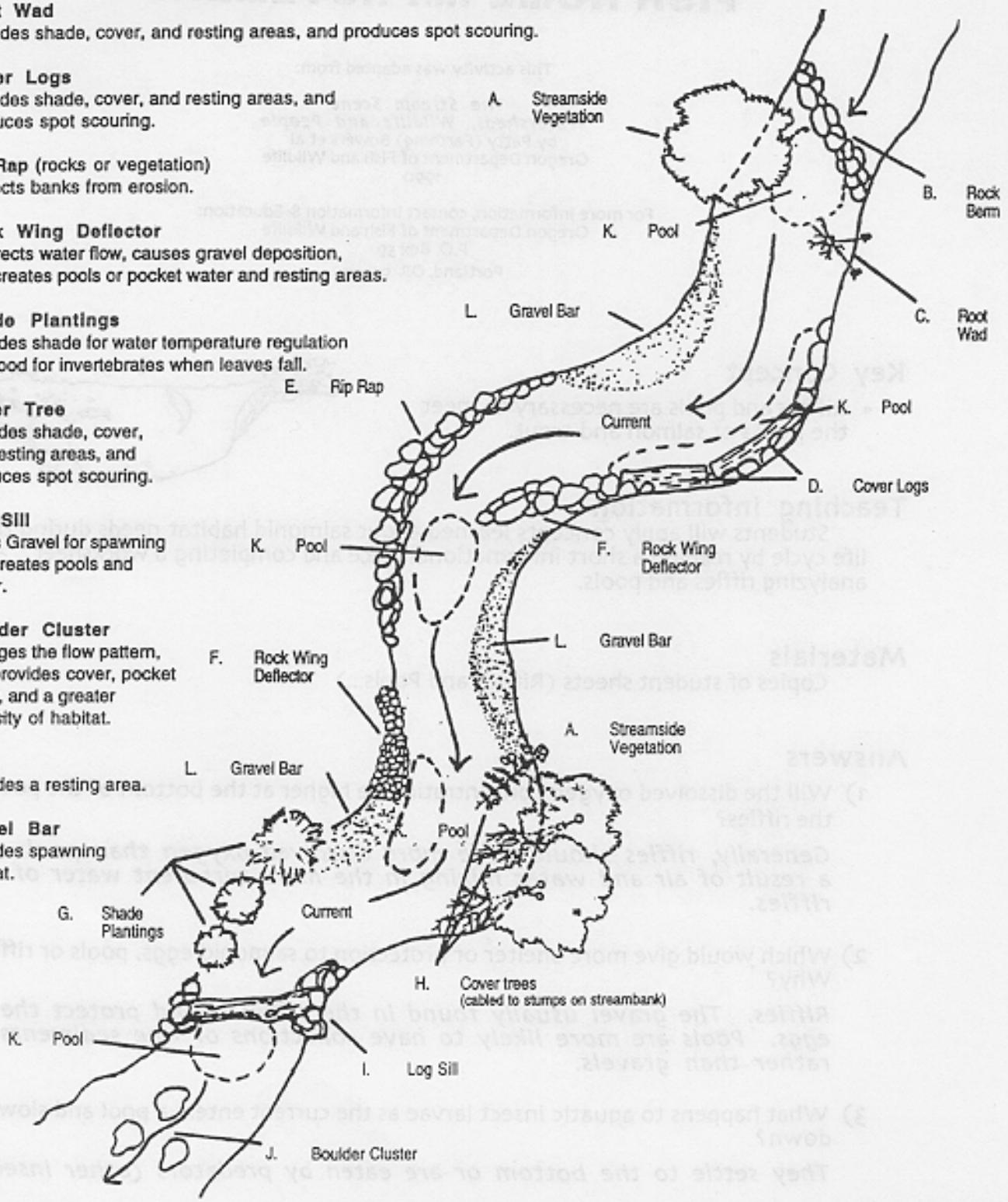
H. Cover Tree
Provides shade, cover, and resting areas, and produces spot scouring.

I. Log Sill
Traps Gravel for spawning and creates pools and cover.

J. Boulder Cluster
Changes the flow pattern, and provides cover, pocket water, and a greater diversity of habitat.

K. Pool
Provides a resting area.

L. Gravel Bar
Provides spawning habitat.



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Portland, OR 97207

Key Concept

- Riffles and pools are necessary to meet the needs of salmon and trout.

Teaching Information

Students will apply concepts learned about salmonid habitat needs during their life cycle by reading a short informational piece and completing a worksheet *analyzing riffles and pools.*

Materials

Copies of student sheets (Riffles and Pools...)

Answers

1) Will the dissolved oxygen concentration be higher at the bottom of the pools or the riffles?

   Generally, riffles should have more dissolved oxygen than pools, as a result of air and water mixing in the more turbulent water of the riffles.

2) Which would give more shelter or protection to salmonid eggs, pools or riffles? Why?

   Riffles. The gravel usually found in the riffles would protect the eggs. Pools are more likely to have collections of fine sediments rather than gravels.

3) What happens to aquatic insect larvae as the current enters a pool and slows down?

   They settle to the bottom or are eaten by predators (other insects

or fish).

4) Where would be the best place for salmonid fry to wait for lunch? Why?

At the head of a pool or tail of a riffle. To be first in line for drifting insects.

5) Where would salmonid fry use the most energy catching food? Why?

On the riffles. It is harder to maintain position in the faster water of a riffle.

6) Chum salmon fry only spend as much time in the stream as it takes to get to the ocean (one day to three weeks). Coho salmon juveniles live for a year in the stream before heading to the ocean. Steelhead and sea-run cutthroat juveniles live up to three years in the stream before heading to the ocean. If a stream has good spawning habitat but not much rearing habitat, will it be more likely to support chum or coho salmon fry? Why?

Chum. Because chum salmon fry immediately begin moving toward the sea; they do not need extensive rearing habitat in the stream.

7) If a stream has both spawning and rearing habitat, which salmonid species might it support? Why?

Both. Coho salmon fry could live there because of the availability of rearing habitat.

STUDENT WORKBOOK PAGES

FISH HOME IMPROVEMENT

Do you know...

Salmon and trout (salmonids) are important to anglers. Salmonids are also important to biologists because their presence helps indicate the health of the stream in which they live. Salmonids are one of the first organisms to be affected if their watery home starts to change or if their habitat is unsuitable. Biologists refer to sensitive animals like salmonids as "indicator" species.

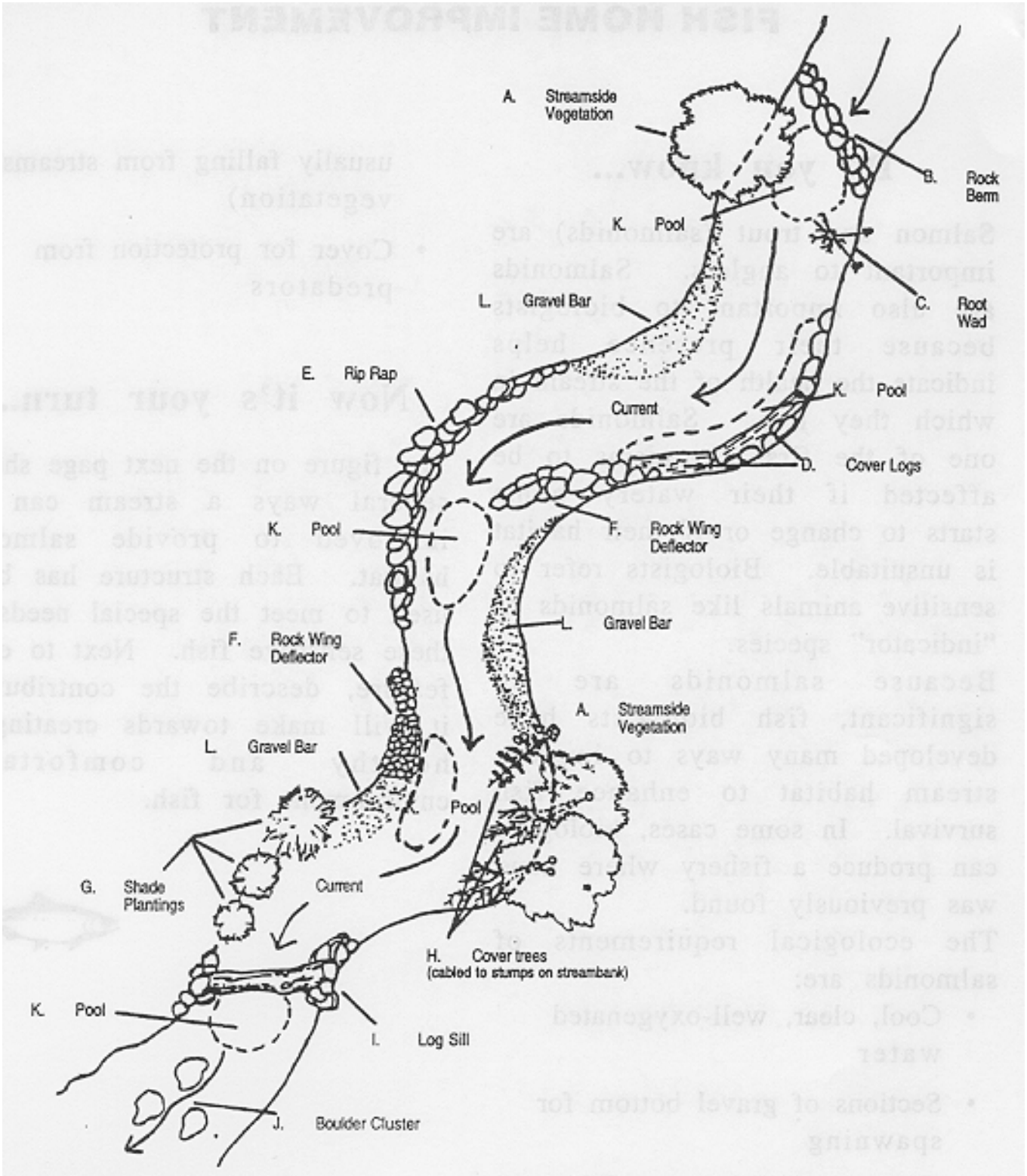
Because salmonids are so significant, fish biologists have developed many ways to improve stream habitat to enhance fish survival. In some cases, biologists can produce a fishery where none was previously found.

The ecological requirements of salmonids are:

- Cool, clear, well-oxygenated water
- Sections of gravel bottom for spawning
- Occasional pools for feeding and resting
- Adequate food (aquatic and terrestrial insects, the latter usually falling from streamside vegetation)
- Cover for protection from predators

Now it's your turn...

The figure on the next page shows several ways a stream can be improved to provide salmonid habitat. Each structure has been used to meet the special needs of these sensitive fish. Next to each feature, describe the contribution it will make towards creating a healthy and comfortable environment for fish.


A. Streamside Vegetation
B. Rock Berm
K. Pool
L. Gravel Bar
C. Root Wad
E. Rip Rap
Current
K. Pool
D. Cover Logs
K. Pool
F. Rock Wing Deflector
L. Gravel Bar
F. Rock Wing Deflector
A. Streamside Vegetation
L. Gravel Bar
Pool
G. Shade Plantings
Current
H. Cover trees
(cabled to stumps on streambank)
K. Pool
I. Log Sill
J. Boulder Cluster

FISH HOME IMPROVEMENT QUESTIONS

- Look carefully at the drawings.
- Answer the questions based on your own experience and the introductory information in this exercise.

1. Will the dissolved oxygen concentration be higher at the bottom of the pools or the riffles?

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_____

_____

_____

2. Which would give more shelter or protection to salmonid eggs, pools or riffles? Why?

_____

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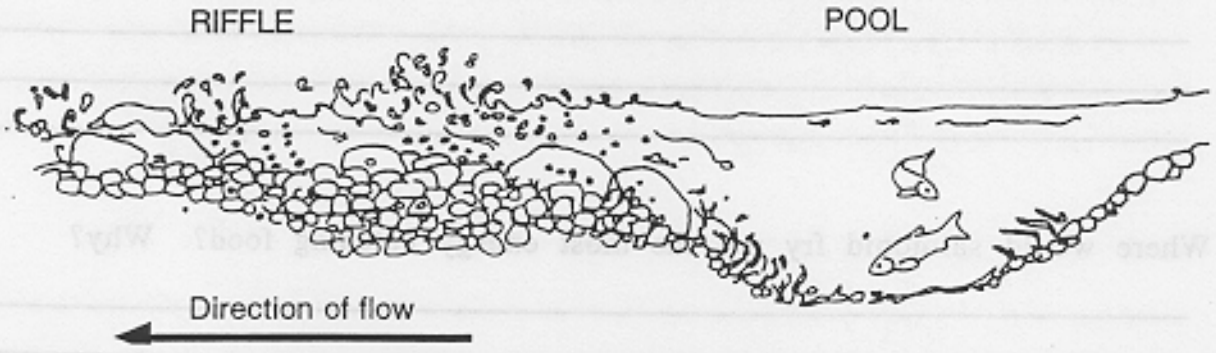
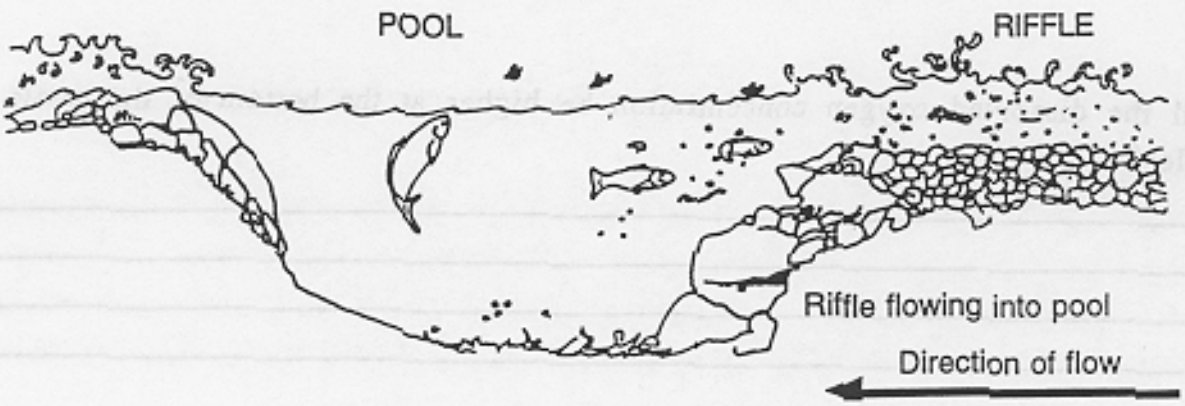
Refer to this diagram as you answer questions 1 & 2.



Refer to this diagram as you answer questions 3 - 5.



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