Salinity & Water Softeners

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PUROSERVE WATER
CWS6

US Water Hardness

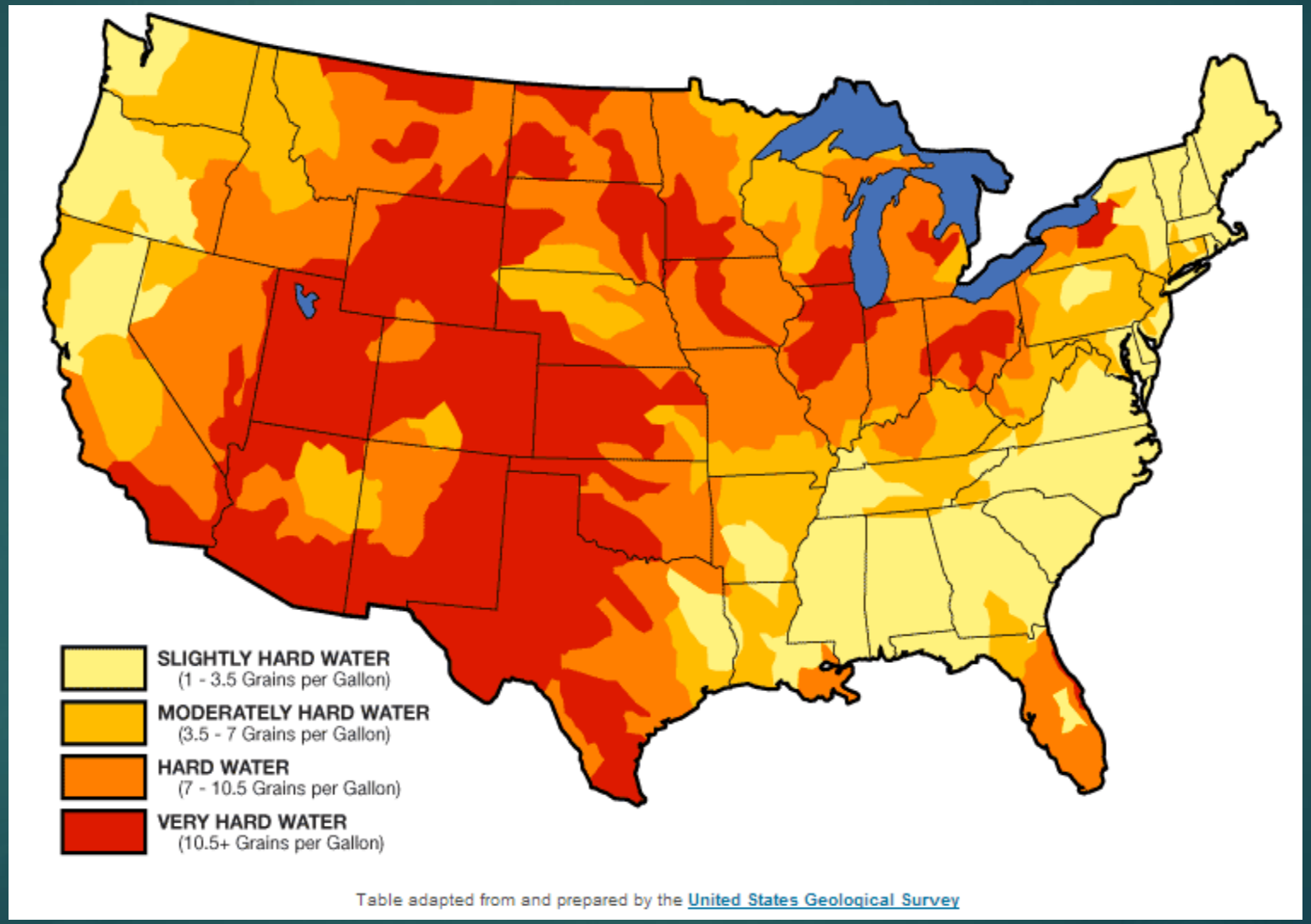

Table adapted from and prepared by the United States Geological Survey

POE – The Softener Market

- 89% of US homes have hardwater
  - Water is considered "hard" when it exceeds 7 grains per gallon (120 mg/L)
  - Many areas receive tap water above 20 grains
- 20 million US homes use a water softener
  - 35% of CA homes use a water softener
  - 50% + of homes in AZ & Las Vegas use a water softener
  - 1M+ new residential softeners are sold every year in the US
  - 15% of those go to CA & AZ – States where salinity management is critical
- Millions of businesses in US have a softener
  - 100K +/- new commercial units are sold each year in the US
  - A properly maintained water softener will last 20+ years
- Industry estimates are that over 3Billion Lbs of salt are discharged to public sewer systems from water softeners EVERY DAY in the US

Water Softeners

- Softeners are more common than you may think – everyone uses them
  - Process water for technology products typically starts with a softener
    - Smart phones, glass, lenses, metal finishes and touch screens – you name it!
    - Data centers and main frame computer facilities
  - Hotels, restaurants, coffee shops, laundries, etc. all use softeners
  - Homes use softeners to help protect equipment, save money on cleaning products, water heating & to improve personal grooming and make their lives easier
- Other commercial water treatment also generates a "brine" including:
  - Reverse Osmosis
  - De-ionization
  - Chip & electronics plants produce up to 3 brine streams before the water gets in the door to make their product – 1 from a softener, 1 from RO and the third from an on or off site regenerated mixed bed de-ionizer
- Point of exit (POExit) – wastewater treatment often produces a "brine" that adds still more salt to the total salinity problem

Important Facts About Soft Water, Water Heaters and Water Using Appliances

- Heating water is the SECOND biggest user of energy in the home
- Consumers are switching to more energy efficient appliances in an effort to reduce energy costs
- Manufacturers of ALL tankless water heaters recommend that consumers use soft water – many of them disclaim hard water as a condition that will VOID their warranty

http://www.wqa.org/detergent/SWB_Studies.pdf

Water Quality Research Foundation Findings About Water Heating Efficiency

- Water heaters on soft water maintained factory efficiency ratings whereas those on hard water dropped rapidly
- Gas water heaters:
  - Hard water resulted in as much as a 25% loss of efficiency
- Electric water heaters showed a similar loss of efficiency
- Tankless water heaters:
  - Failed after only 19 days of testing
  - Water heating efficiency dropped by 10% in less than 2 years
  - Operating costs were 47% less when using soft water

http://www.wqa.org/detergent/SWB_Studies.pdf

Softwater Saves on Cleaning Expenses

- Much of soap chemistry is surfactants (salts), and "softening agents" (more salt), to counteract the effects of hard water – these products also add to wastewater salinity
- Soft water reduces usage of these products by as much as 75%
- Clothing and other textile life is prolonged by up to 15% when washed in soft water
- The typical homeowner spends more than 6 hours a month cleaning water spots, streaks and removing scum

http://www.wqa.org/detergent/SWB_Studies.pdf

Showerheads

- Showerheads may become unusable within a matter of months
- Low flow showerheads – the type used in hotels like this one – when used in hard water lost 75% of their flow in just 18 months

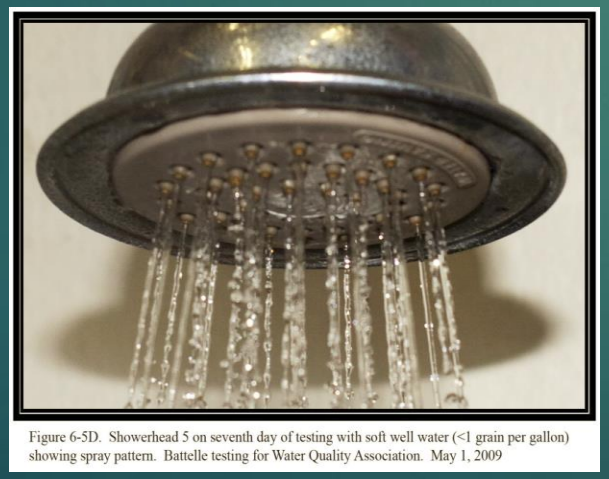

Figure 6-5D. Showerhead 5 on seventh day of testing with soft well water (<1 grain per gallon) showing spray pattern. Battelle testing for Water Quality Association. May 1, 2009

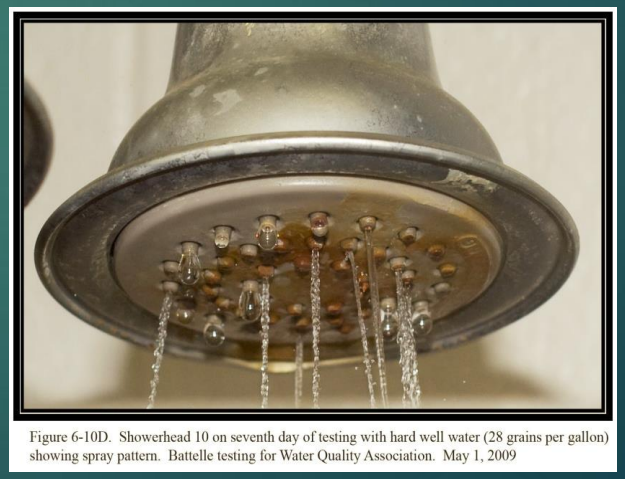

Figure 6-10D. Showerhead 10 on seventh day of testing with hard well water (28 grains per gallon) showing spray pattern. Battelle testing for Water Quality Association. May 1, 2009

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How Softeners Work

- Commercial & industrial softeners
  - Come in any size & often include multiple tank configurations
  - These commercial systems typically use 15 pounds of salt per cubic foot of resin to regenerate.
  - A tri-plex (3 tank) 30 cubic foot system would regenerate at least 60 cubic feet of resin per day – Requiring **1,350 pounds** of salt
- A typical residential softener
  - Holds 1 cubic foot of resin
  - Uses from 6 to 15 pounds of salt per cubic foot to regenerate
    - At 15 pounds of salt you get 30,000 grains of capacity
    - At 6 pounds you get 14,000 grains
    - The result is less salt per regen but more frequent regeneration uses more water
  - Also uses 40 to 80 gallons of water per regen cycle
  - Regenerates every 2 to 3 days

A Typical Duplex Commercial – Industrial Softener

Blown Tanker Salt

So, How Big Is The Salt Contribution From Softeners

- Several communities have quantified the salt load from softeners & they are often the biggest source of salt pollution
  - 30% of the salt in Santa Clarita wastewater was from the 11% of the homes that had water softeners
  - 80% of the salt in Scottsdale's wastewater comes from water softeners
  - Minnisota's Twin Cities use 340,000 tons of road salt per year but 25% of the salt found in area ground water actually comes from water softeners

Las Vegas

- Over 50% of LV homes use a water softener
- All of the big hotel resorts & MOST of the other businesses in LV must use a water softener
  - A friend who helps maintain the softeners at one of the smaller resort hotels here says they use over 2 tons of salt per day
- Salt levels in the CO River increase by as much as 38% in the LV stretch
  - Roughly 50% of the increase appears to be from the salt in LV's wastewater
  - This salt eventually ends up
    - In SoCal via the CO River Aqueduct
    - In Central AZ via the CAP Aqueduct
    - In the Imperial Valley

What To Do

- Some utilities are now regulating the softening industry to reduce salt levels in wastewater through brine discharge prohibitions
- Softwater is still critical for many of the products we rely on:

- Technology starts with softwater
  - Chip manufacturing requires high purity water
  - Data centers use a flood of treated water for cooling
- Imagine
  - Life without your smart phone or Alexa
  - You can't control your smart home
  - You don't have "the cloud" to store EVERYTHING
  - And thus you can't call LYFT to get a ride
  - What if the electronics in your car weren't there