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Water Resources Research Center

College of Agriculture and Life Sciences

WaterSustainability

School Water Audit Program (SWAP)

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ARIZONA WET Water Education For Teachers

MWS Master Watershed Steward

Outline

1. SWAP Goals
2. Collaborative Community Project
3. The SWAP Process
4. Case Studies & Outcomes
5. Conclusions

SWAP Goals

- Educate students about the need for water conservation, by engaging in ***real-world*, *action-based*** projects that integrate science, language and math skills and utilize technology.
- Determine the amount of water used in a school.
- Implement **behavior** & **technology-based** conservation alternatives in schools and homes.
- **Incentivize community involvement** through student-led technology retrofit installments and student presentations to decision makers.
- **Decrease water use** in the school and community.

The Partnership –
Relevant Project-based Learning

Middle school students, teachers, district superintendents, groundskeepers, community volunteers and city water conservation specialists partner to implement the SWAP, a real-world, learning project that brings relevancy to the curriculum in ways that districts cannot, working independently.

Collaborative Community Project

- **K-12 education** is demanding more, locally relevant experiential learning.
- **Community volunteers** want to make positive, local changes.
- **Water providers** want a return on their water conservation investments.
- **Communities**, large and small, in the arid west need to adopt a culture of wise and efficient water use.

Education Stakeholders – STEM Education

Business leaders, governors, & others are urging a redoubled commitment to strengthening U.S. students' preparation to succeed in the subjects known by the increasingly familiar shorthand of STEM.

Through STEM education learners engage in:

1. the scientific process,
2. cutting edge technologies,
3. mathematical thinking skills that contribute to problem solving, and
4. systems thinking that undergirds the creation of new services and solutions.

Volunteer Stakeholders

- 2009 has been called the *Year of the Volunteer*

The SWAP Program meets the needs of volunteers. Volunteers want:

1. you to be prepared for them
2. to feel welcomed
3. good training
4. to do interesting work
5. to know up front how much time the job will take
6. to be appreciated
7. to be communicated with
8. **to know that they are helping to make the world a better place**
9. **to be socially connected**
10. **to learn something new**

City and Private Water Company Stakeholders

- Water conservation specialists want to instill an ethic of water conservation/water efficiency in their constituents through the adoption of new behaviors or the installation of water efficient technology.
- The SWAP galvanizes communities around water efficiency and ensures that water saving devices are installed (when given out) and water savings reported.

Community Stakeholders

Community members want:

- healthy and thriving cities and towns with enough natural and economic resources to sustain quality of life
- improvements to their infrastructure including water efficient technology
- knowledge and skills required to make good decisions

The SWAP Process

1 - Getting Their Feet Wet: A Home Water Audit

2 - Plunging In: The School Inventory

Indoor Audit

- 3.1 - Structured Inquiry: Bathroom Faucet Audit
- 3.2 - Guided Inquiry: Classroom Faucet Audit
- 3.3 - Guided Inquiry: Cafeteria Audit
- 3.4 - Student-driven Inquiry: Student-led Audit

Outdoor Audit

- 3.5 - Structured Inquiry: Athletic Field Audit
- 3.6 - Guided Inquiry: Non-athletic Field Audit
- 3.7 - Student-driven Inquiry: Student-led Audit

4 - Resurfacing: Communicating Data & Recommendations

Auditing a Faucet

SWAP: Bringing it Home

- Students learning to measure baseline data, test for leaks and install simple retrofit devices. They can bring knowledge and skills home to their parents.
- By going through the students, water conservation incentive programs can be targeted at a now-interested community.

Connecting to the Community


School Water Audit Project

NOVEMBER 2008 S.W.A.P. WATER WASTE FOR WATER EFFICIENCY ISSUE ONE

Pilot Program winner at Southwest Elementary in Phoenix, AZ

SWAP Conserves Water & Builds Citizens

"I want to show my little brother how great his big sister is. And I want to make a good role model for him and my baby sister. That's pretty much what I want to do." Alyssa, 8th grade.

Isn't that pretty much what we all want to do? Alyssa's simple and pure statement was not about her plans to save the world, solve the crisis of the day or cure cancer. Alyssa, an eighth grader at Southwest Elementary School in Phoenix, Arizona, was talking about her participation in a school water audit. Water conservation specialists take notice! Teen-age water sleuths wielding stop watches and buckets might just be "cool!" Or "hot." Or "whatever." Terminology aside, the word is out that conserving water may be the best way to distinguish yourself in front of younger siblings. How did that happen? Is being smart and preserving valuable resources now okay? Even for girls? I guess so!

Alyssa and her fellow students have recognized Arizona's desert environment have enough water to use, be enough to waste. 366 kinder through 8th grade Sonc Elementary School stu participated in a two week water audit project. All 6th, 7t 8th grade students participat audit plan was based on the W activity in Project WET's Conserve Water Educator Students measured water us school and wrote proposals ab conserve water. One proposal was selected for funding and implementation. The winning proposal noted that the school had a hand washing station with

The key to the success of this project was that students

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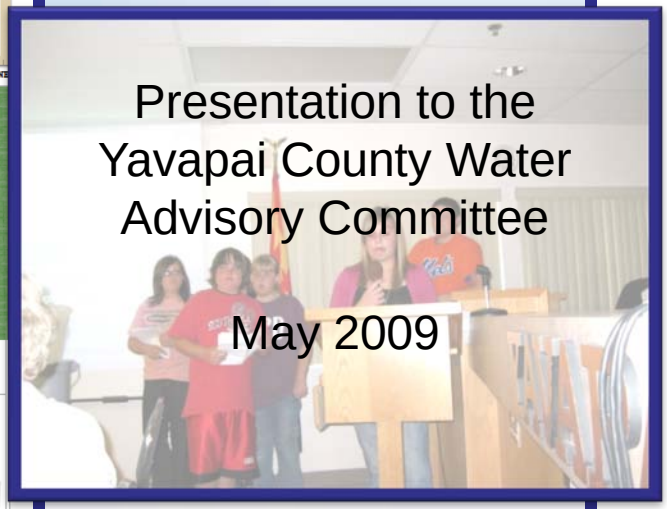


101 things to do instead of wasting water by taking long showers

- •Take a nap
- •Swing on a swing
- •Play a video game
- •Drink a cup of hot chocolate
- •Play a game
- • Eat a lollipop
- • Watch TV
- • Watch a movie
- • Listen to your IPOD
- • Have a bowl of Ice Cream
- • Play with your Pet
- • Practice guitar or piano
- • Read a book
- • Fly a kite
- • Jump on the trampoline
- •Talk on the phone
- •Play on the computer
- •Have a glass of milk or soda
- •Send a friend a text message
- •Share a story
- •Dip strawberries in chocolate
- •Create a work of art
- •Make origami ……

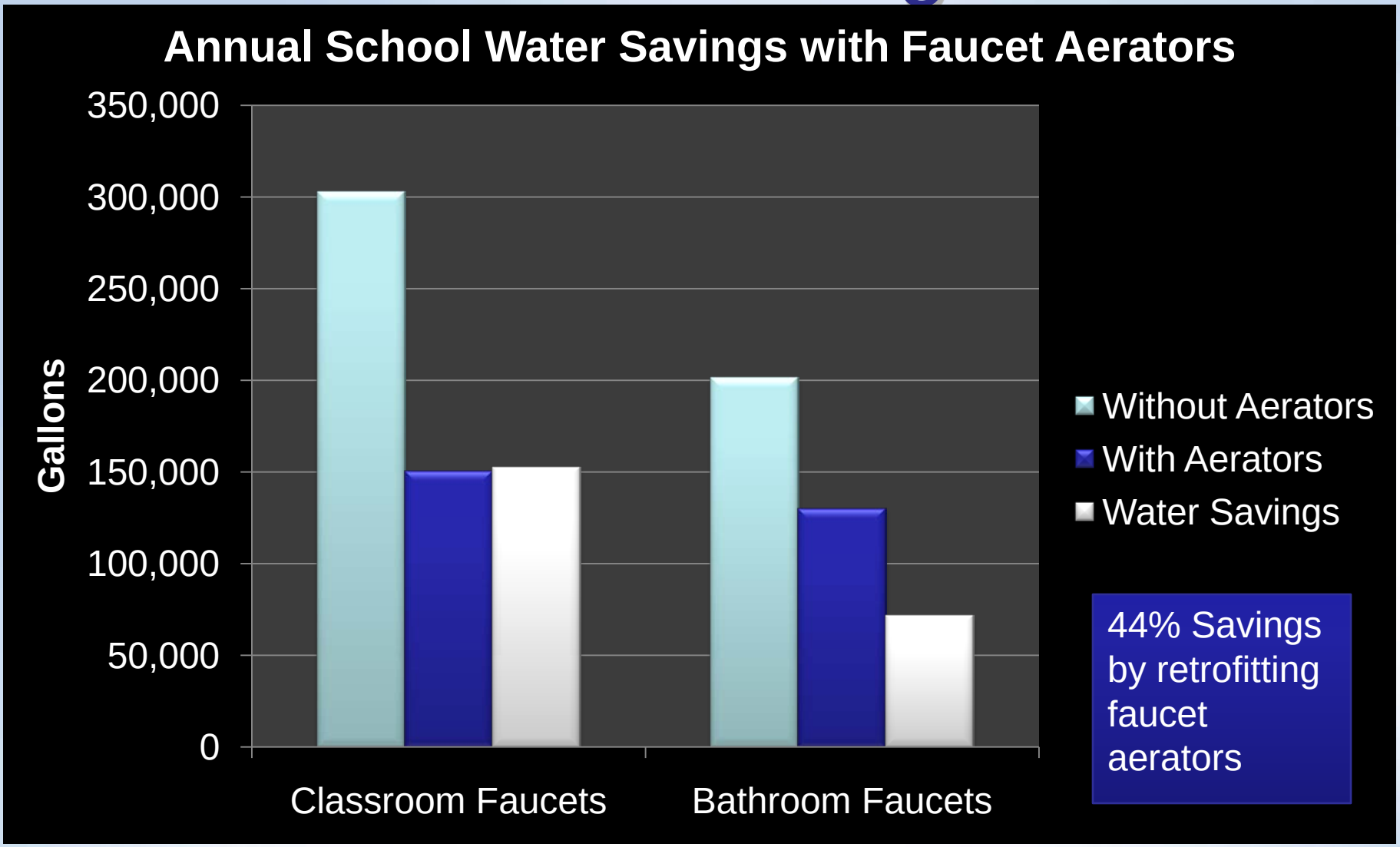
Think about how much water you're saving and what a difference you are making!

Wilson K-8 Case Study

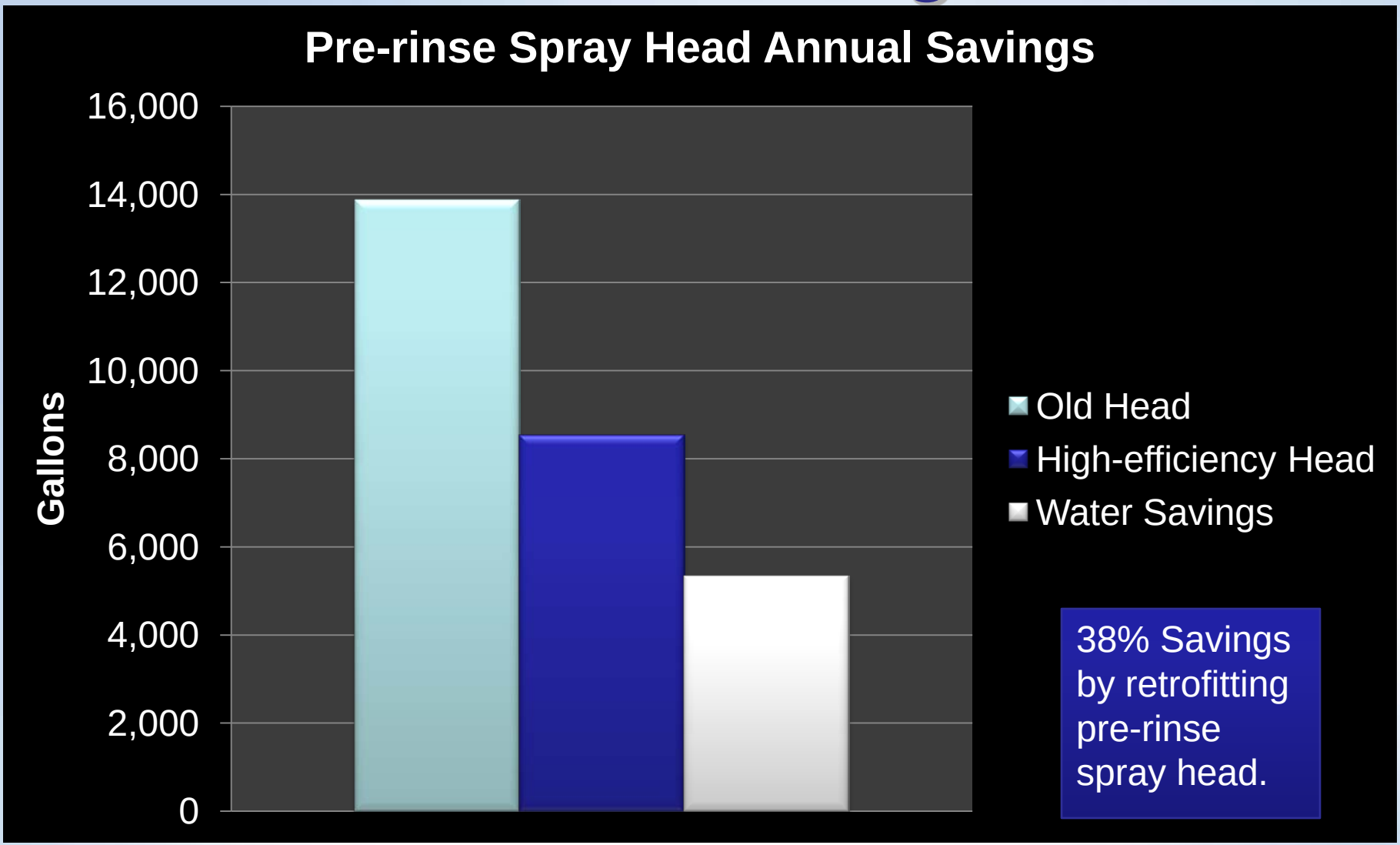
- Students Involved: 100 6th Graders
- Volunteers Involved: 10, 100+ hours

  (at Independent Sector volunteer rate of $19.51 = ~$2,000)
- Monetary Investment: $0
- Tucson Water donated:
  - 200 aerators
  - 100 low-flow shower heads
  - 100 shower timers
  - 100 toilet flappers
  - Hundreds of dye tabs

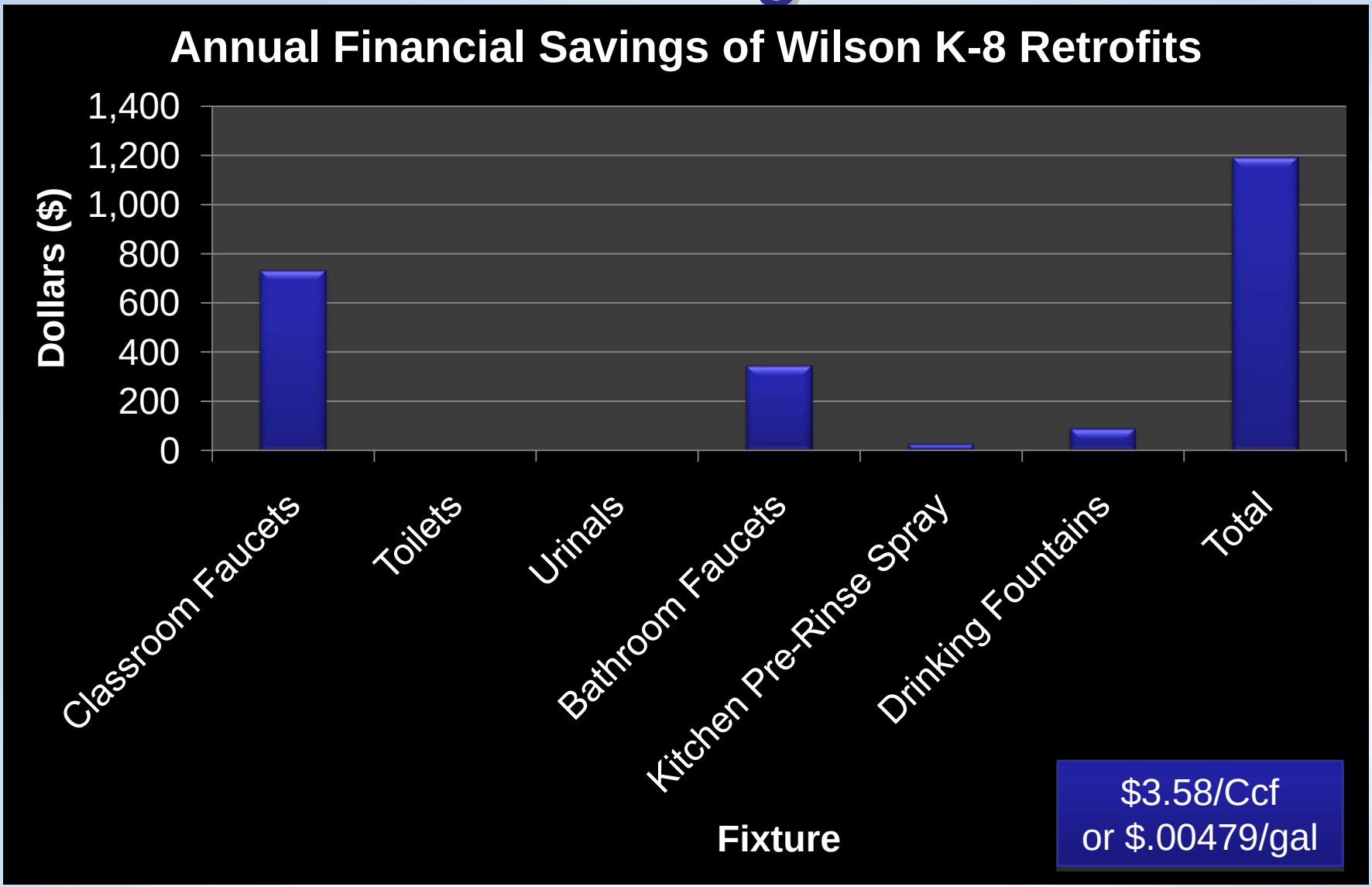
Wilson K-8 Projected Water Savings



Wilson K-8 Projected Water Savings



Wilson K-8 Projected Financial Savings



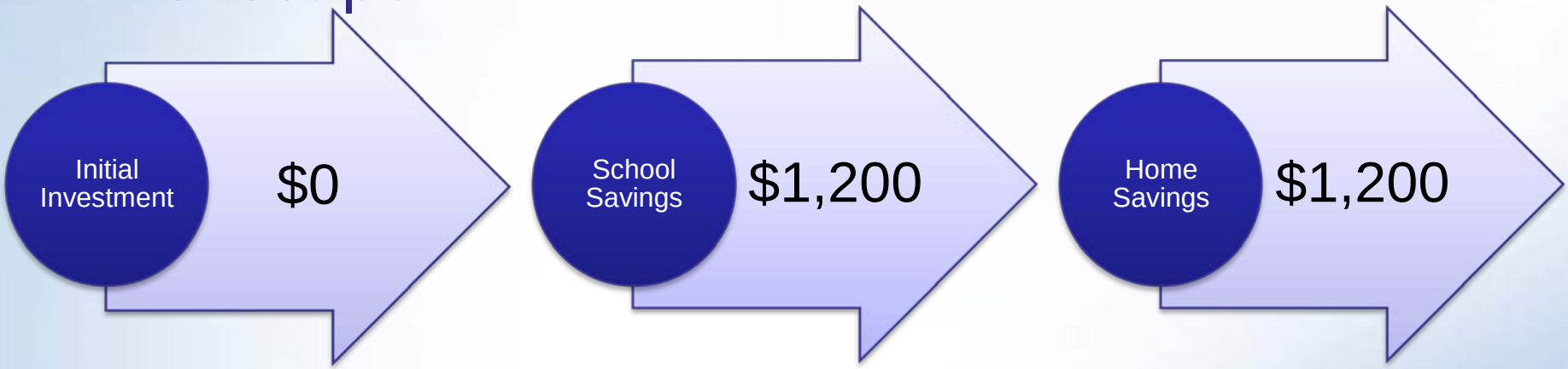
Home Water Audit Projected Savings

Home Retrofits	Devices Used	Annual Savings (gallons)	Annual Savings* (dollars)
Aerators	112	408,800	$77.67
Shower Timers	99	246,375	$763.76
Shower Heads	85	775,625	$147.37
Toilet Flappers & Dye Tablets	79	922,720	$175.32
Total		**2,353,520**	**$1,164.12**

*Water rate = $2.28/12,000 gallons

Wilson K-8 Results & Recommendations

- Audits conducted over 3 week period – every fixture in school audited
- ADWR replaced pre-rinse sprayhead valve with local media coverage
- Students made ***"how to"*** videos to use at other schools
- Students want to remove non-field turf and xeriscape

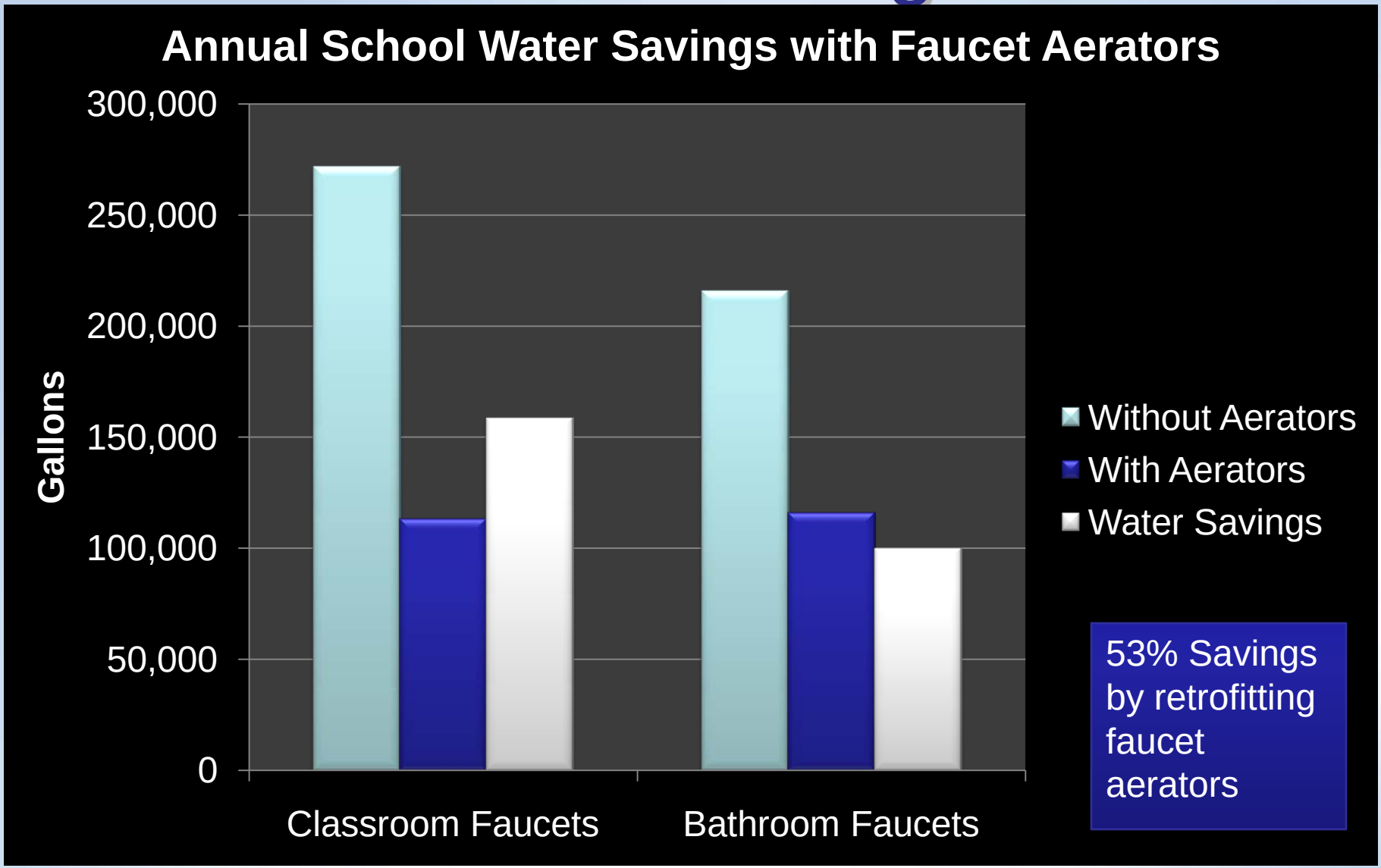


Cottonwood MS Case Study

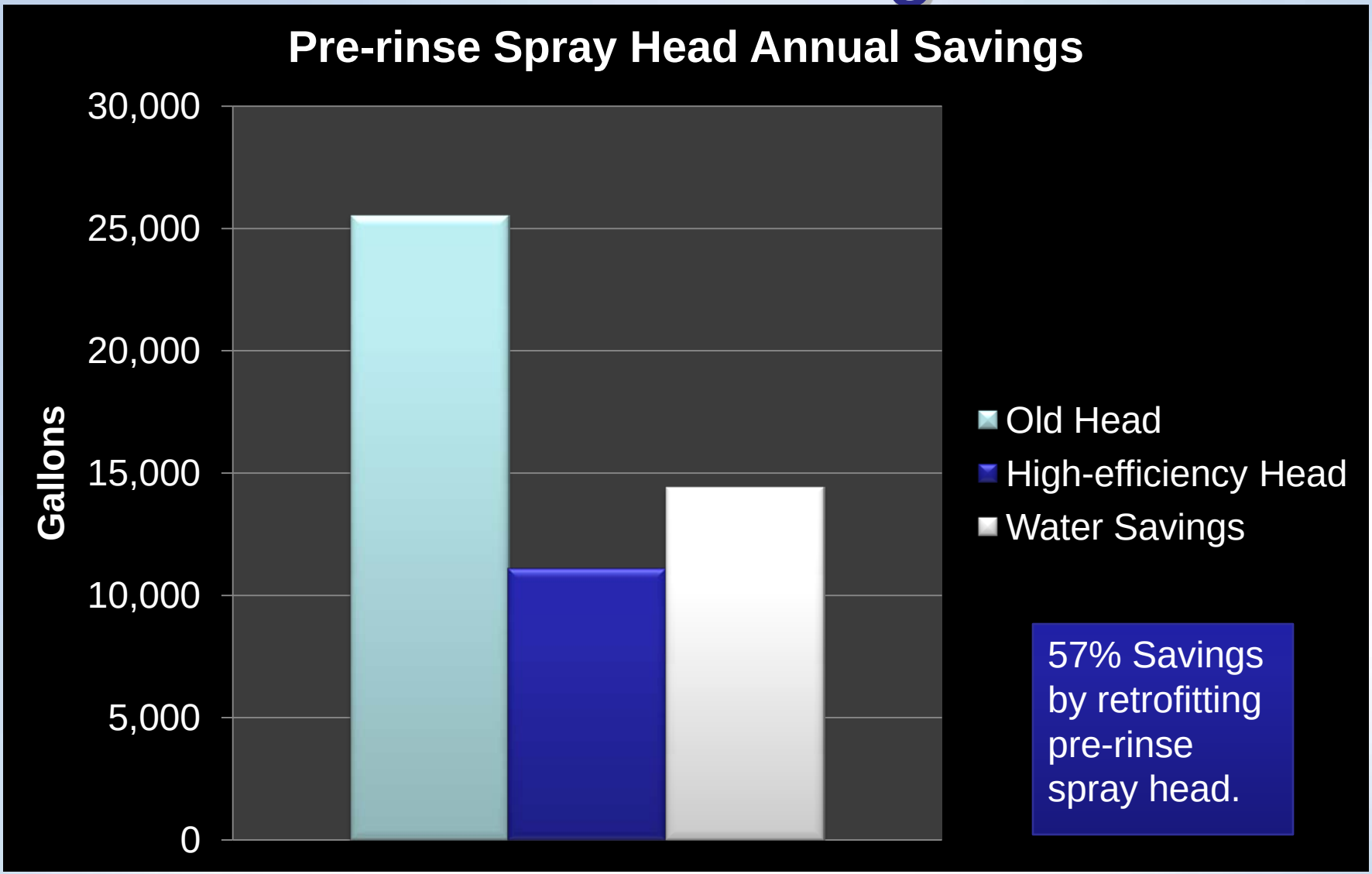
- Students Involved: 120 7th Graders
- Volunteers Involved: 18, 100+ hours (including the mayor & ADWR AMA director)

  (at Independent Sector volunteer rate of $19.51 = ~$2,000)
- Monetary Investment: 0
- City of Cottonwood provided:
  - 270 aerators
  - 72 catch cans
  - 250 dye tabs

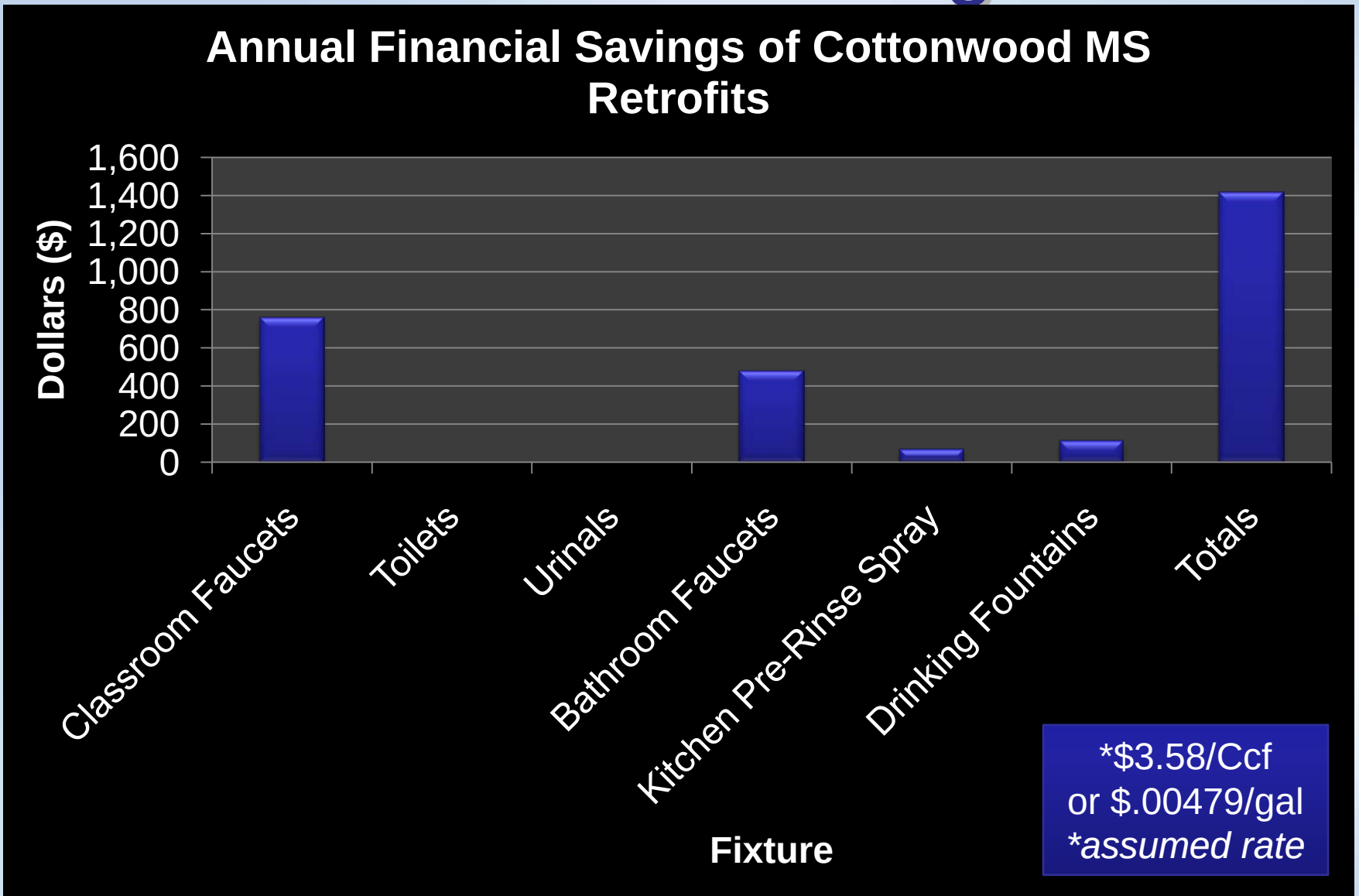
Cottonwood MS Projected Water Savings



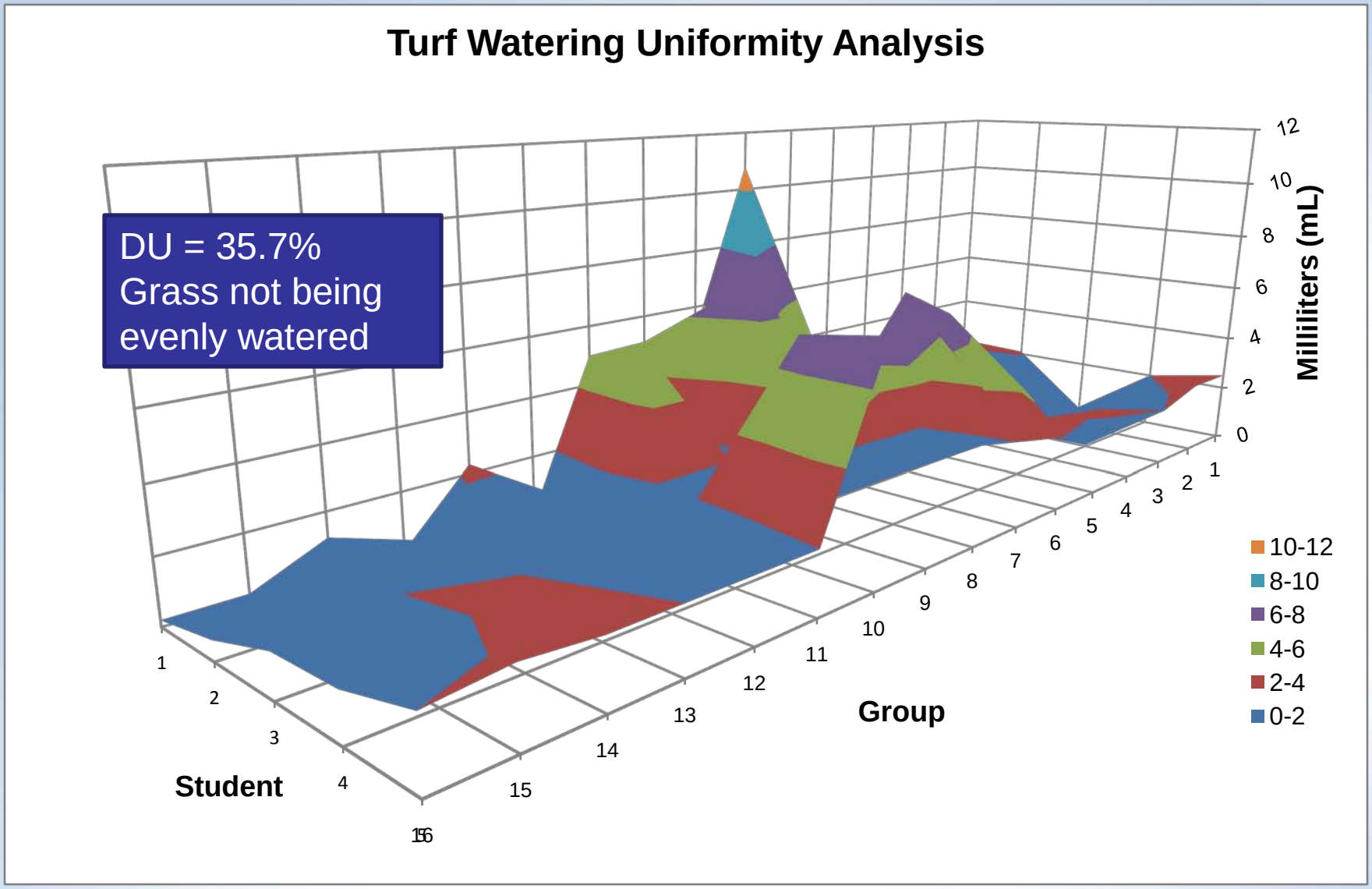
Cottonwood MS Projected Water Savings



Cottonwood MS Projected Financial Savings

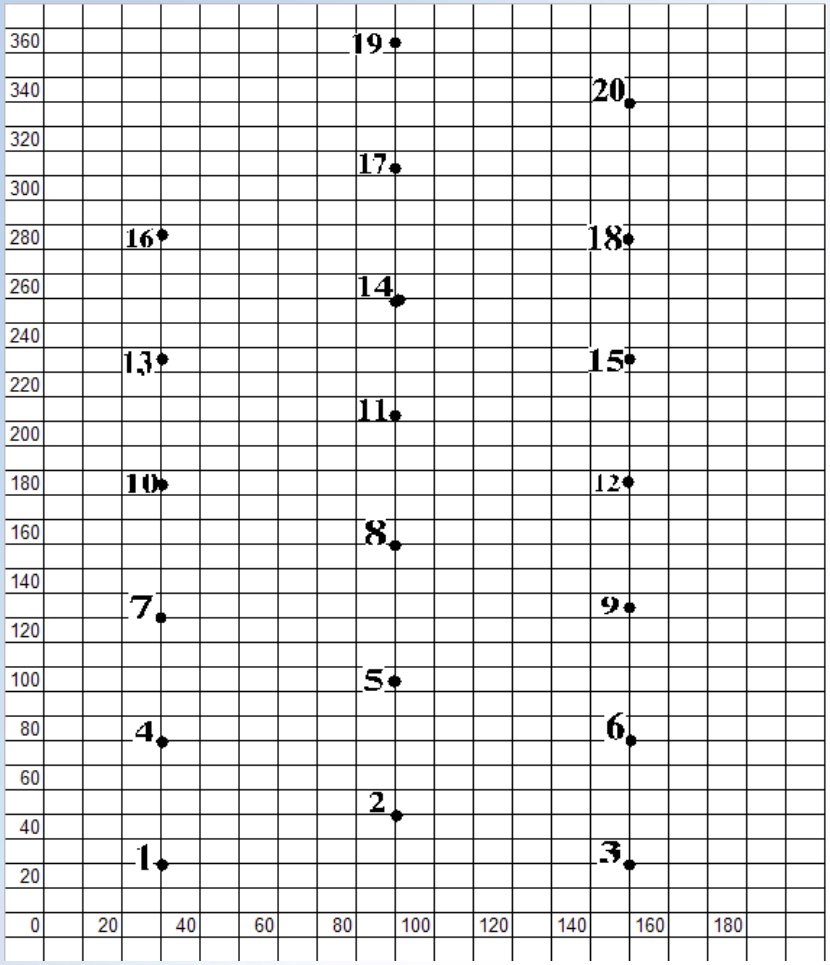


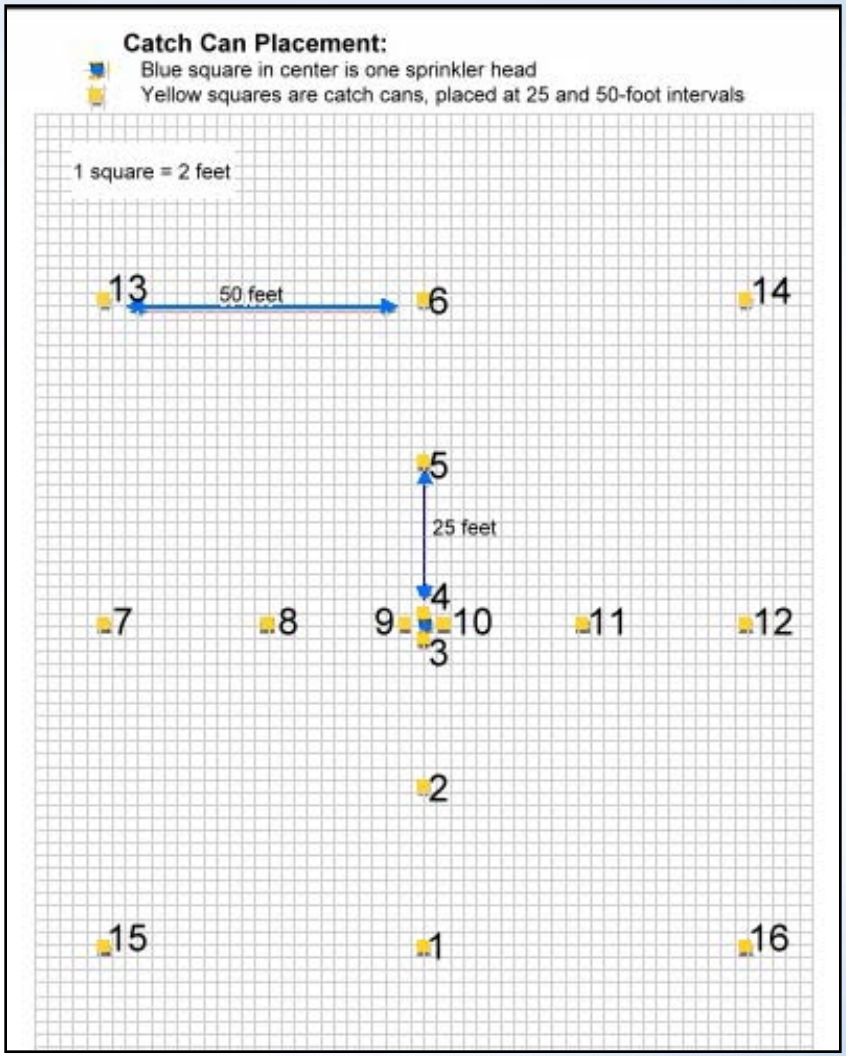
Outdoor Irrigation Audit



Distribution Uniformity

Sprinkler Locations on a Rectangular Athletic Field





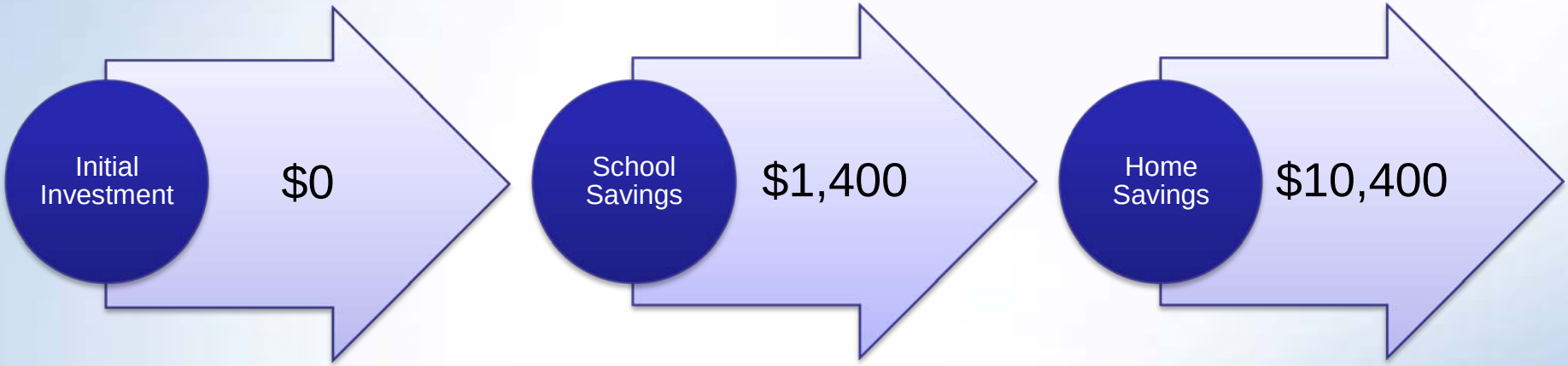
Home Water Audit Projected Savings

Home Retrofits	Annual Savings (gallons)	Annual Savings* (dollars)
Aerators	876,000	$2,715.60
Dye Tablets (16% toilets had leaks)	2,464,480	$7,639.89
Total	**3,340,480**	**$10,355.49**

*Water rate = $3.10/1,000 gallons
Toilet savings based on 200 gallons/day for leaky toilets

Cottonwood MS Results

- Outdoor Audit lead to an IA professional audit
- 6 Students presented findings to county Water Advisory Board
- Governor's Excellence in Economic Development Award, Future Leaders



SWAP Student Testimonials

- “Doing the water audit that we have done with our class has made me realize that every family can do something about saving water…I think every person should hear what you have to say so we will all be more concerned about the things we use water for and so we will be more careful. I think kids can teach their parents some things about saving water.” -Wesley Keller

- “I learned how to replace a flapper and check my toilets with food color, and change the aerators and save water, and I learned how to use the shower head… I thought it was cool because if my parent’s water bill went down I would get the extra money, and at the same time I would be saving water.” “THANK YOU!!” -Ryan Kennedy

SWAP Parent Testimonial

From: SCOTT JUDY ESBIT

Subject: Re: Water Audit Homework

Very cool! Simon & I (while Scott is out of town) managed to put the aerators on the bathroom faucets. We definitely see the difference in the flow of the water. He will bring to class tomorrow the 3 old ones. Thanks for engaging the kids in a worthwhile learning experience that will help in so many ways! I look forward to seeing what happens w/ the toilet.

Judy Esbit

Student Survey Results

- When asked to rank the water audit, **44% of respondents felt it was "one of the best class projects ever", while another 44% felt it was "a good class project",** with 6% responding that it was a "fair" or "mediocre" class project.
- When asked "**What is the best definition of water conservation?"**
  - **64% responded that it was "the use of water saving methods including both technology and changing people's actions to reduce the amount of water that is used"**
  - 22% of respondents chose "changing people's action to reduce the amount of water that is used", 13% selected "the use of technology to reduce the amount of water that is used".

SWAP Works…making the water conservation gears turn

Next Steps: Energy Audit

- The water-energy link is simple: utilities rely on water for power generation processes and water municipalities use energy to treat and distribute supplies.
- The U.S. Geological Survey estimates that generating electricity accounts for almost half the nation's annual water use.
- Water, on the other hand, requires a steady supply of electricity to pump it, move it, treat it, distribute it, retrieve it after it's used and treat it for reuse or recharge.
- The next step in the evolution of this successful model is to: 1) incorporate the energy audit through the development of an inquiry-based curriculum and 2) link energy and water resources so that students understand that to use one is to use the other.

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