

Name _____

DELTA DISCOVERY VOYAGE



WATER PATROL

ACTIVITY BOOK

The more you know about water – where it comes from and where it goes – the more you can wisely use and conserve this important resource.



Delta Discovery Voyage

The Dish on the Delta

Flowing south, the mighty Sacramento River meets the north-bound San Joaquin River just south of Sacramento in an area called the Delta. Here the two rivers mingle with smaller tributaries to form a maze of waterways surrounding many islands. The rivers' fresh water rolls west through a narrow break in the Coast Range and meets salt water of the San Francisco Bay. The Bay-Delta Estuary is the largest estuary on the West Coast of North America, where the mix of fresh and salt water provides an environment that supports many types of plants and animals.

Originally, the marshy lands of the Delta were a haven for trappers due to the abundant

wildlife. After gold was discovered in California, farmers started planting in the fertile soil of the Delta to provide food to the miners. These farmers began building levees to drain the marshy land. The drained areas were transformed into productive island farms. The Delta farms are still important today.

Water from the Delta is pumped and transported throughout the State. Canals and aqueducts take water from the Delta to cities around the Bay Area, to millions of acres of farmland in the San Joaquin Valley and to 15 million people in southern California.

The Delta is also the state's most important fish habitat.



Millions of people rely on the Delta for drinking water

However the populations of many native species of fish have declined. Many things could be contributing to the decline including drought, poor water quality, water diversions and the presence of non-native species that compete for food. * ■

Wanted

Definitions for the following:

Acre-foot	Ichthyology
Adaptation	Invertebrate
Bacteria	Levee
Bay	Mercury
Benthos	Microscopic
Bioaccumulation	Native Species
Biodegradable	Nutrient
Conservation	Photosynthesis
Decomposer	Plankton
Delta	Pollution
Density	Potable
Detritus	Producer
Effluent	Recycled Water
Environment	Salinity
Ecology	Salt Water
Endangered	Scavenger
Estuary	Tides
Filter Feeder	Vertebrate
Food Chain	Wastewater
Food Web	Water Cycle
Fresh Water	Watershed
Habitat	Wetlands
Hydrology	

Students Seek Truth

This year fifth grade students from across Contra Costa County will embark upon a journey to discover the truth about the Sacramento-San Joaquin Delta.

They plan a period of intense classroom study, combined with an exciting field trip aboard the Research Vessel Brownlee, to determine how they can be good stewards of the Delta environment.

They will discover how people depend upon the Delta for drinking water, farming, industry, and recreation and how fish and wildlife need a healthy Delta to survive.

Student Ian Quizative remarked: "The future of the Delta will be in our hands. As students, we need to find out what threats face the Delta, and also what we can do to help." ■



Word Roots Alluvial and Delta

A delta is the place where rivers fan-out just before emptying into the sea. Technically, deltas are called "alluvial fans." Alluvial comes from the Latin word "Alluere," meaning "to wash against." Alluvial fans have been made of land that has been deposited or left by water. The Greeks coined the word "delta" because the fan-like shape reminded them of the triangular shape of the letter they called "delta," which became our letter "D."

Does anyone in your class know the Spanish noun for rain? If so, do you see any similarities to the word "alluvial"? ** ■

No New Water!!

Studies of the world's water have concluded there is no new water for the world's growing population. Evidently the same water has been getting used over and over for millions of years.

An expert in the field, Dr. H. Tuoh, said: "My research indicates that if it wasn't for the water cycle we would really be out of luck. We have got to do better with the limited fresh water we have on the earth." ■

* Water Education Foundation, "Layperson's Guide to the Delta"

** Metropolitan Water District of Southern California, "Water Times"

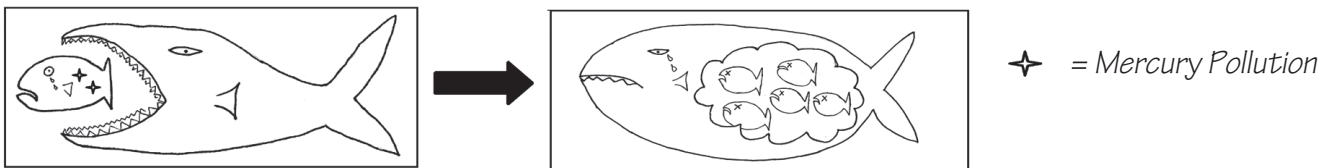
2 Mercury & Pollution

Bioaccumulation & Biomagnification



Pollutants, like mercury, are released into the Delta from industry and household chemicals. **Plants and animals living in contaminated areas absorb mercury simply by being around it!** Having toxins, like mercury, in their bodies can make having healthy babies, catching food, and even moving, difficult!

Biomagnification: From the Food Chain



When animals who have absorbed toxins from their environment (bioaccumulation) are eaten by predators, the predators may then absorb some of the toxins from their prey. **The mercury is passed from prey to predator.** Often, large, “top” predators have very high levels of mercury because as it is passed along the food chain, mercury concentrates in the top predators’ bodies. These levels can be dangerous to their health. Can you name any fish that are “top” predators that you might eat?

How can you help? By taking chemicals to the Household Hazardous Waste Collection Facility we can keep toxins OUT of the Delta’s wildlife, and out of you!

Bio-Math: Striped Bass & Mercury

If a striped bass is 12 years old and has a concentration of 0.9 ppm (parts per million) of mercury in its blood, how much mercury (in ppm) has it been absorbing yearly, on average?

1		÷		=		ppm of mercury per year
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Using your answer from #1, how many years does it take for a striped bass to reach 0.45 ppm of mercury in its blood?

2	ppm of mercury per year	X	_____ years	=		0.45 ppm of mercury in its blood
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If each plankton a striped bass eats has absorbed 4 units of mercury from its habitat, and the bass loses half (or 0.5) of the mercury it eats back into the habitat, how many plankton does it have to eat before it has 600 mercury units in its body? 256 mercury units? 50 units?

3	4 units of mercury	X	1/2 or 0.5 mercury lost	X	_____ number of plankton	=		600 mercury units in its body
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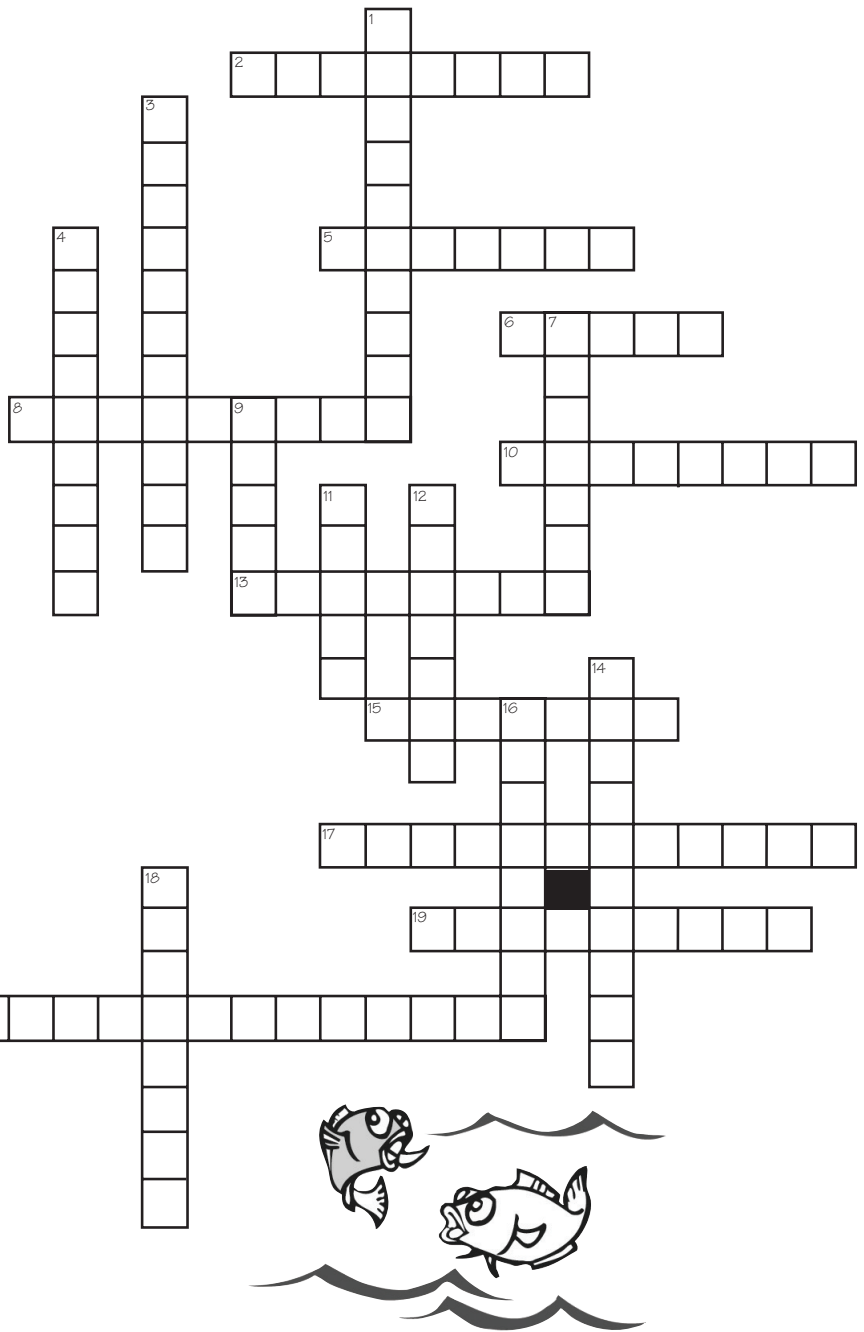
3 Delta Discovery Crossword

Across

2. An organism that makes food (green plants are an example).
5. Area in which an organism normally lives.
6. An embankment built to prevent a river from overflowing.
8. Harmful impact on the environment resulting from human activities.
10. Drifting aquatic animals and plants.
13. The amount of salt in the water.
15. Organisms in an ecosystem, shows who eats whom.
17. An animal lacking a true backbone.
19. Where the water falling to earth drains into a common source.
20. The process by which plants make food.

Down

1. Modification of an organism in order to survive in its habitat.
3. The study of fish.
4. The study of water.
7. The study of relationships between organisms and their environment.
9. Rising and falling of seas.
11. Where the Sacramento and San Joaquin join.
12. The bottom dwelling community.
14. An animal with a backbone.
16. Dead plant and animal material, and the bacteria decomposing them.
18. An organism that eats plants and/or animals.



Try these vocabulary words:

Adaptation
Benthos
Consumer
Delta
Detritus
Ecology

Food Web
Hydrology
Habitat
Ichthyology
Invertebrate
Levee

Photosynthesis
Plankton
Pollution
Producer
Salinity
Tides

Vertebrate
Watershed

4 Water Sources

Our Water is A-mazing!

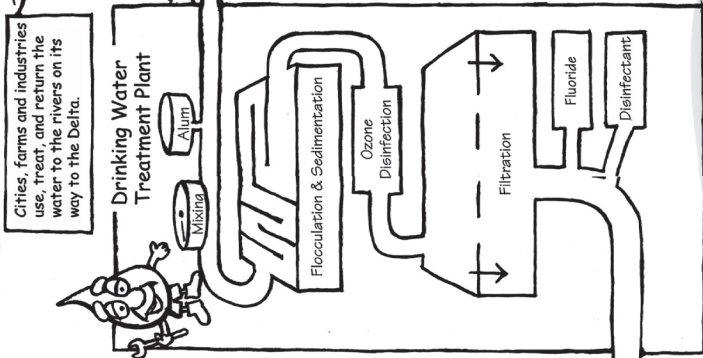
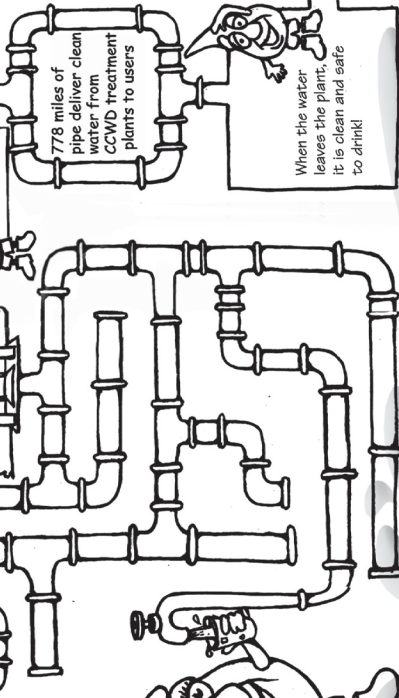


Water is essential for all living things.

Lawns and plants use a lot of water.

More water is used in the bathroom than any other room in our home!

Water... what would we do without it!



Cities, farms and industries use, treat, and return the water to the rivers on its way to the Delta.

Water flows down the 43-mile Contra Costa Canal to water treatment plants.

Fresh water is stored in the reservoir to mix with Delta water when Delta salinity is high.

Water is pumped from the Delta to the Los Vaqueros Reservoir or down the canal to the treatment plants.

Pumps push the water up to the reservoir.

CONTRA COSTA WATER DISTRICT

The two largest rivers in California, the Sacramento and the San Joaquin, bring water into the Delta.

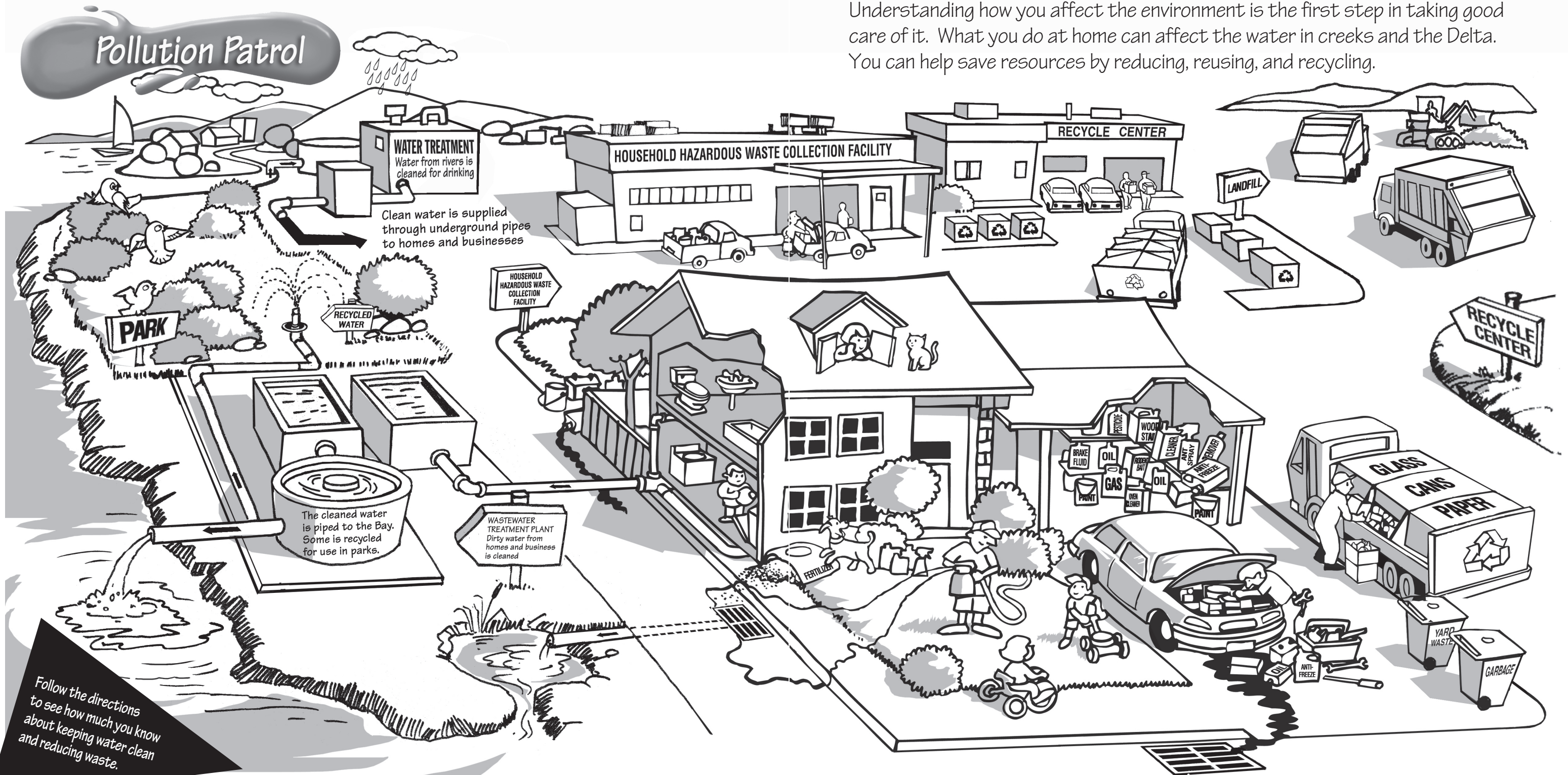
California Water Facts:

- Water is the only substance on earth that naturally occurs in all three states of matter (solid, liquid, and gas)
- There is no "new" water - the same water continuously goes through the water cycle (evaporation, transpiration, condensation, and precipitation.)
- Although the Delta comprises just 1% of California's total area, 40% of the state is in the Sacramento - San Joaquin River Delta watershed.
- 2/3 of all Californians depend upon the Delta for at least part of their water supply.
- The population of California continues to grow, but the amount of available fresh water remains the same. Cities, farmers, industry, and the environment all depend upon this limited supply.

There are some great websites on the Internet where you can find out more about your water and the environment. Here are a few suggestions:
 Contra Costa Water District: www.ccwater.com/education (look at the online resources and water related links)
 Central Contra Costa Sanitary District: www.centralsan.org
 United States Geologic Society: <http://ga.water.usgs.gov/edu>
 Delta Diablo Sanitation District: www.DDSD.org
 Environmental Protection Agency: www.epa.gov/water/kids.html

Pollution Patrol

Understanding how you affect the environment is the first step in taking good care of it. What you do at home can affect the water in creeks and the Delta. You can help save resources by reducing, reusing, and recycling.



1 Where does your water go?
Draw a line to follow the path of dirty water from the house to the treatment plant. Then draw a line to follow the path of clean water to the Bay.

2 Find and circle 4 places where water could be polluted with oil or chemicals that might harm our creeks, the Delta, or the Bay.

3 Find and list 3 things that can be hazardous waste if not used up or disposed of properly.

4 Find and mark an X on the place where you can take leftover paint, oil, fluorescent lights, or other household wastes to be recycled, reused, or disposed of safely.

5 Draw a drop of water where:
• water is being wasted
• water is being reused

6 Water Info

Delta Math

1. $\frac{2}{3}$ of California's population gets at least part of their water from the Sacramento-San Joaquin Delta. The population of California is nearly 40 million. How many Californians depend upon water from the Delta?

2. California is a large state and covers 156,000 square miles. 62,400 square miles of California is in the Sacramento-San Joaquin Delta Watershed, meaning rain and melting snow drains into the Delta. What percentage of California is within the Delta Watershed?

3. Although the Delta watershed is quite large, the Delta itself is only 1% of California's total land area. How many square miles does the Delta cover?

One Small Way You Can Make A Big Difference



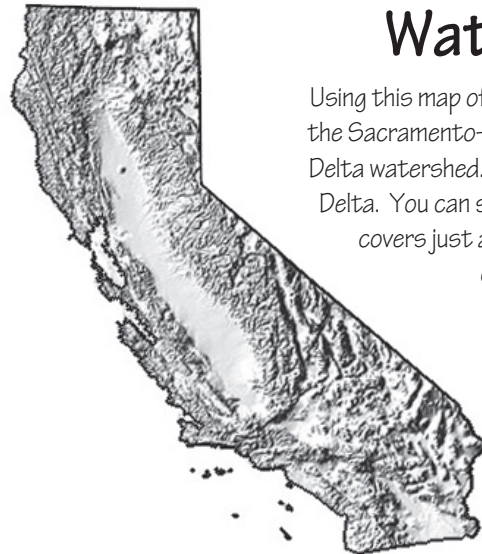
Have you ever seen a sign like this stenciled onto the ground

near a storm drain on a street?

Storm drains are designed to take storm run-off back to local creeks and then out to the Delta. Water that goes down the storm drain does not get treated before it ends up in the creeks, streams and Delta. Anything that gets washed into the storm drain also ends up in the Delta.

Here are some simple ways you and your family can help keep the Delta clean:

- Dispose of household waste properly.
- Clean up after your pets.
- Use yard chemicals like fertilizer and pesticides sparingly.
- Move vehicles for street sweeping.



Watershed

Using this map of California, outline the Sacramento-San Joaquin River Delta watershed. Put a star on the Delta. You can see that the Delta covers just a small part of the overall watershed.

A Few Questions for Discussion

1. You know that water on earth is naturally recycled. This process is called the water cycle. Discuss what would be different about the earth if there was no natural water cycle.
2. Describe how snow in the mountains ends up as the water we drink in our homes.
3. What is meant by the saying "Everyone lives downstream from somebody else" - Why is that important to us?

7 Water Wise Word Search

There are 25 words about keeping water clean hidden in this word puzzle. Words may be written up and down, or from left to right.

Can you find and circle the following 25 hidden words?



- Bacteria
- Bay
- Biodegradable
- Central San
- Conserve
- Delta Diablo
- Environment
- Estuary
- Filter
- Hazardous
- Mercury
- Pollution
- Protect
- Recycle
- Reuse
- River
- Sewer
- Sludge
- Storm drain
- Test
- Toxic
- Treatment
- Wastewater
- Water District
- Watershed

8 Pre-Trip Quiz Delta Discovery Voyage

1. What two major California rivers form the Delta?

2. The water in the Delta is saltier in the fall than in the spring. Why do you think this is?

How is the Delta important to:

3. People who live in cities?

4. Fish and wildlife?

5. Farmers?

6. Name some recreational activities people do in the Delta.
Unscramble these words:

fghnisi

bingoat

mmingsiw

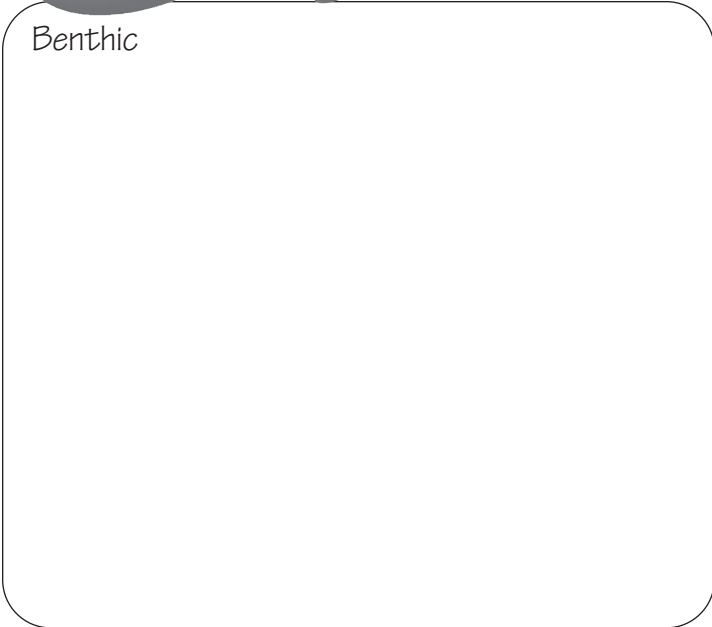
True or False

- ___ 7. Most of the water in the Delta originates as snow in the Sierra Nevada Mountains.
- ___ 8. When it rains, the water that drains off my driveway and into the street is cleaned of pollution and chemicals before it empties into the Delta.
- ___ 9. The water we drink has never been used before.
- ___ 10. I can make a difference in the quality of water we drink and in the quality of water available for fish and other wildlife.
- ___ 11. The water we drink has never been used before.
- ___ 12. I can make a difference in the quality of water we drink and in quality of water available for fish and other wildlife.
- ___ 13. The water we drink has never been used before.

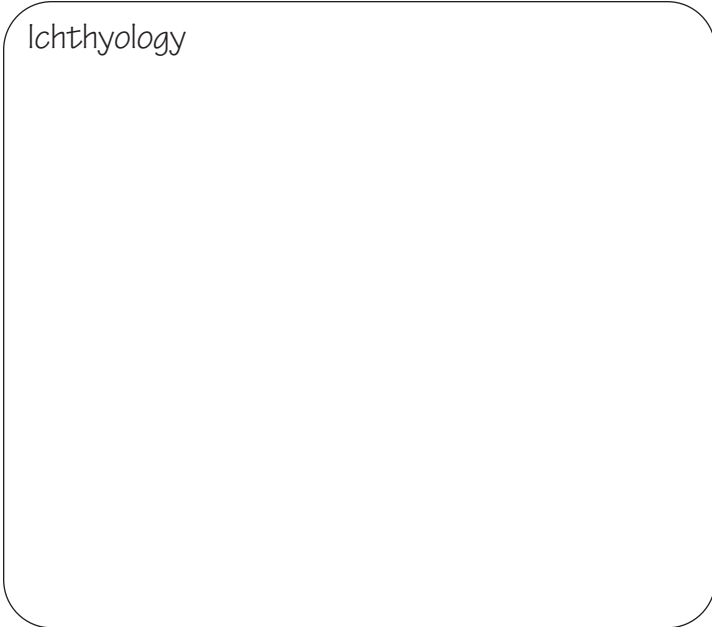
9 Post-Trip Report

Draw and describe what you did at each station aboard the R/V Brownlee

Benthic



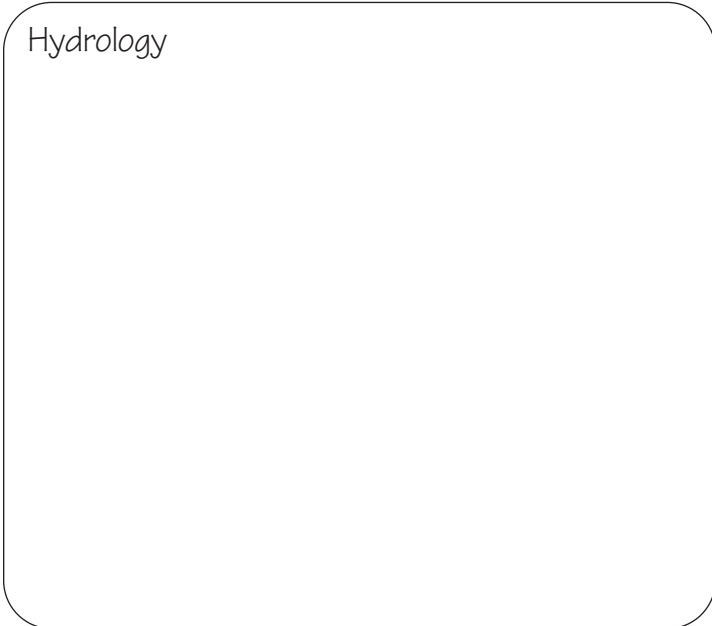
Ichthyology



Plankton



Hydrology



What 3 things will you share with your family and friends about this trip?

What did you like most about this trip?

Drain Detectives

Dear Parent: Please help your child complete this survey to identify products in your home that can contribute to water pollution.



1) Check off any of the household hazardous wastes (HHW) that you have at home.

2) Carefully store leftover products for a trip to the HHW Collection Facility (see below).

3) Remember to recycle used motor oil by taking it to the HHW Collection Facility.



Household Products

- Batteries
- Fluorescent bulbs & compact fluorescent lights (CFLs)
- Bleach, ammonia, cleaners
- Furniture polishes



Personal Care Products

- Mercury fever thermometers
- Fingernail polish & remover
- Hair care, perfumes & colognes



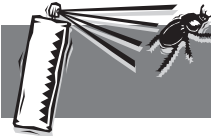
Automotive Products

- Motor oil, gasoline, antifreeze
- Brake & transmission fluid
- Car batteries



Paint Products

- Latex & oil-based paints
- Wood stain & varnishes
- Paint remover/paint thinner & solvents



Garden and pest-control products

- Pesticides, herbicides, fertilizers



Miscellaneous

- Cooking oils & grease (large quantities, as from a turkey fryer)
- Chemicals

Other products labeled with caution, danger, poison, toxic, etc. What did you find?

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

Free HHW Collection Facilities

Central County

Location

Central Contra Costa Sanitary District
4797 Imhoff Place
Martinez, CA 94553

Hours

Monday - Saturday, 9 a.m. - 4 p.m.
Call for Holiday closures

Call 1-800-646-1431
www.centrialsan.org

Communities eligible to use the HHW facility include: Alamo, Clayton, Clyde, Concord, Danville, Lafayette, Martinez, Moraga, Orinda, Pacheco, Pleasant Hill, San Ramon, Walnut Creek, and other unincorporated central county areas.



East County*

*Also includes e-waste & sharps

Location

Delta Diablo
2550 Pittsburg-Antioch Hwy,
Pittsburg, CA 94509
(between Loveridge & Somersville)

Hours

Thursday - Saturday, 9 a.m. - 4 p.m.
Call for Holiday closures

Call 925-756-1990
www.ddsd.org

Antioch, Bay Point, Bethel Island, Brentwood Byron, Discovery Bay, Knightsen, Oakley and Pittsburg.

Pharmaceutical Disposal

CCCSD's HHW Collection Facility does not accept pharmaceuticals. For a list of locations for free, safe disposal, go to www.centrialsan.org and click on the link in the bottom right corner.