

# Bottled Water and The Environment



## Outcomes of Lecture:

You are consumers so you make decisions with your money.

Bottled water makes a lot of money for big business.

Oil and Water Do Mix!! The Hydrocarbon Footprint....

Manufacturing of plastic bottles uses lots of oil and water.

Bottled water uses oil and water to distribute, recycle or throw away.



# Park Record Park City, Utah

## Oakley water 'special'

By Patrick Parkinson  
Of the Record staff

Todd Jarvis, your host and a Senior Researcher in Water Resources at the Institute for Water and Watersheds at Oregon State University was one of the hydrologists for Oakley while this well was drilled. He sampled the well for age dating and prepared the Sole Source Aquifer Petition to EPA for Oakley to protect the aquifer.

Saturday, March 20, 2004 - A Park City water company will soon be bottling water from a spring in Oakley for sale to exclusive restaurants nationwide. Robert Sasser, a proprietor of Wasatch Ice Water Company, said based on carbon dating, the water is more than **21,000 years old**.

"It's a completely protected aquifer, which is very, very unusual, Sasser said. Oakley residents often call the water "dinosaur water" or "the springs of eternal life, Sasser said. "There's no contaminants of any kind in the water, he said, adding that the water was discovered nearly 2,000 feet underground. Sasser said when marketed commercially, the Oakley water would be "**the most expensive water in the United States.**"

# Bottled Water in U.S.

- 💧 Americans shell out more than \$20,000 "every minute of every day" or up to 60 cents for a glass of bottled water\*
- 💧 1978 Consumption = 415 Million Gallons\*\*
- 💧 2006 Consumption = 8.2 Billion Gallons\*\*\*
- 💧 For comparison, Worldwide Consumption = 41 Billion Gallons\*\*\*

\*\* Water Follies (2002)

\*\*\* Beverage Marketing Corporation

U.S. BOTTLED WATER MARKET  
Per Capita Consumption  
2001 - 2005

<u>Year</u>	<u>Gallons Per Capita</u>	<u>Annual % Change</u>
2001	18.7	--
2002	20.7	10.8%
2003	22.1	7.0%
2004	23.8	7.6%
2005	26.1	9.6%

Source: Beverage Marketing Corporation

# Why Drink Bottled Water?



[www.toothpastefordinner.com](http://www.toothpastefordinner.com)

# Bottled Water is Big Business

REVENUES (2006)

\$10.8 Billion in US

\$47.5 to \$100  
Billion Worldwide

(Beverage Marketing Corp.  
World Water Forum 2006)

U.S. BOTTLED WATER MARKET  
Volume and Producer Revenues  
2001 - 2005

<u>Year</u>	<u>Millions of Gallons</u>	<u>Annual % Change</u>	<u>Millions of Dollars</u>	<u>Annual % Change</u>
2001	5,185.3	--	\$6,880.6	--
2002	5,795.7	11.8%	\$7,901.4	14.8%
2003	6,269.8	8.2%	\$8,526.4	7.9%
2004	6,806.7	8.6%	\$9,169.5	7.5%
2005	7,537.1	10.7%	\$10,012.5	9.2%

Source: Beverage Marketing Corporation


In 2002, bottled water corporations spent \$93.8 million for advertising.  
(Boston Globe, September 25, 2005)

# Who Are The Players?

- ◆ 700 brands are sold in the United States
- ◆ Aquafina = PepsiCo (\$1.3B)
- ◆ Dasani = Coca-Cola (\$1B)
- ◆ Deja Blue = Dr. Pepper/SevenUp
- ◆ Nestle = Perrier and 72 brands in 160 countries (\$3.1B)
- ◆ Dannon = Visit one of their plants at Mt. Shasta!

# Who Is Perrier?

**“Perrier” = 32% of U.S Market**

- 💧 **Arrowhead**
  - 💧 **Calistoga (Spring & Mineral)**
  - 💧 **Poland Spring**
  - 💧 **Ozarka**
  - 💧 **Ice Mountain**
  - 💧 **Deer Park**
  - 💧 **Perrier (Mineral Water)**
- 

# Who is Dannon?

**No. 2 worldwide in bottled water**

- ◆ **Evian (marketed by Coca-Cola in US & Canada)**
- ◆ **Volvic (Mineral Water)**
- ◆ **Dannon Natural Spring Water (from Mt. Shasta)**
- ◆ **Pure American**
- ◆ **Enon Springs**
- ◆ **Alhambra Junior Sport Drinking Water**
- ◆ **Sparkletts Junior Sport Drinking Water**

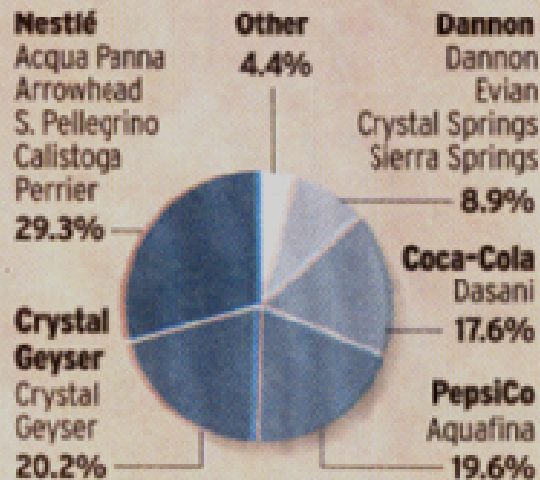




# Who Dominates Market In Oregon?

## 2003 MARKET SHARE

The Sweetwater Co., which sells EarthH<sub>2</sub>O bottled water, has lost Oregon grocery-store market share to Coca-Cola, PepsiCo, Nestlé and Crystal Geyser. Here is a list of the competitors' brands, along with a breakdown of market share last year.



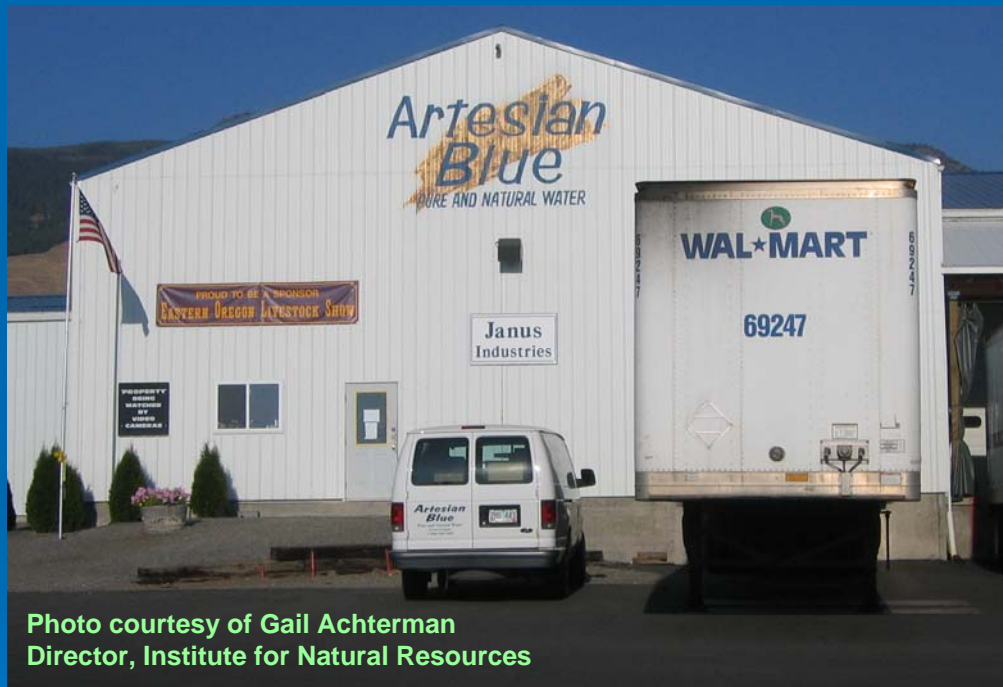
Source: The Sweetwater Co.

TED MITCHNER/THE OREGONIAN

**Nestle = 29%**  
**Crystal Geyser = 20%**  
**Pepsi = 20%**  
**Coca-Cola = 18%**

**Others = EarthH<sub>2</sub>O and other smaller bottlers who are our neighbors = 4%**

# Who Gets Their Bottled Water From Oregon Sources?

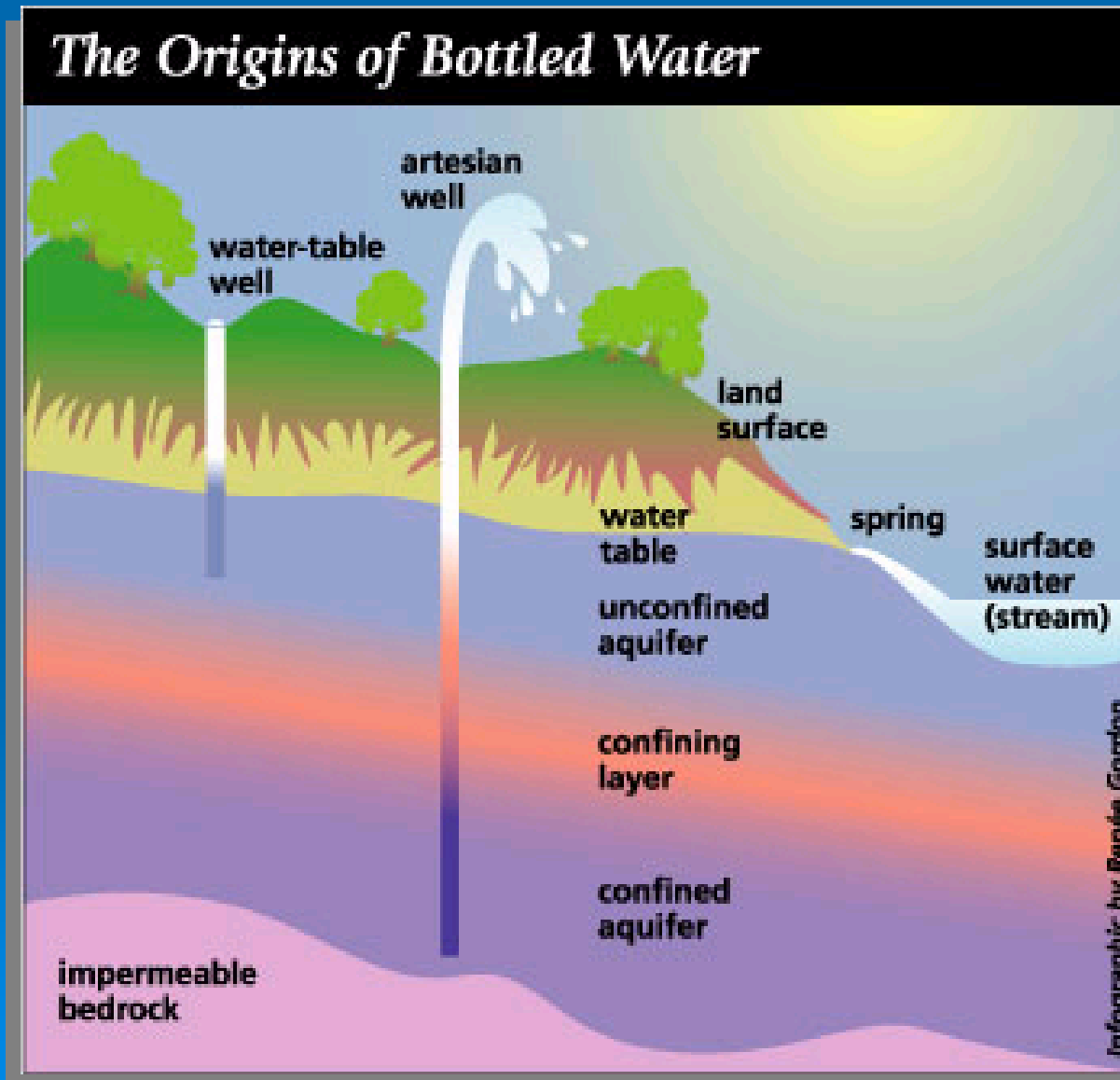


Wal-Mart Brand of Bottled Water is from an artesian well in Cove, Oregon. Where is Cove? It is about 10 miles east of LaGrande.

# Types of Bottled Water

- ◆ **Artesian Water/Artesian Well Water** - Water from a well that taps an aquifer in which the water level stands at some height above the top of the aquifer. **Not as valuable as Spring Water, but may be the same water.**
- ◆ **Drinking Water** - Water that is bottled sanitarily without added sweeteners or chemical additives. Flavors, extracts, or essences may be added.
- ◆ **Mineral Water** - Water containing no less than 250 parts per million total dissolved solids. Many times from a geothermal well or spring.
- ◆ **Purified Water** - Water from which all minerals and any other solids have been removed. May also be called distilled, deionized, or reverse osmosis.
- ◆ **Sparkling Water** - Water that after treatment, and possible replacement with carbon dioxide, contains the same amount of carbon dioxide that it had as it emerged from the source.
- ◆ **Spring Water** - Water derived from an underground formation from which water flows naturally to the surface of the earth. **It must be collected only at the spring or through a bore hole tapping the underground formation.**
- ◆ **Well Water** - Water from a hole drilled in the ground which taps the water of an aquifer.

# Sources of Bottled Water



# Bottled Water vs. Tap Water

- ◆ Bottled water is **a lot** more expensive than tap water.
- ◆ Let's go shopping and find out how much it costs:
- ◆ Corvallis Tap Water = \$0.03 to \$0.05 per gallon
- ◆ Brita Filter Pitcher (\$25.00) and filter (\$8.00) = the filter alone gets us to \$0.10 to \$0.12 /gal.
- ◆ Vending Machine (BYOB): \$0.30 to \$0.40/gal
- ◆ Bulk water (No Fancy Bottle): Treated Portland Water (\$0.68/gal); Unknown Spring (\$0.78/gal)
- ◆ Bottled Waters:       Mt. Shasta = \$2.56/gal to  
                                  Perrier = \$5.03/gal  
                                  Park City "Ice" Water = \$18.00/gal
- ◆ About **one-fourth** of bottled water is treated tap water.  
    Aquafina = \$3.77/gal  
    Dasani = \$3.38/gal

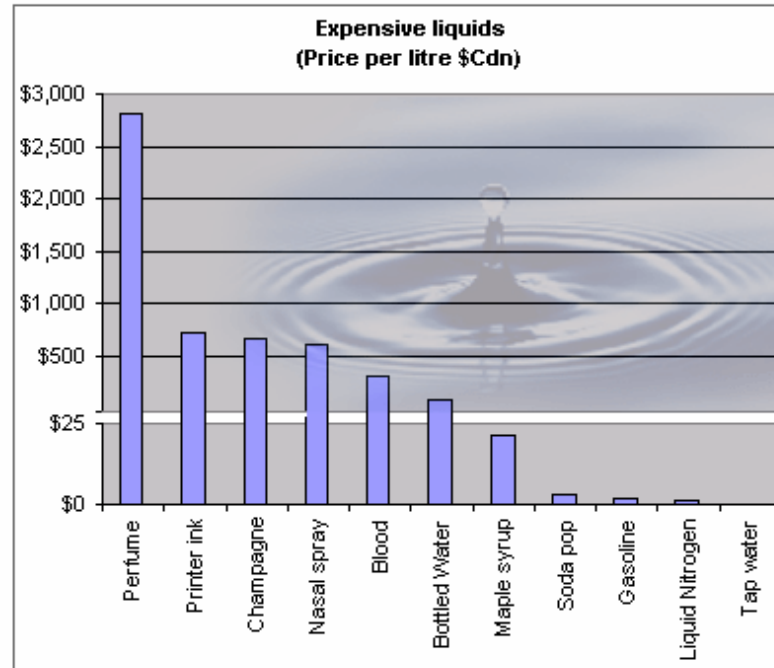
Retail outlets charge upwards of \$50,000 for shelf space, and make about 50% of the profits.

# Bottled Water vs. Other Liquids

CBCnews

IN DEPTH

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Perfume: Chanel No. 5; Bottled Water: at expensive bar; Gasoline: Canadian average as of May 1, 2007 (Various sources)

IN DEPTH  
Consumers

## Going with the flow

The most expensive liquids

Last Updated May 14, 2007

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# Bottled Water Regulations

- ◆ Bottled water, unlike tap water provided by a utility, is considered a **food**. The U.S. Food and Drug Administration (FDA) regulates bottled water.
- ◆ EPA is responsible for the safety of drinking water from public water systems through SDWA.

(Joe Gelt, Arroyo, 1996; IBWA, 2003)

The bottom right portion of the slide features several concentric, light blue circular ripples that resemble water droplets hitting a surface, set against the dark blue background.

# Corvallis Water & SDWA

## The following substances were tested for but not detected:

### Synthetic Organic Chemicals

2,4-D  
2,4,5-TP (Silvex)  
Bis (2-ethylhexyl) adipate  
Alachlor (Lasso)  
Atrazine  
Benzo(a)pyrene  
BHX-gamma Lindane  
Carbofuran  
Chlordane  
Dalapon  
Dibromochloropropane (DBCP)  
Dinoseb  
Dioxin<sup>3</sup>  
Diquat  
Endothall  
Endrin  
Ethylene dibromide (EDB)  
Glyphosate  
Heptachlor epoxide  
Heptachlor  
Hexachlorobenzene  
Hexachlorocyclopentadiene  
Methoxychlor  
Pentachlorophenol  
Bis (2-ethylhexyl) phthalate  
Picloram  
Polychlorinatedbiphenyls-PCBs  
Simazine  
Toxaphene  
Vydate (Oxamyl)  
3-Hydroxycarbofuran  
Aldicarb

Aldicarb sulfoxide  
Aldicarb sulfone  
Aldrin  
Butachlor  
Carbaryl  
Dicamba  
Dieldrin  
Methomyl  
Metolachlor  
Metribuzin  
Propachlor  
Perchlorate  
DCPA-mono+di acid  
Methyl-tert butyl ether (MTBE)  
Nitrobenzene  
2,4-Dinitrotoluene  
2,6-Dinitrotoluene  
Acetochlor  
4,4'-DDE  
EPTC  
Molinate  
Terbacil

### Volatile Organic Chemicals

1,1-Dichloroethylene  
1,1,1-Trichloroethane  
1,1,2-Trichloroethane  
1,2-Dichloroethane  
1,2-Dichloropropane  
1,2,4-Trichlorobenzene  
1,2-Dichlorobenzene  
1,4-Dichlorobenzene  
Benzene  
Carbon Tetrachloride

Cis-1,2-Dichloroethylene  
Ethylbenzene  
Methylene chloride  
Styrene  
Tetrachloroethylene  
Toluene  
Total Xylenes  
Trans-1,2-Dichloroethylene  
Trichloroethylene  
Vinyl chloride  
Dibromochloromethane  
Chloromethane  
Bromomethane  
2,2-Dichloropropane  
1,1-Dichloropropene  
1,1-Dichloroethane  
Dibromomethane  
Cis-1,3-Dichloropropene  
Trans 1,3-Dichloropropene  
1,3-Dichloropropane  
1,1,1,2-Tetrachloroethane  
1,1,2,2-Tetrachloroethane  
1,2,3-Trichloropropane  
Bromobenzene  
2-Chlorotoluene  
4-Chlorotoluene  
1,3-Dichlorobenzene

### Microbiological

Total coliform bacteria  
E. coli bacteria  
Giardia<sup>4</sup>  
Cryptosporidium<sup>5</sup>

### Inorganic Chemicals

Antimony  
Arsenic  
Asbestos<sup>4</sup>  
Barium  
Beryllium  
Cadmium  
Chromium  
Color  
Cyanide  
Manganese  
Mercury  
MBAs (detergents)  
Nickel  
Selenium  
Silver  
Thallium  
Nitrite  
Zinc

<sup>3</sup> In 2000, the City of Corvallis began testing voluntarily for Dioxin twice every year, and Dioxin has not been detected in any samples.

<sup>4</sup> Results for *Giardia* and *Cryptosporidium* are from samples of Willamette River tested in 1997.

<sup>5</sup> A waiver has been granted by the Oregon Health Division for the testing of asbestos. The waiver was based on no risk of asbestos in the source water and the absence of asbestos pipe in the City's water distribution system.



# Bottled Water Environmental Problems

- It takes 1,851 gallons of water to refine one barrel of crude oil.\*\*
- Twenty-four gallons of water are needed to make one pound of plastic. \*\*
- 1.5 to 2.7 million tons of plastic used per year to make bottles for bottled water.\*\*\*
- That's  $24\text{gal/pd} \times 2000\text{pd/ton} \times 1.5\text{million tons} = 72$  billion gallons of water or 24 times the quantity of water used by the City of Corvallis every year to make bottles **that are empty.**

\*\*Emily Gersema, Associated Press (2003)

\*\*\*FAO and Earth Policy Institute (2006)

# Bottled Water Environmental Problems

Another look at the situation:

- 💧 1.5 to 2.7 million tons of plastic used per year to make bottles for bottled water.
- 💧 American Plastics Association indicates that for every kilo (2.2 lbs.) of plastic used for PET bottled water bottles, it takes about 0.6 gallons of oil.

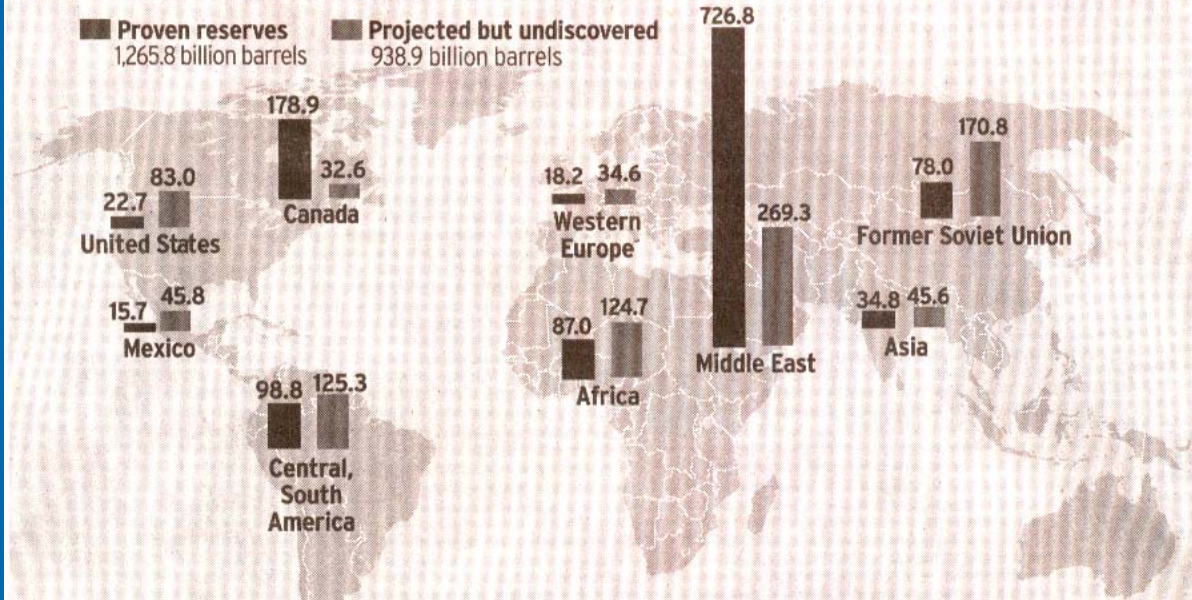
That's....

$1.5 \text{ M tons} \times 2000 \text{ lbs/ton} \times 0.3 \text{ gal/lb.} \times 1 \text{ bbl/42gal} =$   
**21.4 M bbl of oil to make empty PET bottles**

# How Much Oil is 21 Million Barrels?

## GLOBAL OIL

Countries and world regions with major oil reserves and projected but undiscovered oil resources. In billions of barrels



Top oil consumers	
In millions of barrels per day, 2003	
United States	20.0
China	5.6
Japan	5.4
Germany	2.6
Russia	2.6
India	2.2
South Korea	2.2
Canada	2.2
Brazil	2.1
France	2.1
Mexico	2.1

Top oil producers	
In millions of barrels per day, 2003	
United States	11.1
Japan	5.3
Germany	2.5
South Korea	2.2
China	2.0
France	2.0
Italy	1.7
Spain	1.5
India	1.4

Top 10 U.S. suppliers	
In barrels per day, 2003	
Saudi Arabia	1.7 million
Mexico	1.6 million
Canada	1.6 million
Venezuela	1.2 million
Nigeria	832,000
Iraq	481,000
Angola	363,000
U.K.	359,000
Kuwait	208,000
Norway	181,000

Source: Energy Information Administration

KNIGHT RIDDER TRIBUNE NEWS SERVICE

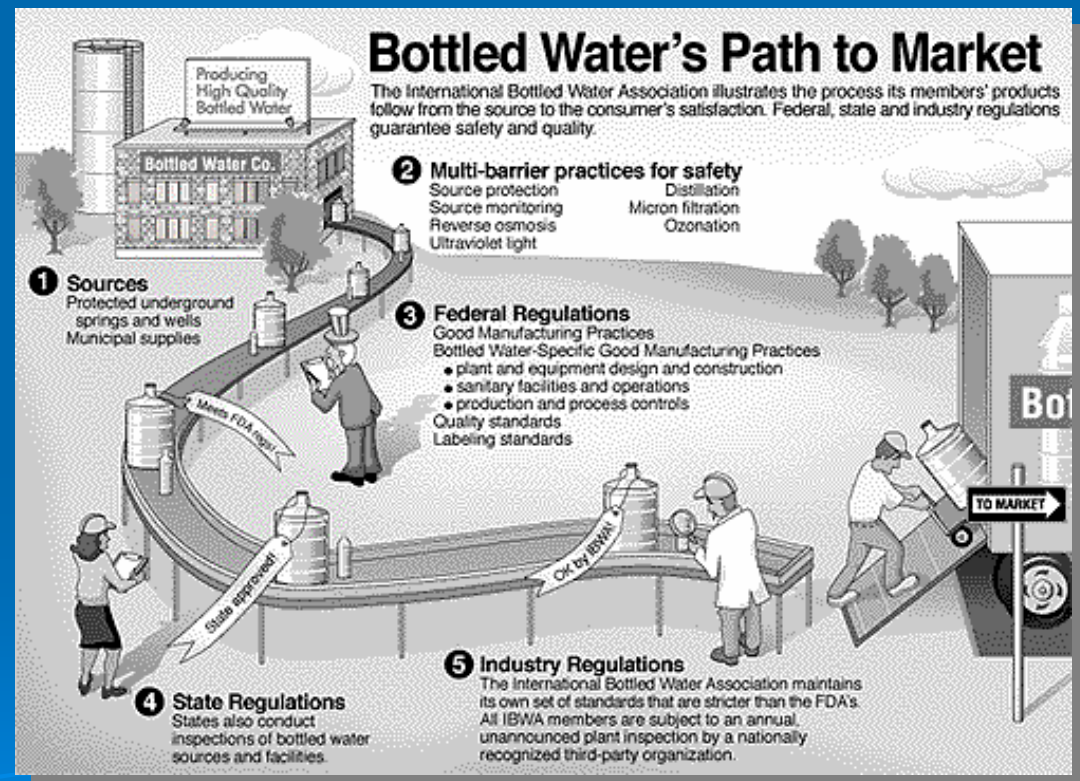
# Bottled Water Environmental Problems

- “Tap water comes from underground pipes, while the manufacture, distribution and disposal of bottled water requires much more energy and fuel.”\*

- How is Bottled Water is distributed?*

- How are the bottles recycled or thrown away?*

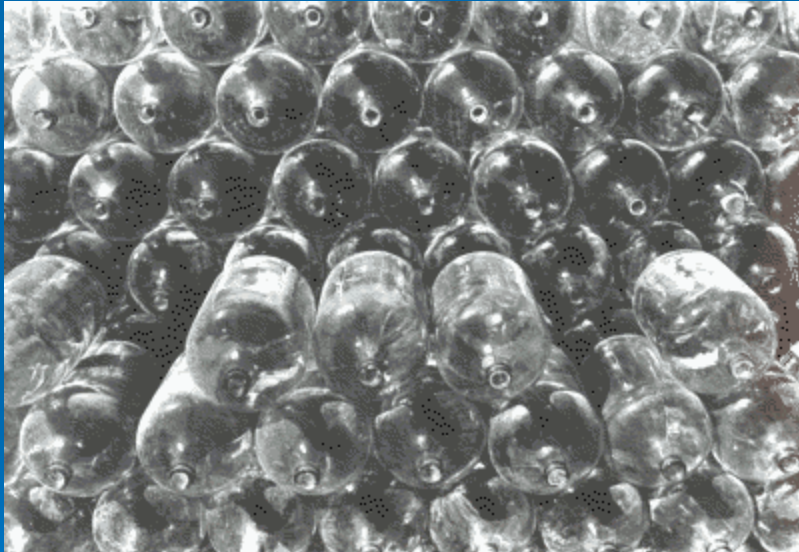
(\*BBC)



(International Bottled Water Association)

# Bottled Water Environmental Problems

“...an immense waste of energy and plastic and resources if you consider the number of bottles that are made and transported and disposed of...” (NRDC)



What about the landfill management problem?

Try flattening a plastic bottle.

💧 US Consumes Equivalent of **43 Billion** 16 ounce Polyester (PET) bottles

💧 ODEQ reports **125 Million** bottles thrown away in Oregon, yet the bottles can be recycled 20 to 30 times.

💧 Recycling rate has fallen from **54% in 1994 to 19% in 2003**

Water Follies (2002), [www.designinsite.dk](http://www.designinsite.dk), msnbc, 2005

# September 19, 2005

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**Bottled Water Cited as Contributing to Cavity Comeback**

By **Michael Smith, MedPage Today Staff Writer**  
Reviewed by **Rubeen K. Israni, M.D., Fellow, Renal-Electrolyte and Hypertension Division, University of Pennsylvania School of Medicine**  
**September 19, 2005**

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**MedPage Today Action Points**

- Advise patients that fluoride is an established preventive for tooth decay, especially in young children.
- Caution parents that excessive use of bottled water may mean they and their children won't get enough fluoride to build strong teeth and prevent decay.
- Note that a proper diet and good oral hygiene are other important elements of dental health.

**CME SPOTLIGHT**

What's this?

**RESOURCES**

**Dingertip Formulary™**

*Find Drug Formulary Information for any Health Plan*

# Shifting international geography of the bottled water industry

- In five years, bottled water consumption will be highest along the Pacific Rim. *China is expecting large growth. Most of our recycled bottles go there.*
- Canada will continue to close the gap between them and France in imports.
- Mexico also looks to be a place where many plants might decide to invest.
- A decade ago, France was considered at the center of the industry, but as of 2000 the industry seems to heading in all directions.

<http://www.soc.duke.edu/~s142tm16/conclude.htm>

[http://www.panda.org/downloads/freshwater/bottled\\_water.pdf](http://www.panda.org/downloads/freshwater/bottled_water.pdf)

**GLOBAL BOTTLED WATER MARKET**  
**Leading Countries' Consumption and Compound Annual Growth Rates**  
**1999 – 2004**

2004 Rank	Countries	Millions of Gallons		CAGR 1999/04
		1999	2004	
1	United States	4,579.9	6,806.7	8.2%
2	Mexico	3,056.9	4,668.3	8.8%
3	China	1,217.0	3,140.1	20.9%
4	Brazil	1,493.8	3,062.0	15.4%
5	Italy	2,356.1	2,814.4	3.6%
6	Germany	2,194.6	2,722.6	4.4%
7	France	1,834.1	2,257.3	4.2%
8	Indonesia	907.1	1,943.5	16.5%
9	Spain	1,076.4	1,453.5	6.2%
10	India	444.0	1,353.3	25.0%
<b>Top 10 Sub total</b>		<b>19,159.8</b>	<b>30,221.6</b>	<b>9.5%</b>
All Others		6,833.5	10,535.0	9.0%
<b>TOTAL</b>		<b>25,993.3</b>	<b>40,756.6</b>	<b>9.4%</b>

Source: Everage Marketing Corporation

# Conclusions

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Monday, January 29, 2007

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Adam Bird / Special to The Detroit News

"I'm worried that they will never stop," says Valerie Duer, who is fighting Nestle's efforts to draw from the Muskegon River watershed.

**Michigan is ground zero in groundwater war**  
Residents fear lower water levels as Nestle taps into western Michigan watershed

If the use of bottled water continues to increase at the current rate, the world will be in short supply in 22 years.

Posted on Sat, May. 21, 2005

## More municipal water utilities bottling their water

JOHN HARTZELL  
Associated Press

**MILWAUKEE** - A growing number of municipal water utilities are tapping into the bottled water market to fight the flood of competition from profit-making companies.

The utilities' message to consumers is that their product is as good as what's found on store shelves and less expensive. They hope to make a few bucks and help their ratepayers in the process.

"People should not have to spend an exorbitant amount of money for municipal water as a less expensive alternative

- 💧 Bottled water *isn't worth the price*, especially considering that it must be purchased, transported, and stored by the consumer.



# Recommendations

- 💧 If you must buy bottled water, look for “*Purified*”, “*Rain*” or “*Well*” water in Corvallis because it is just as pure, if not more pure, as a “*Spring*” Source.

- 💧 **Don't like Chlorine taste?** Place pitcher of water in fridge overnight. Chlorine gas disappears.

- 💧 **Think about this...** “Our consumer preferences for spring water, involve innocent choices made by individuals, but their cumulative impact has the potential to devastate springs and rivers”

-Robert Glennon, Ph.D. and author of *Water Follies*

- 💧 **Recycle your bottles.** The plastics industry really does want your bottle back.

# Thank You For Your Attention

*“North American tap water is the best you can get.”*

*Institute for Water and Watersheds*

*Oregon State University*

*[water.oregonstate.edu](http://water.oregonstate.edu)*

INSTITUTE FOR  
WATER AND  
WATERSHEDS

