



The University of Arizona... Your Land-Grant college

- Morrill Act 1862 Land Grant Colleges– UA—1885
- Smith-Lever Act – 1914 – Cooperative Extension
- Vision: Educational Leadership in Arizona, the nation and world
- Mission: Improve and enhance Arizonan's Quality of Life
- Values: Scholarship, creativity, integrity, cooperation, diversity and mutual respect
- Focus and Programs:
 - Teaching, research and extension through teamwork and integration of scientific research-based information.
 - Environment and Natural Resources
 - Family, Youth and Community
 - Marketing, Trade and Economics
 - Animal Systems
 - Plant Systems



Verde
Watershed
Association



ARSENIC IN YAVAPAI COUNTY GROUND WATER:

CHALLENGES AND SOLUTIONS

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NATURAL RESOURCES**

**UA-CALS-COOPERATIVE EXTENSION
YAVAPAI COUNTY**

2005



+∞ Alchemy and Arseni ♀

*I am an evil, poisonous smoke...
But when from poison I am freed
Through art and sleight of hand,
Then can I cure both man and beast
From dire disease oft times direct them;
But prepare me correctly, and take great care
That you faithfully keep watch over me;
For else I am poison, and poison remain
That pierces the heart of many a one*

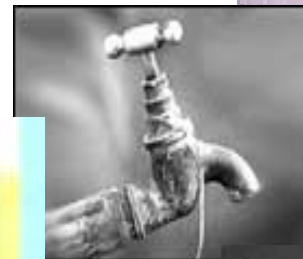
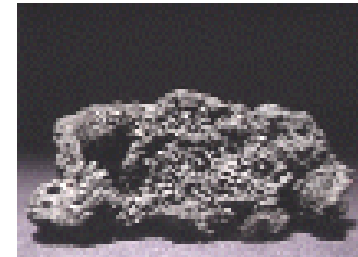
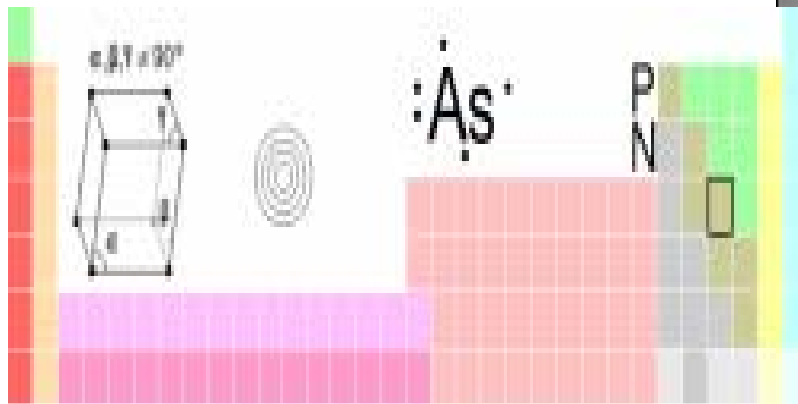


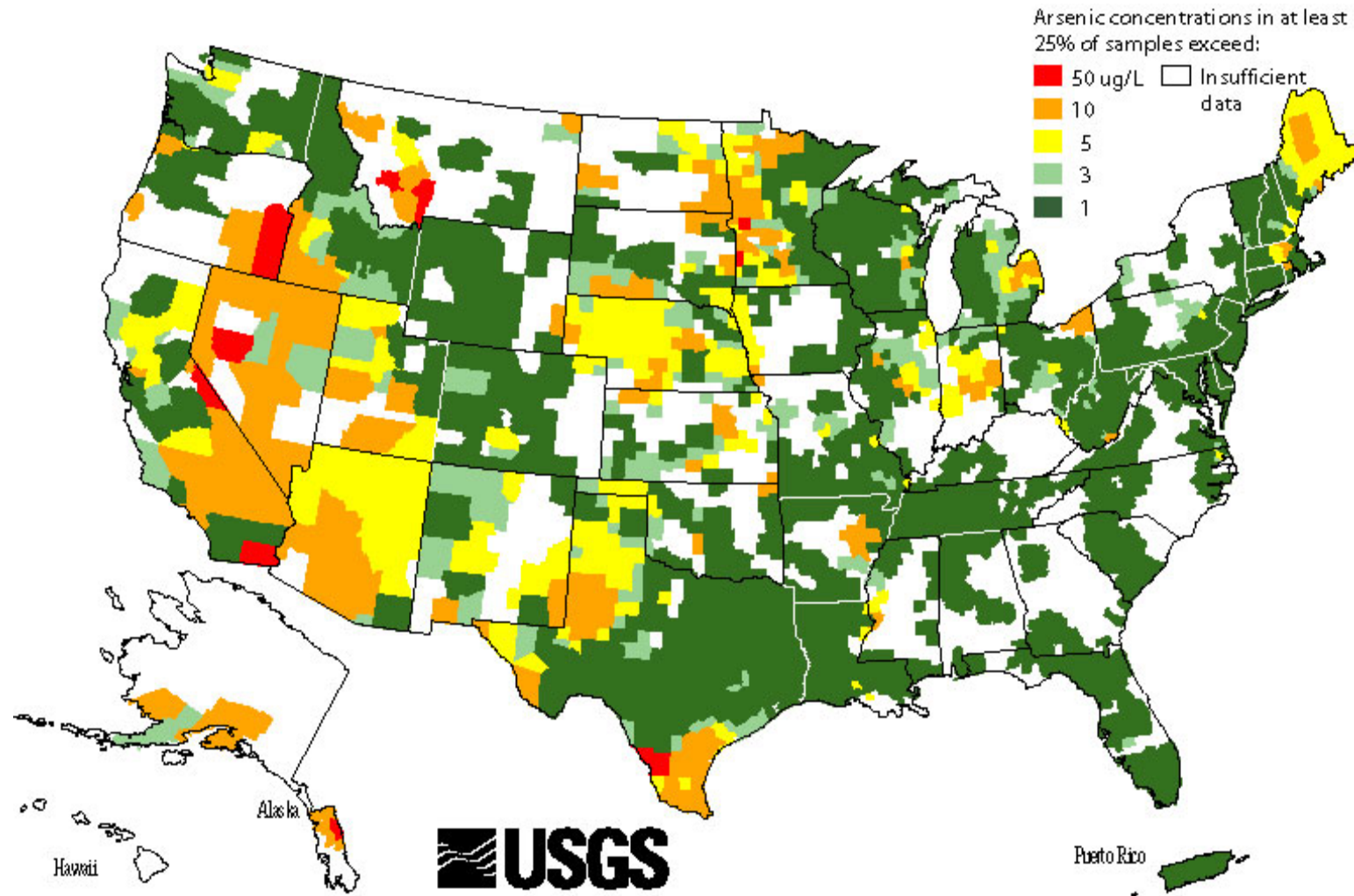
Valentini, 1694



What is Arsenic

- Naturally occurring element in Arizona
- **Arsenic (As)** acts like a metal
- **Arsenic** may be a product of industry
- Occurs in many forms.
- **As** can be found in both organic and inorganic forms. (**Inorganic forms considered more toxic**)





What are Levels of **Arsenic** Exposure?

- **Arsenic in the Air?** Lower in Rural areas ..Higher in Urban areas....Highest in Industrial areas.
- **Arsenic in Water?** Lowest in seawater...higher in rivers and lakes....highest in underground aquifers located in Volcanic/Sedimentary **Arsenic-rich** areas.
- **Background levels** of **Arsenic** vary from one region to another and sources of natural or man-made **Arsenic**



Arsenic in Living Things

- Amounts of **As** vary from organism to organism.....in the same household.
- Levels of **As** contamination vary with local contamination sources.
- Animals living in freshwater, or plants and animals living on land are less apt to accumulate **As** those plants or animals found in marine environments.
- Water and Food are main sources of **As** exposure for humans.



What Happens to **Arsenic** in Your Body?

- Most soluble **As** is excreted via Urine
- Efficient removal of **As** varies from individual to individual.
- Levels of **As** can be determined by lab testing of hair, body tissues and fluids.
- **As** is **inhaled** or **ingested** as food.
- Long-Term **versus** Short-Term Exposure



Arsenic Problems in Arizona?

- Most Arizona ground water has background levels of **Arsenic** of **28-40ppb** (AzGS/ADEQ)
- Levels of **Arsenic** in Southwestern Ground Water exceeding 100 ppb is “rare”
- The three Paulden “Deep” wells are **anomalies.**
- No formal, exhaustive studies of Arizona Private Well Water.....most data appears to suggest **As** in ground water in Yavapai County less than **50 ppb**
- New Standard set by USEPA/WHO is **10ppb (old was 50ppb)**
- No historical evidence supporting Arsenic poisoning from humans eating animals or plants raised in Arizona



Potential Arsenic Sources and Problems ?

- **Chromated copper arsenate** (CCA) has been used for over 70 years with no ill effects
- **Arsenic** (AsO_3) has been used in agriculture chemicals, glass production, pharmaceuticals, and metal alloys for years
- Fossil fuel emissions and tobacco smoke both are significant **Arsenic** exposure sources



What About your Family, Pets, Livestock, and Garden?

- External use of water containing less than 50ppb **Arsenic** poses a minimal risk to humans or animals.
- Ingestion of food contaminated with **In-organic Arsenic** is most serious concern. Arsenic tends to move quickly from animals via urine
- Virtually no evidence of significant **Arsenic** uptake by plants being irrigated with AZ well water..... grains and root-crops most likely to take in **Arsenic**
- Read labels.....**Arsenic** exposure from contact with preservatives, insecticides, etc. is not uncommon.
- “Arizonan’s”, animals, wildlife, Native Americans, have been drinking water containing 50ppb (or less) **Arsenic** for years with no apparent health problems (excessive exposure to **Arsenic** does increase health risks)
- If you suspect **Arsenic** poisoning of a human, pet, or livestock check with a physician or veterinarian.



THE BOTTOM LINE FOR PRIVATE WELL OWNERS

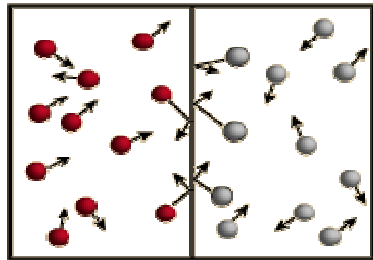
Arizona's Law says:

“.....it is the sole responsibility of the private well owner to determine the quality (potability) of their private well water.”

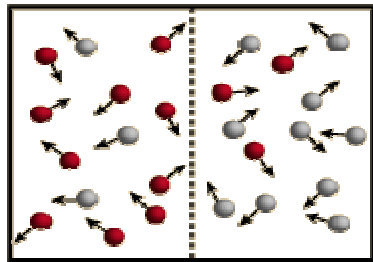


How does **Arsenic** get into your Water?

Arsenic Source v



v
Diffusion v



v
Mixing v

v
Pumping



Treatment

- Treatment ?it depends on the type and amount of **Arsenic** in your water and \$\$\$\$
- How much can or are you willing to spend?
- **Arsenic** removal technologies for individual well owner's homes (point-of-use and whole house) are evolving as we speak.



What do you need to know?

What type of **Arsenic do you have** (Ionic form)?

What is the possible origin of the Arsenic in your water: *Organic? Inorganic? Natural ??????*

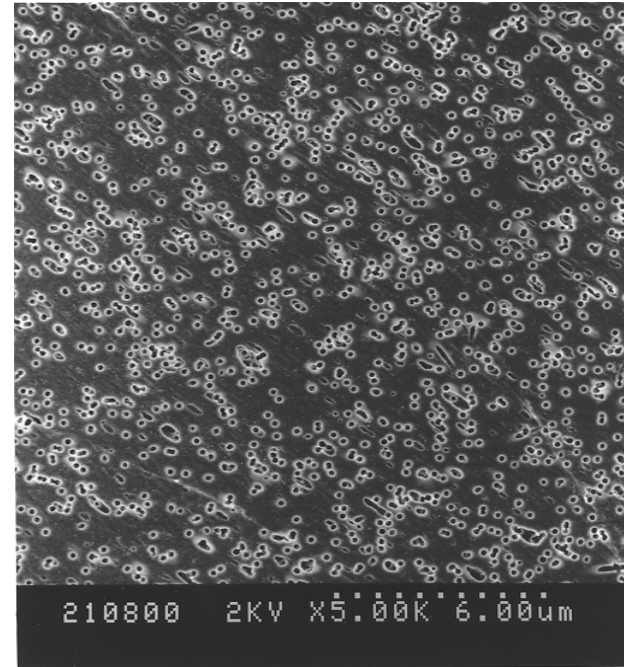
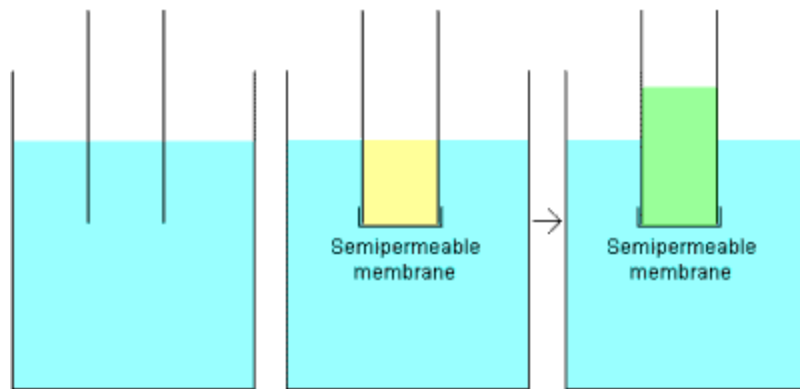
How much **Arsenic** do you have (ppb)?

Are there other water quality considerations?

Who has technology to remove it?



Reverse Osmosis



- 2 micron (0.002 mm)



Point-of Use Technology

- The most current technology for arsenic removal (< 300ppb) for a piped water supply is moderately costly, most have limited efficiency and maintenance requires technical expertise.
- New technology , incorporating/enhancing other types of treatment technologies including, reverse osmosis, co-precipitation, ion exchange and activated alumina filtration are being field-tested.
- Simple and older technologies for household removal of arsenic from water may have to be adapted to and proven sustainable, in each different well-water setting.
- Recent studies have reported preliminary successes in using packets of chemicals for household treatment. Some mixtures combine arsenic removal with disinfection. One example, developed by the WHO/PAHO Pan American Center of Sanitary Engineering and Environmental Sciences in Lima, Peru (CEPIS), has proven successful in Latin America.



ADEQ Approved Certified Products



BEFORE YOU BUY!

- Determine if you have an **Arsenic** problem
- Research the technology....will it handle your **Arsenic** problem?
- Contact a responsible, ethical vendor/provider and discuss your needs.
- Get an estimate of costs.....water chemistry testing by vendor, installation, routine periodic maintenance and monitoring.....in writing.
- Periodically have your treated water “product” tested by an independent, certified lab to be sure your technology does what it claims to do.
- Then.....What if?.....Remember, Buyer Beware!



The University of Arizona Cooperative Extension Recommends:

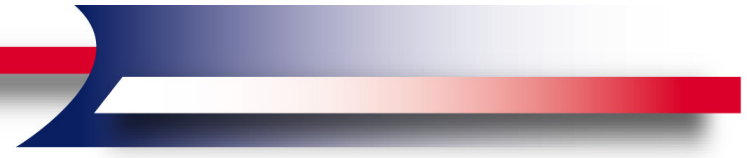
- Test your well water regularly....including **Arsenic**
- Determine the level of **Arsenic** contamination and what is your exposure level to **Arsenic**.
- If you are experiencing any health problems which could be caused by excessive exposure to **Arsenic**.... consult your family physician or Arizona Department of Health Services.
- If your well water **Arsenic** tests exceed **10ppb**, stop drinking it...move to a safer source of water for drinking and cooking while you come up with a plan.



Detection?... Treatments?... and Solutions?.....

Your UA-COOPERATIVE EXTENSION Can Help!

- **CE** has a list of Certified Laboratories.
- **CE** has On-site, (non-certified) Arsenic Test kits (Includes *Arsenic*, pH, NO₃, NO₂, Alkalinity & Hardness)
- **CE** provides scientific-based, research information regarding Arsenic in your drinking water
- **CE** can direct you towards current technology for point-of use treatment and Arsenic removal in your home



“Stress” and Not Knowing if You Might Have Arsenic in Your Well Water????

- Take a *Deep Breath and Stop Worrying* about what you don't know
- Have your well water tested for **Arsenic** and.... you might want to consider more parameters....bacteria, nitrates, etc. ..while your at it...on a annual basis.
- Once you know what you have (or don't have) you will either be relieved and/or be better equipped to seek professional, responsible assistance.

Remember to Contact Your Local **Cooperative Extension Office**





Contact Our Yavapai County Offices:

Prescott:

840 Rodeo Dr, Bldg C
Prescott, AZ 86305
928-445-6590
FAX: 928-445-6593

Cottonwood:

2657 E Village Drive
Cottonwood, AZ 86326
928-646-9113
FAX: 928-646-9108

WEBSITE: <http://cals.arizona.edu/yavapai>

