STEM Education Innovation Alliance

Science, Climate & Environment Day
February 14, 2018

COLUMBIA CREST A-STEM ACADEMY

Ashford, Washington | Eatonville School District

– Presentation Slides –

Upcycling, Terracycling and Red Worms: How to Be a "Green" Sustainable School

Engineering with Upcycled Materials

Kayden Dewey

Automatic Cat Food Feeder

Columbia Crest A+STEM Academy

The Journey to my Invention:

Robot built at Summer Camp Invention

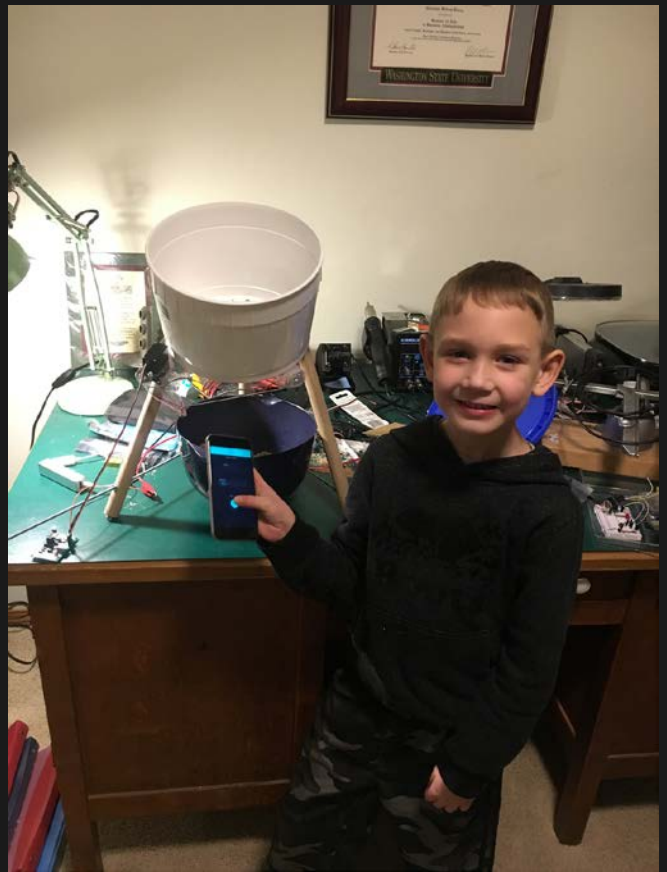
- Tear Apart Pieces from a VCR to assemble the body of a robot

Airplane built at Home

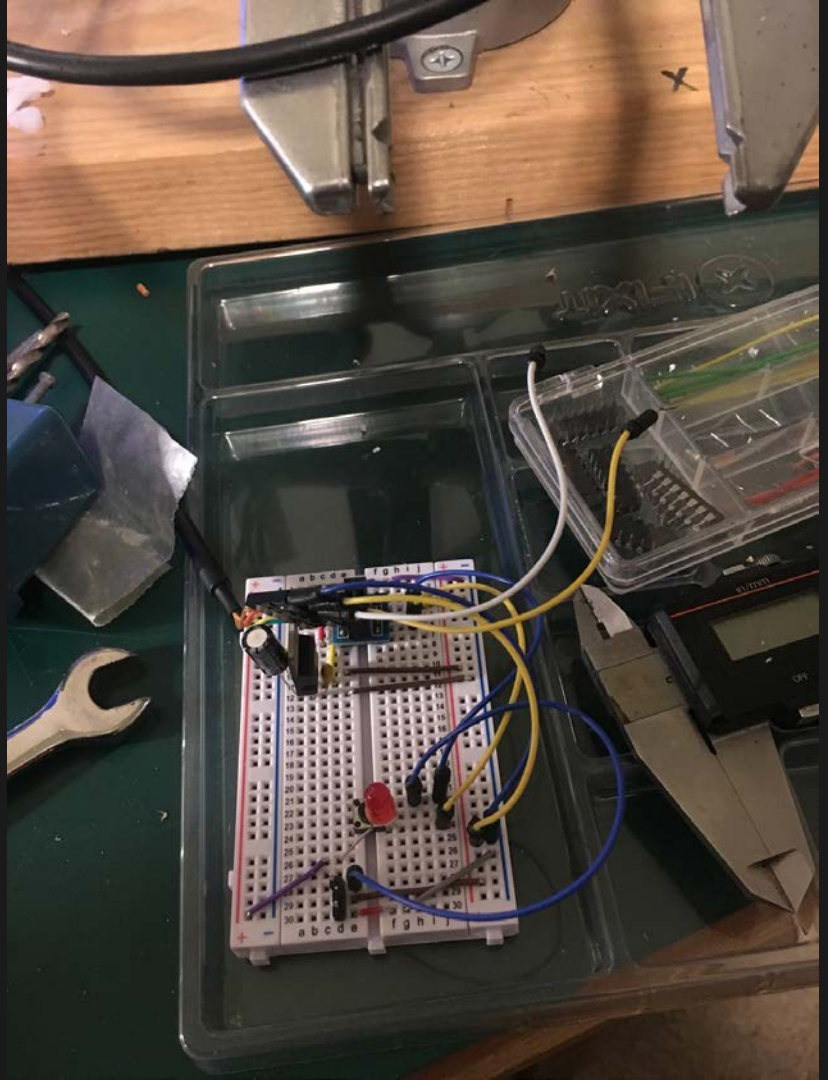
- Paper Towel Roll used as the body
- Toilet Paper Roll underside of wings
- Cut out Cardboard from a Cereal Box for the top side of the wing
- Applesauce Squeeze Pouch Cap for the Propellor

→ This has led to designing and building an **Automatic Cat Food Feeder**

The container is an Ice Cream Bucket



The majority of the materials were found at my house



STEM Education Innovation Alliance

Science, Climate & Environment Day
February 14, 2018

BORDEAUX ELEMENTARY SCHOOL

Shelton, Washington | Shelton School District

– Presentation Slides –

Environmental Factors Affecting Salmon

Environmental Factors Effecting Salmon

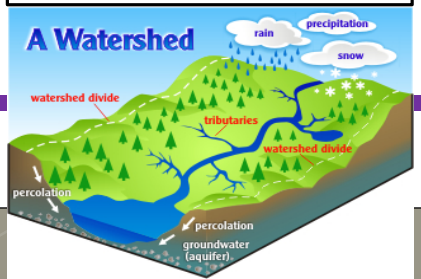
PROJECT: Salmon in the Classroom

WHAT DID WE LEARN FROM THIS PROJECT:

- Watersheds
- Pollution
- Water Quality

→ Environmental and human impact

→ Raising salmon in the classroom from egg to fry to release.

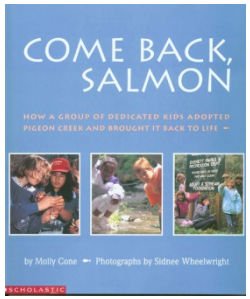


Classroom Investigations

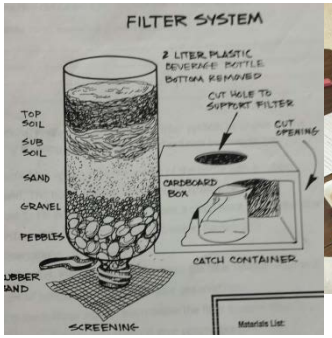
Building Background Knowledge ELA/SCI/SS

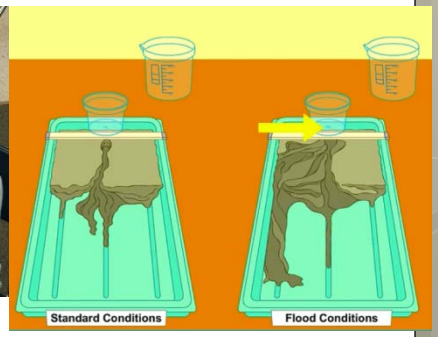
Integrated Learning

- ELA



- Science Experiments:
  - How do natural materials support healthy water & healthy habitats?





- Performance Task: Demonstration of Learning

Performance Essay: Write an essay educating other students on the importance of clean water for salmon.

Field Experiences

Kids Day at OysterFest

- Shellfish
- Watersheds
- Water quality
- Agriculture
- Electrical safety
- Recycling
- Water safety
- Puget Sound
- Pet waste

- Community Partners: Washington Sea Grant & Skookum Rotary

Field Investigations

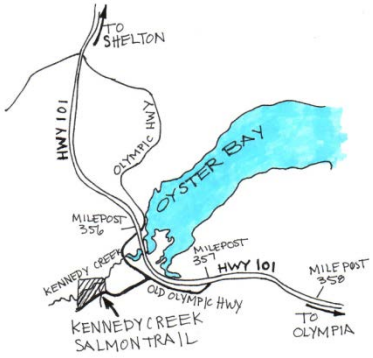
Kennedy Creek

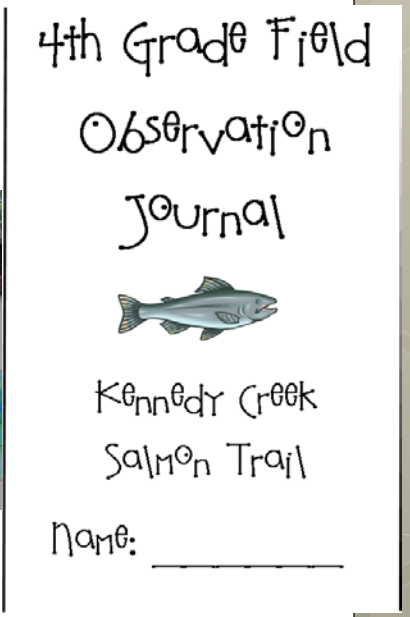
Observations:

Salmon life cycle

Chum spawning

Courting behaviors





- Community Partners: South Puget Sound Salmon Enhancement group

Salmon Release!

Sweet Water Creek - Belfair

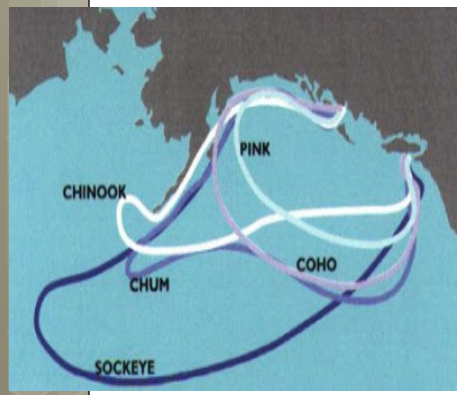
- Observations:
  - Healthy riparian zone
- Food Web activity
- Released our fry!

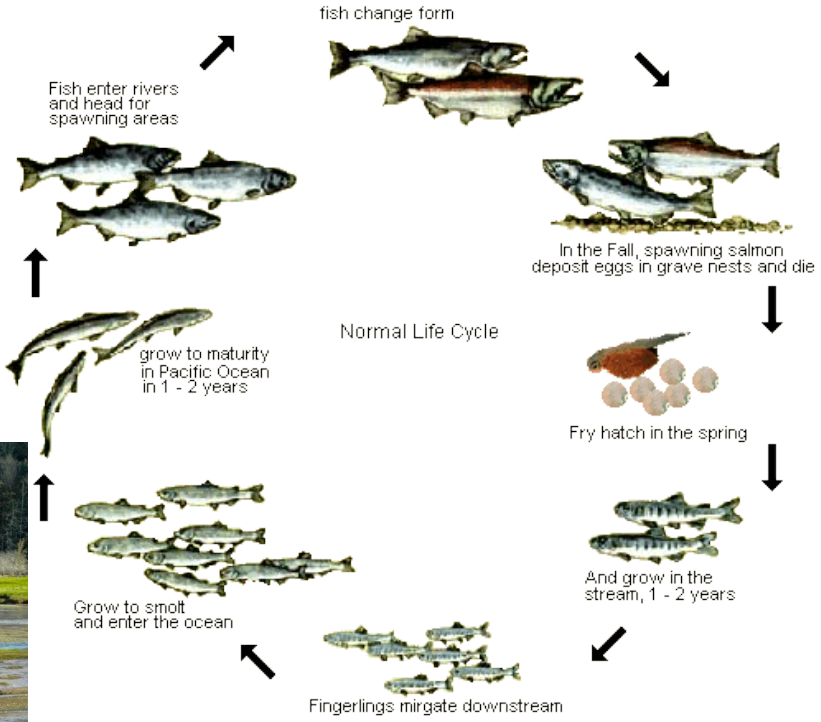
Climate Change

- Air and water temperature is increasing
  - Industry
  - Human Growth

Climate Change
Impact on Life Cycle

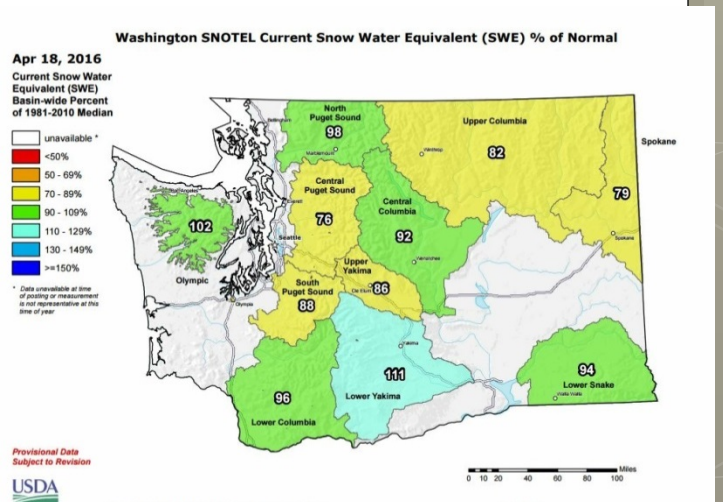
- Increased temperature **effects** salmon's lifecycle
  - Metabolism
  - Shift in Migration





Climate Change
Impact on Habitat Summer/Winter

- Temperature is increasing (**cause**)
- Increased temperature **effects** habitat
  - Less snow pack = lower water/stream levels in the summer months
  - More rain and flooding = higher water/stream levels in the winter months



Impact on Salmon

- Declining salmon population
  - Loss of important food source
  - Impact cultural Native traditions

Salmon Release in Belfair

STEM Education Innovation Alliance

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EVERGREEN MIDDLE SCHOOL

Everett, Washington | Everett School District

– Presentation Slides –

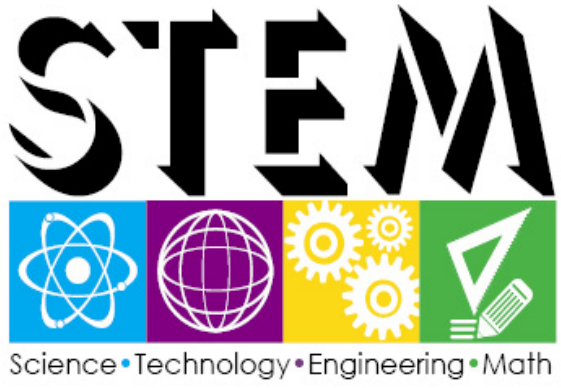
Energy Matters: Applying NGSS to Energy Conservation in Schools

Energy Matters:

Applying NGSS to Energy Conservation in Schools

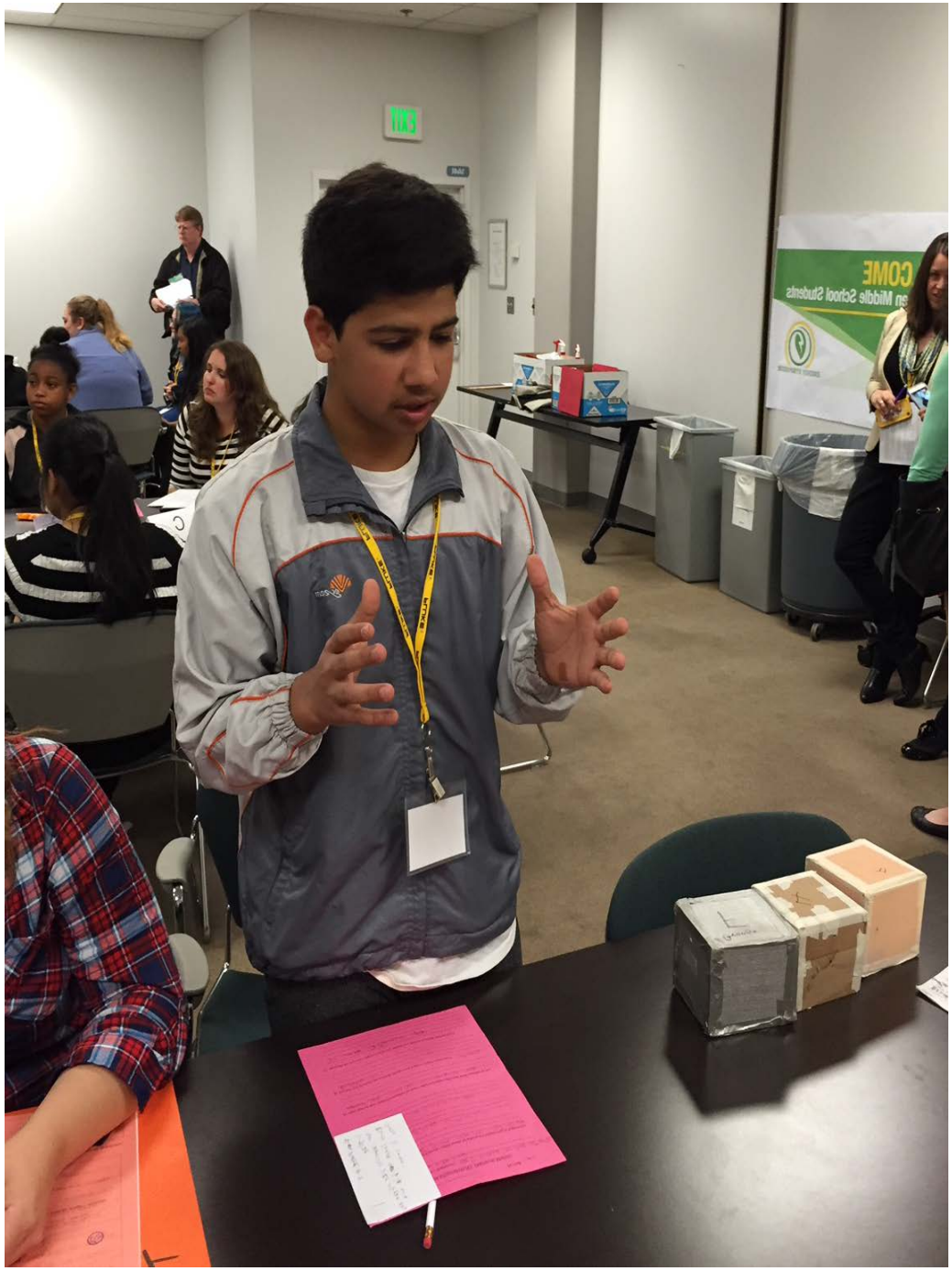
Goals and Partners


NEXT GENERATION
SCIENCE
STANDARDS


STEM
Science • Technology • Engineering • Math


Career & Technical Education
LEARN • EARN • LIVE


21st CENTURY SKILLS



Science and Engineering Practices

Asking questions and defining problems

Developing and using models

Planning and carrying out investigations

Analyzing and interpreting data

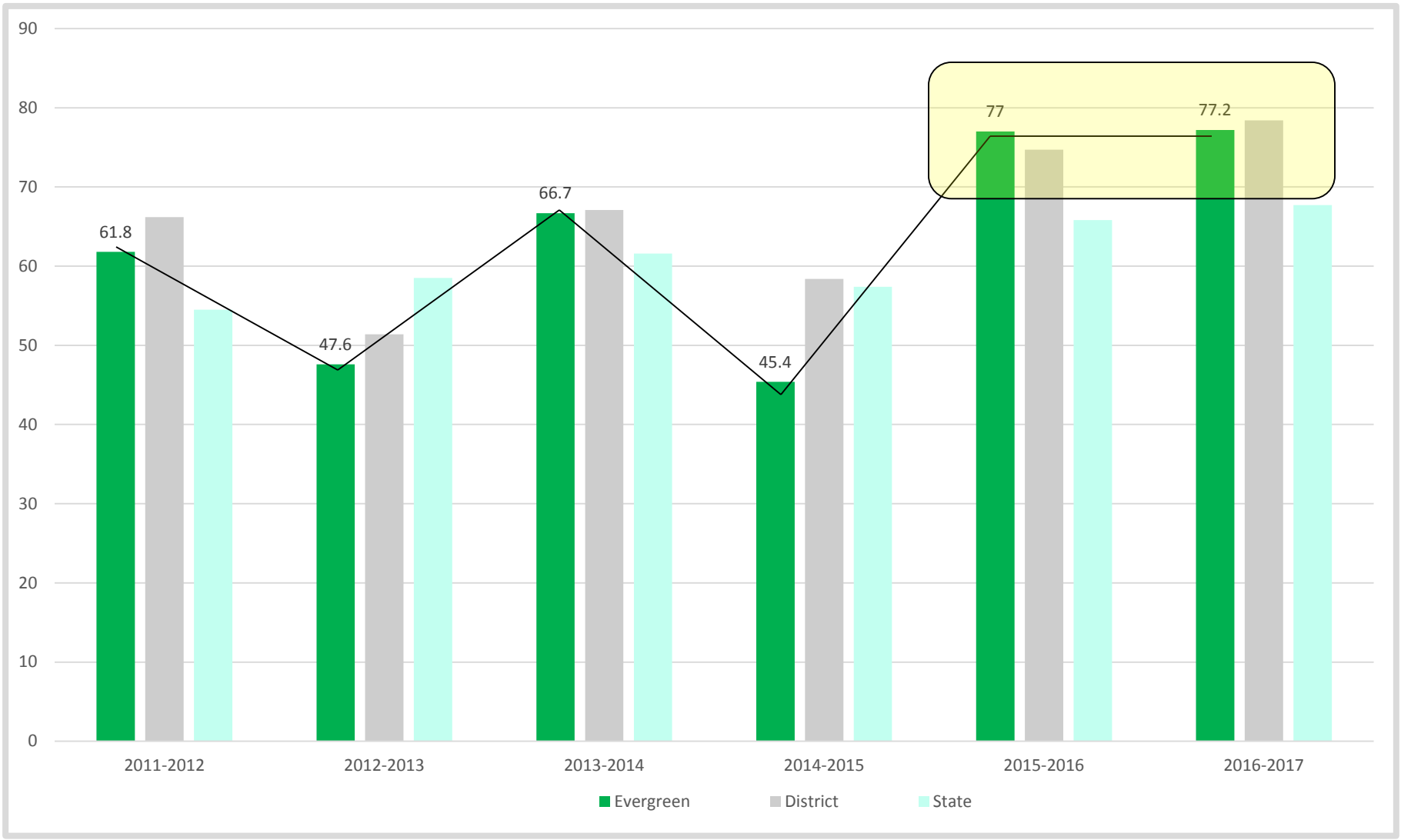
Using mathematics and computational thinking

Constructing explanations and designing solutions

Engaging in argument from evidence

Obtaining, evaluating, and communicating information

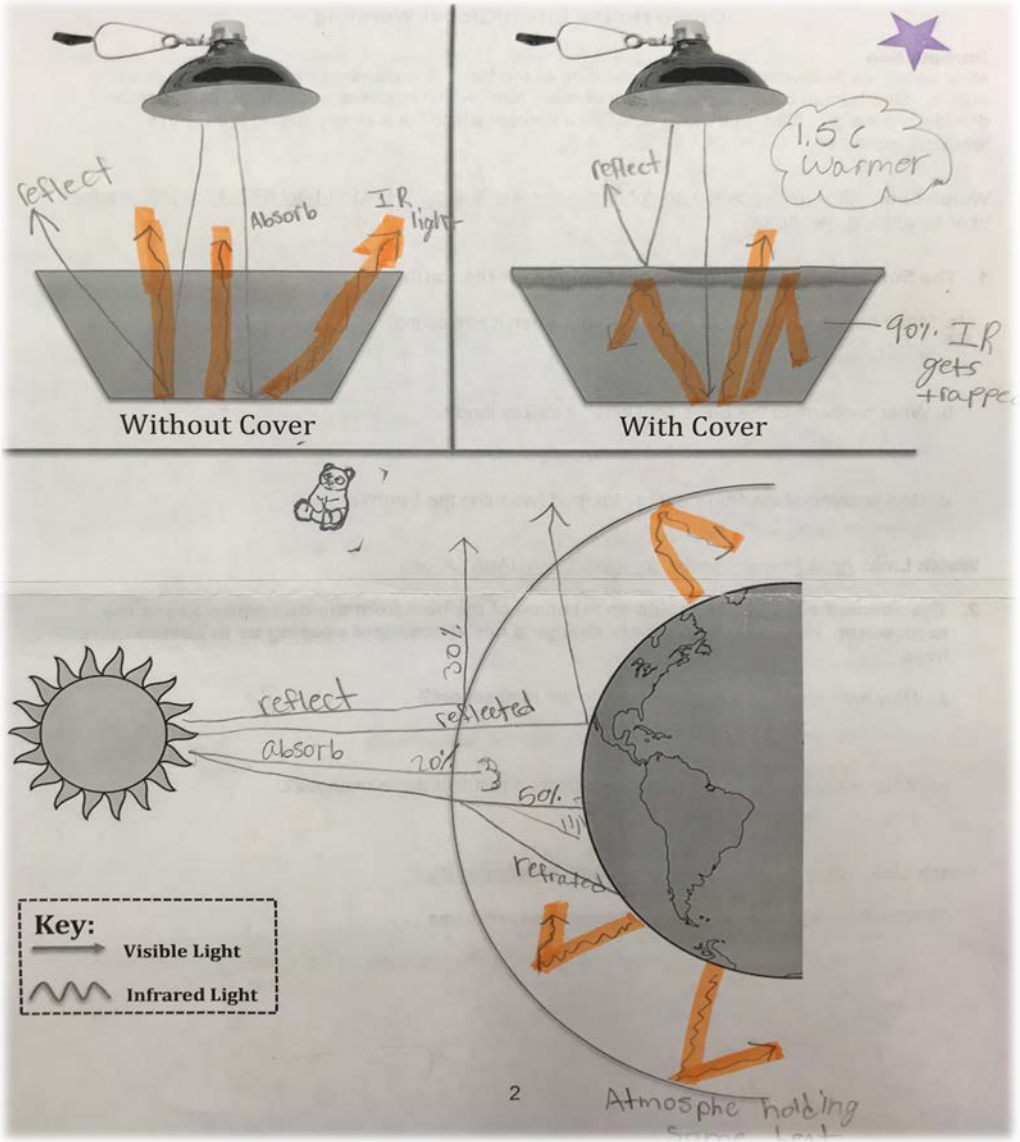
Evergreen's MSP Scores
Science Application



Where does Washington's energy come from?

Modeling Global Warming

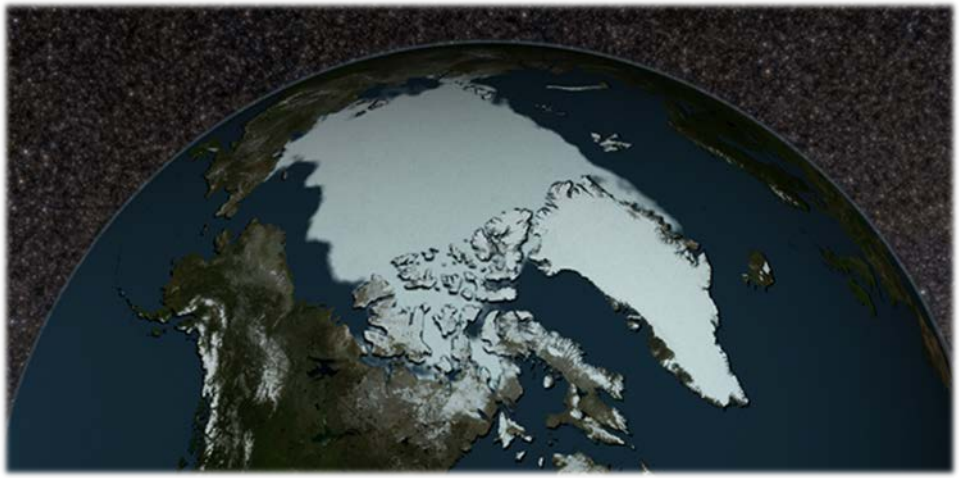
How can we model the greenhouse effect in the classroom?



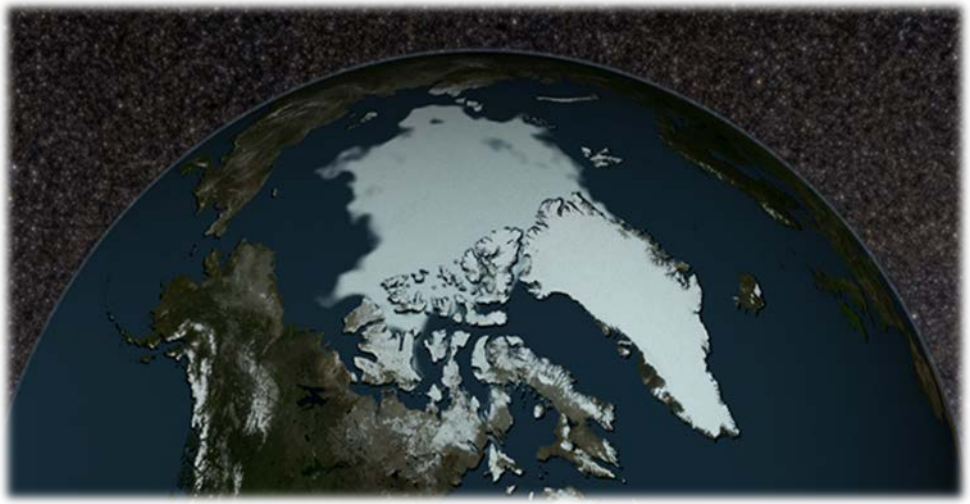
Ice Cores and Global Warming

Ice Sheets and Global Warming

Arctic Sea Ice 1979

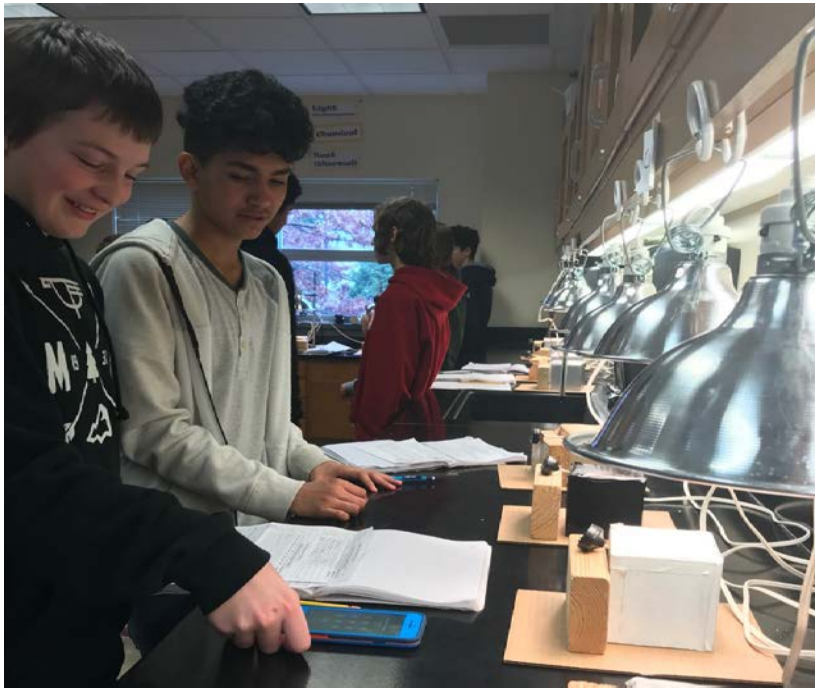


Arctic Sea Ice 2017



Building Models

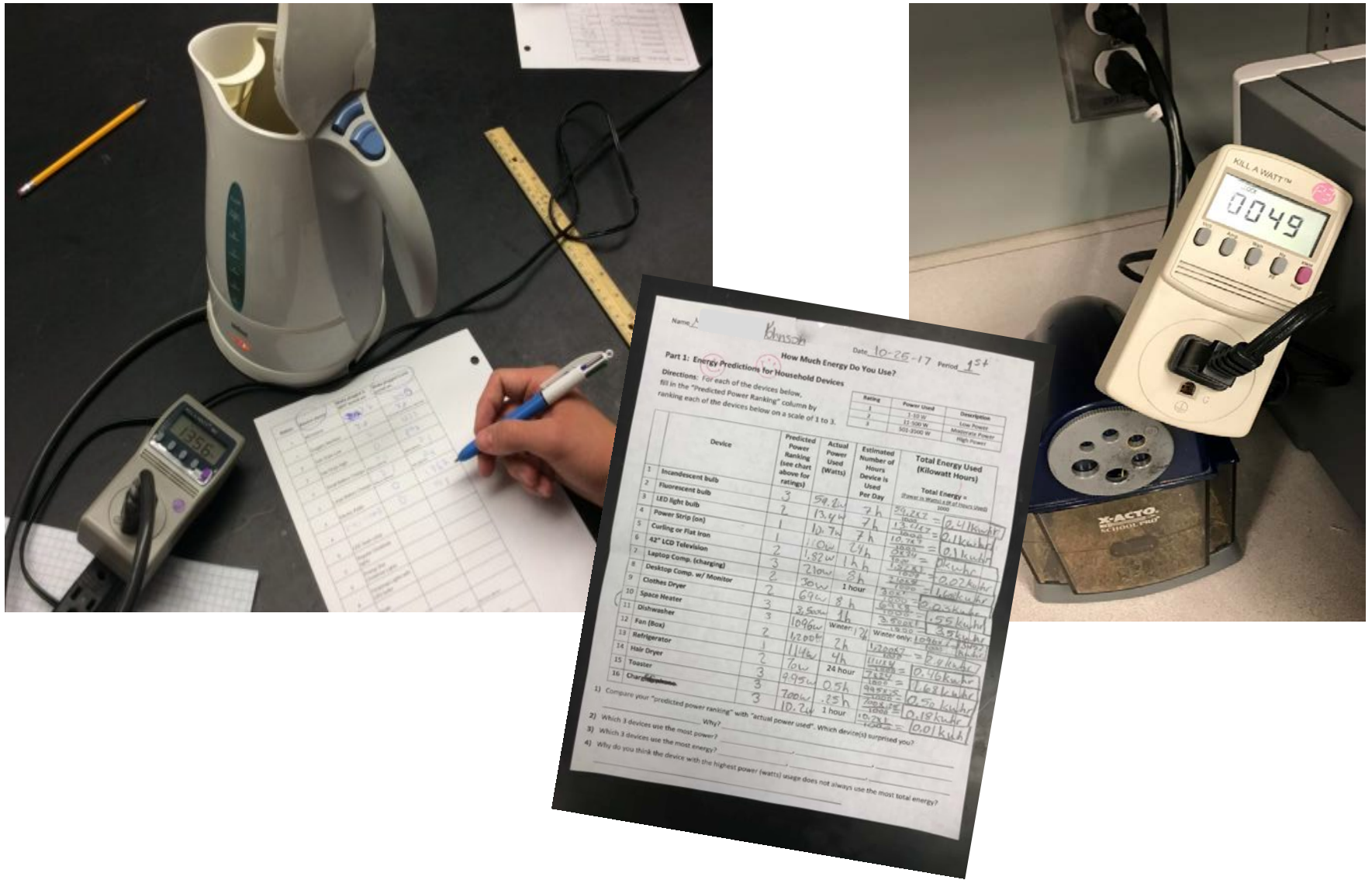
Collecting Seasonal Data with Models



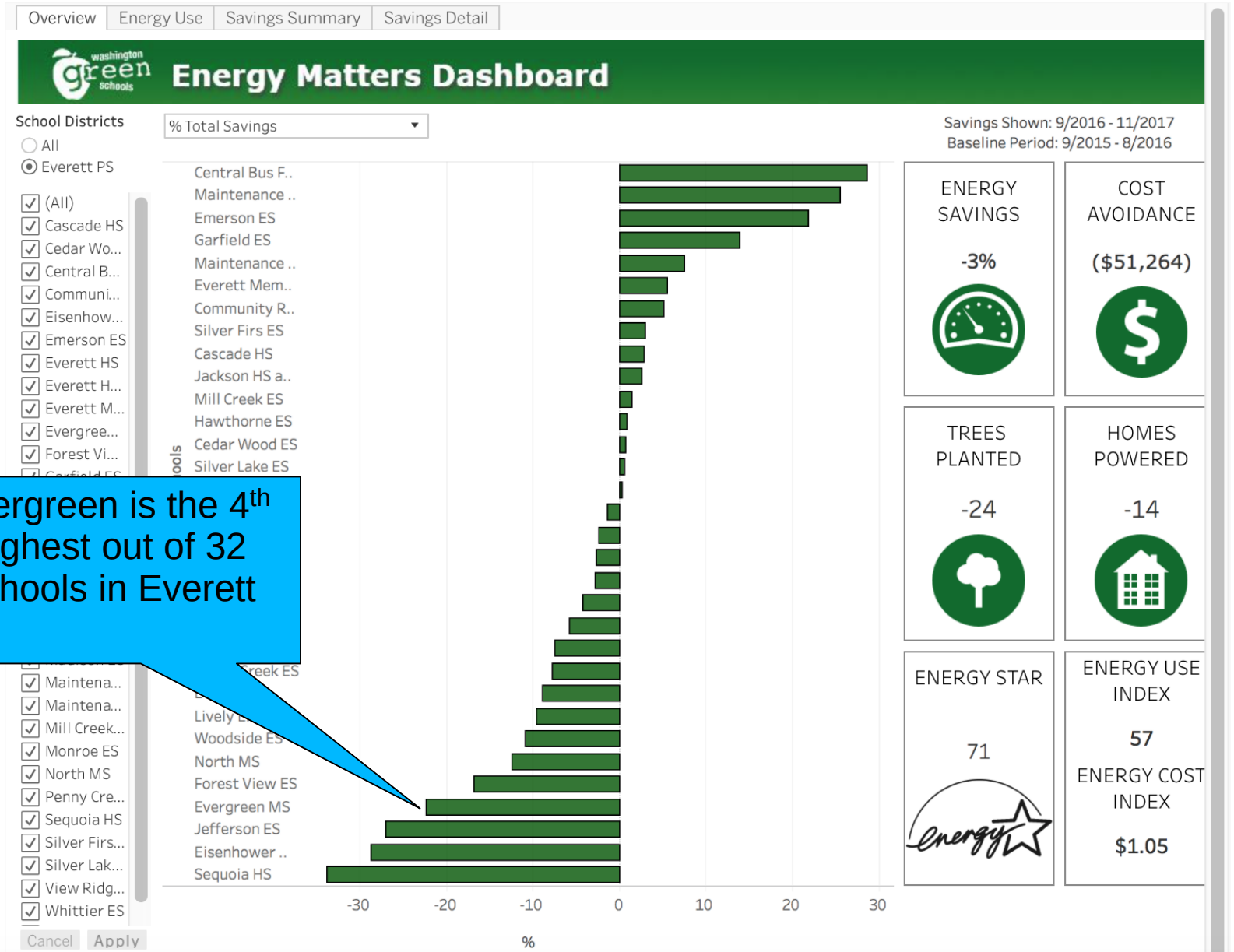
“winter”

“summer”

Using “Kill-A-Watt” Meters

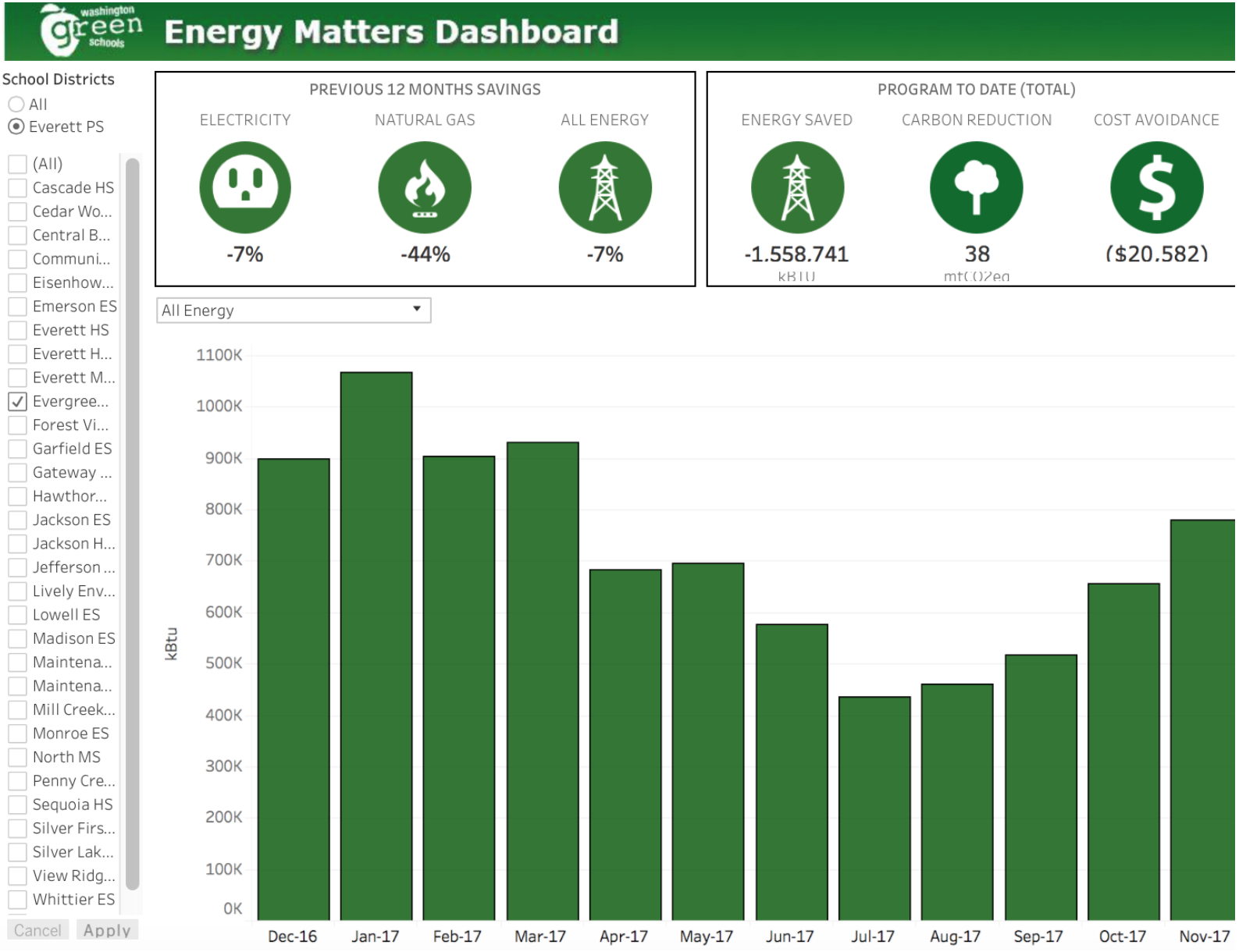


Energy Dashboard



Evergreen is the 4th highest out of 32 schools in Everett

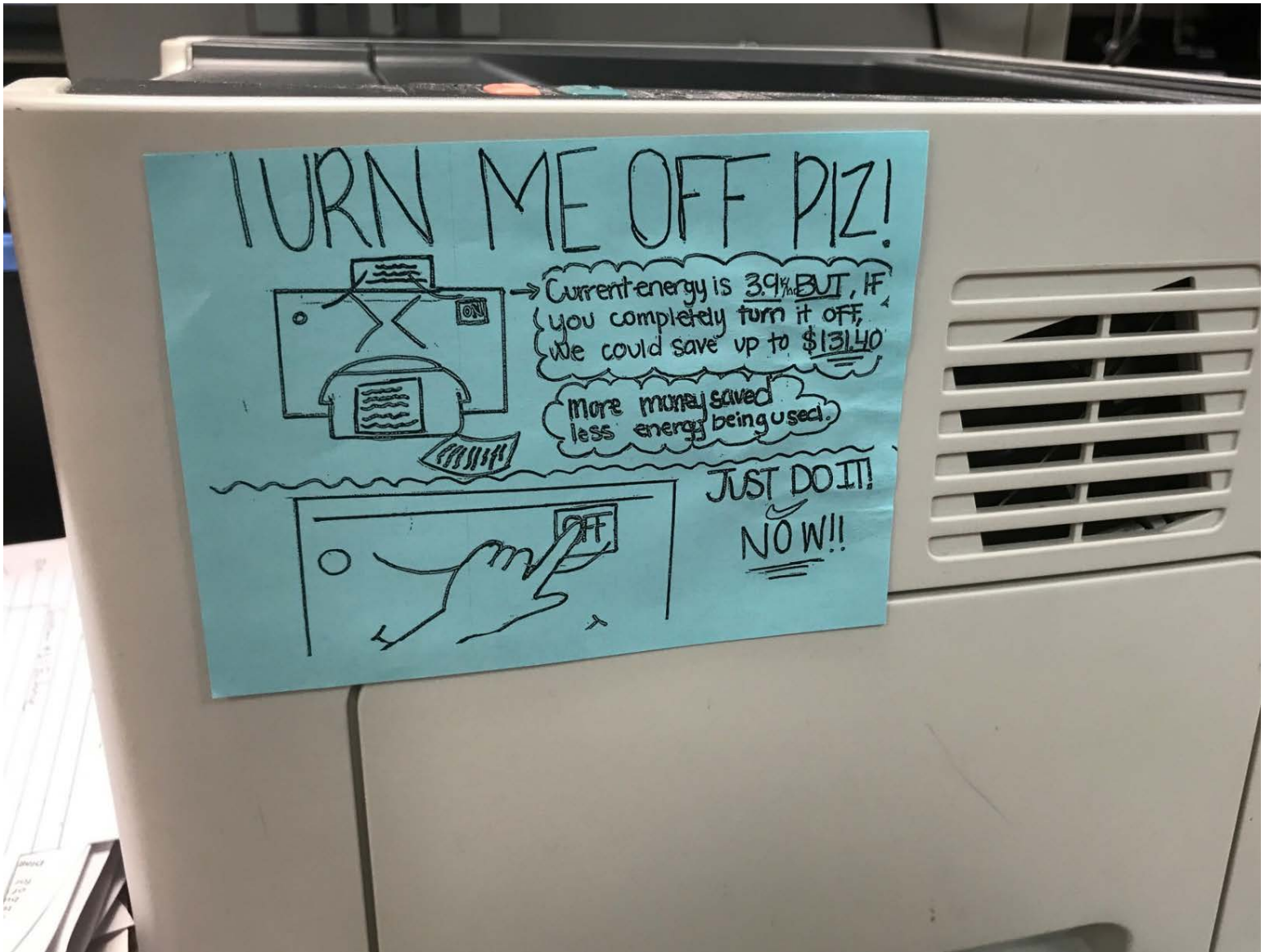
Natural Gas Use



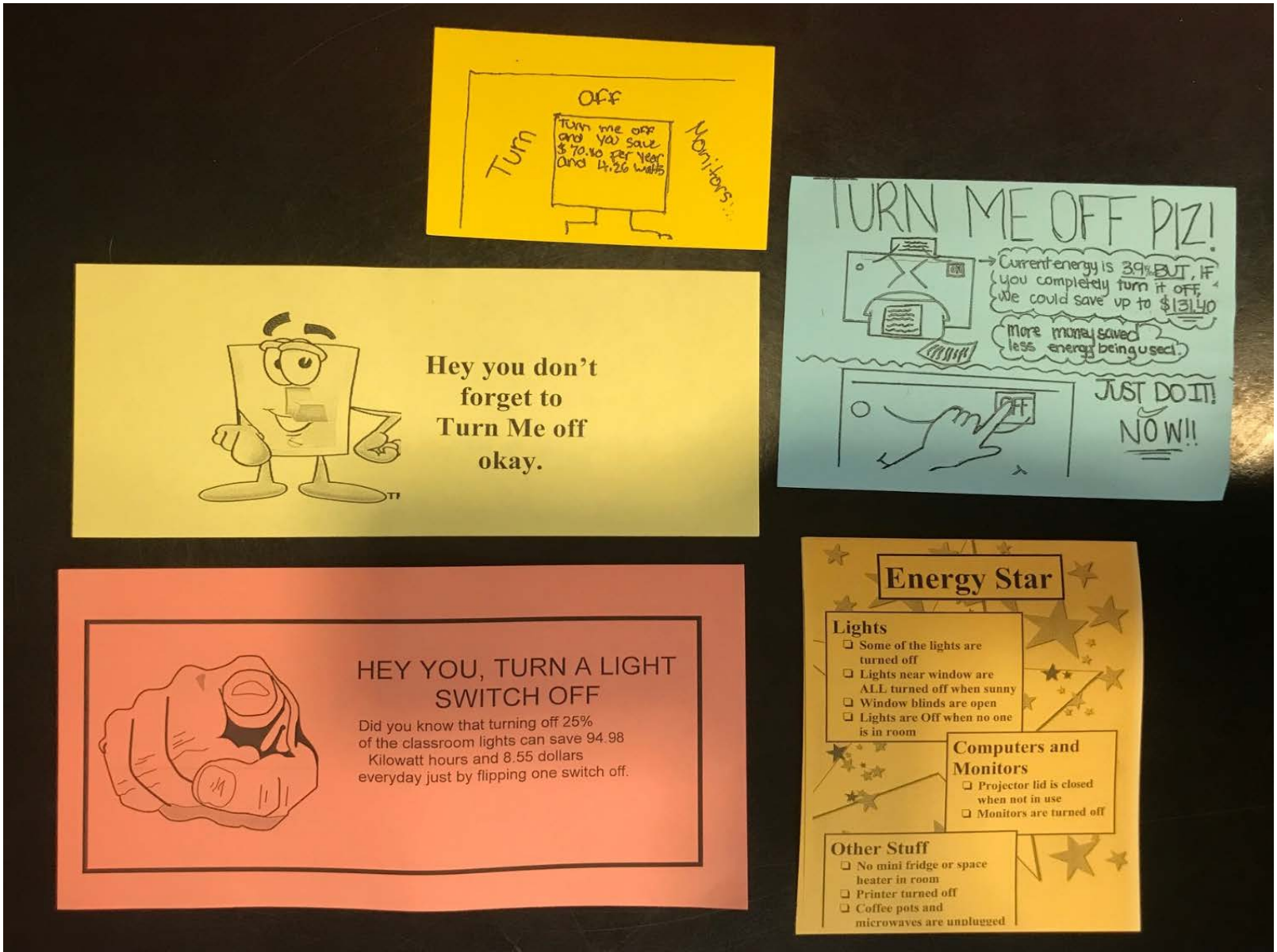
How much is 50 metric tons of CO_2?

× 50

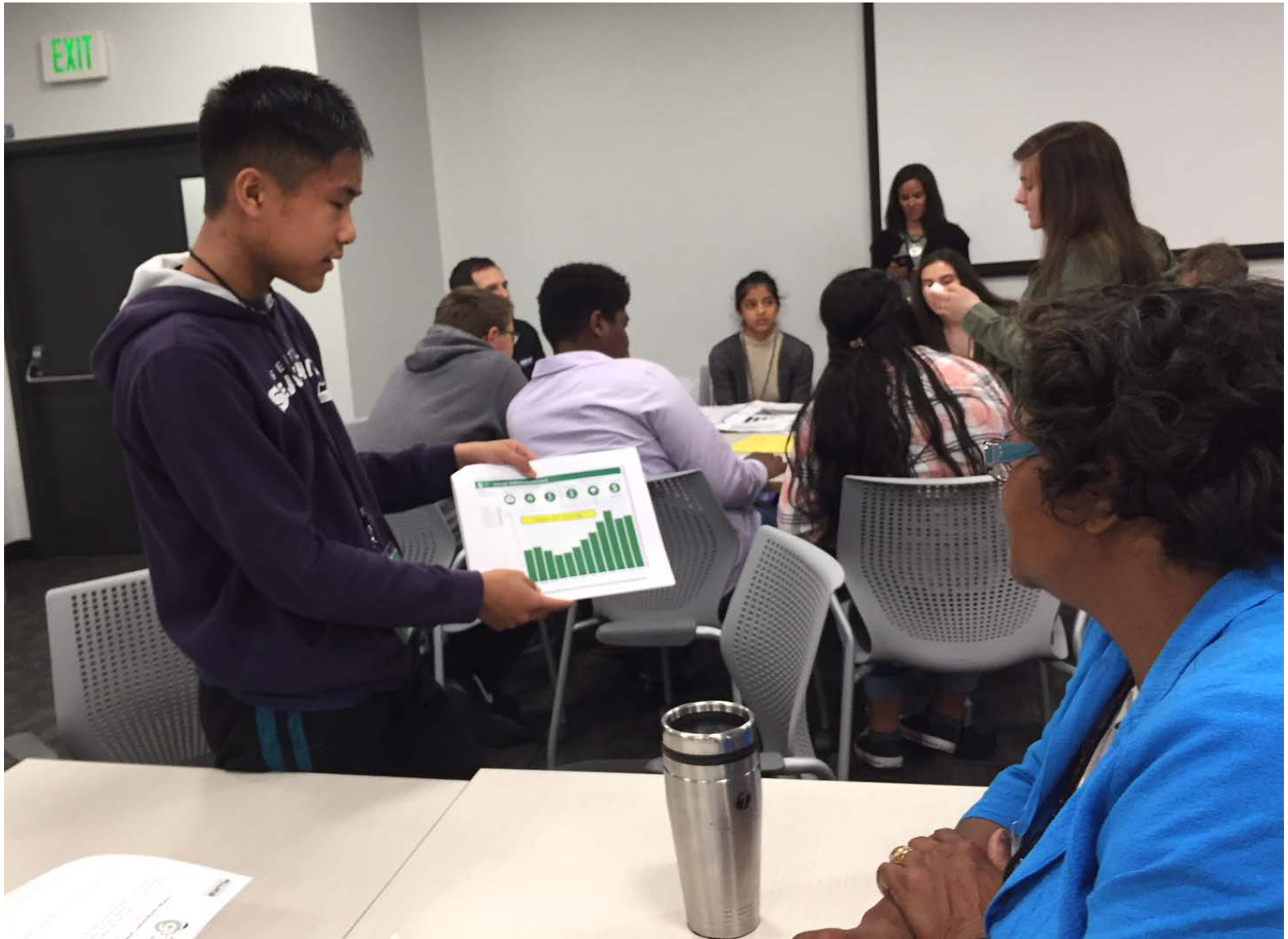
Energy Campaign



Reminders


Turn
Off
Monitors
Turn me off and ya save $70.10 per year and 4,126 watts
Hey you don't forget to Turn Me off okay.
TURN ME OFF PLZ!
Current energy is 39% BUT, IF you completely turn it off, we could save up to $131.40
More money saved less energy being used
JUST DO IT! NOW!!
HEY YOU, TURN A LIGHT SWITCH OFF
Did you know that turning off 25% of the classroom lights can save 94.98 Kilowatt hours and 8.55 dollars everyday just by flipping one switch off.
Energy Star
Lights
Some of the lights are turned off
Lights near window are ALL turned off when sunny
Window blinds are open
Lights are Off when no one is in room
Computers and Monitors
Projector lid is closed when not in use
Monitors are turned off
Other Stuff
No mini fridge or space heater in room
Printer turned off
Coffee pots and microwaves are unplugged

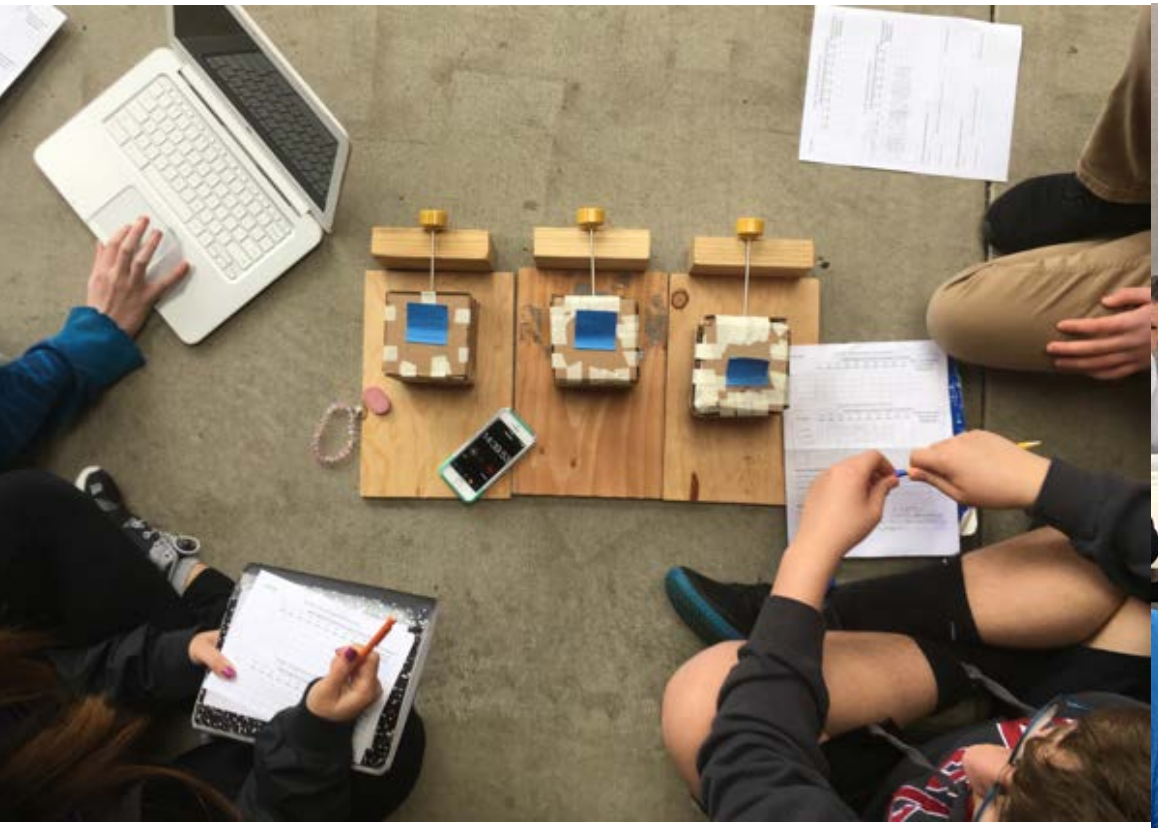
Energy Symposium

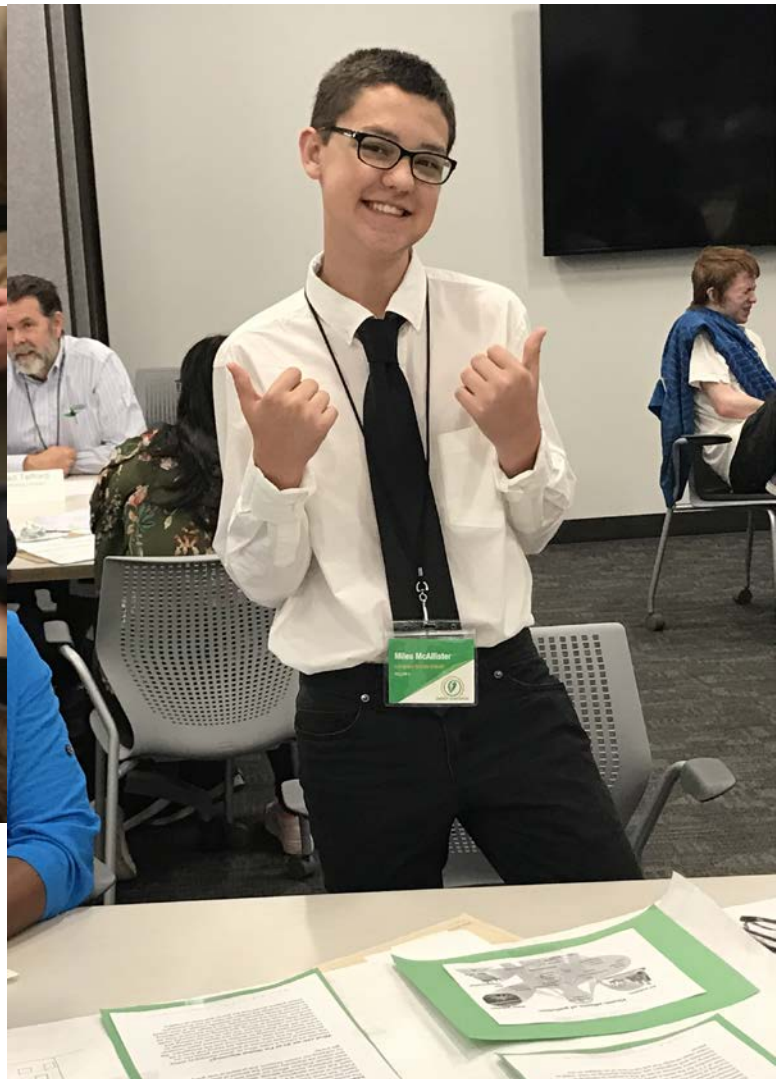


Energy Symposium

Energy Symposium

Thank you!
from the
Energy Matters Team





STEM Education Innovation Alliance

Science, Climate & Environment Day
February 14, 2018

TAHOLAH HIGH SCHOOL

Taholah, Washington | Taholah School District

– Presentation Slides –

Hypoxia

Taholah School CTE Programs

- Hypoxia (Dissolved Oxygen in Ocean)
- Algae Blooms
- Acidification
- Dead Zone

What causes Hypoxia?

- Wind and Current Changes.
- Upwelling from the Quinault Canyon. Non Oxygenated water in the deep parts of the canyon being pushed to the top. (Always moving) By the winds controlling the currents:
- Usually towards late July into September we see the change:
- Weather change (no wind) along with up welling being slowed down and non oxygenated water not making it to the top. The unoxygenated water staying low, moving into the shallow water. This provides no oxygen killing species that are in its way. Shell Fish, Fish, wolf eels, sole (Flounders) Perch ect.:
- Also Algae Blooms:
- When we have the big blooms in the ocean and the algae dies, It takes up oxygen as well. Sometimes this happens during the slowed up-welling:
- An Acidification Study has also linked Acidification to Hypoxia:

Quinault Nation Tribe

- Over 20,000 acres of land.
- 2,000 miles of fresh Water streams.
- 300 Nautical miles of Ocean.
- Quinault Tribe: From the Ocean to the Foot Hills of the Olympic Mountains

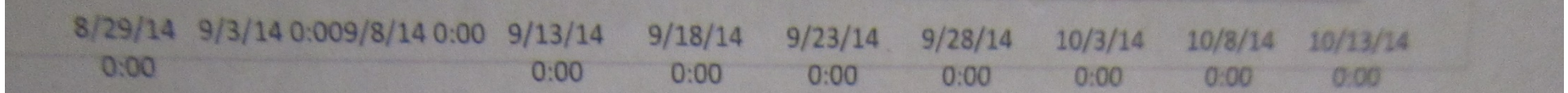
Why Career and Technical Education

- Hands on Visual
- Self Esteem Building
- Helping Each Other to Learn
- Real Life Experiences
- Working Side by Side with Professionals
- Working with our Community and Elders
- Understanding the Importance of all Classes
- Outside as well as in the Classroom

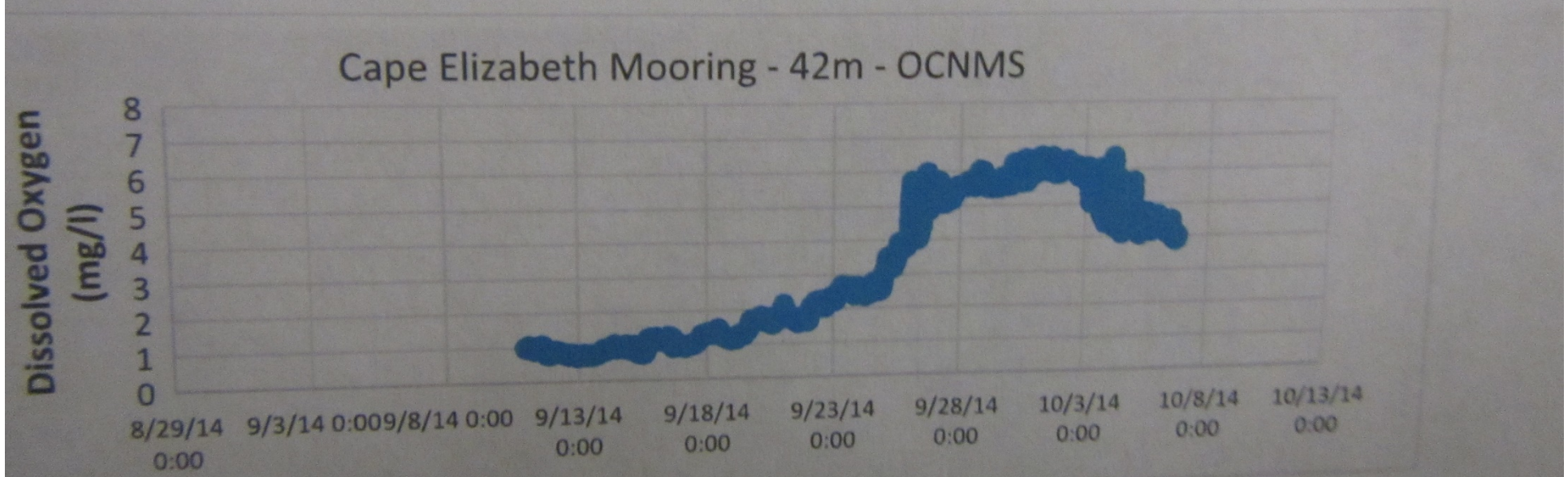
What Tools do we use

- YSI To monitor Water Temp., Salinity, Dissolved Oxygen
- 8 test sites
- Neoprenes
- Write in the rain notebooks, Pencils
- Excel Spread Sheets and Graphing
- PH Testing kits
- Water Tester Incubator: Test for E.coli and Fenkil matter
- HOBO Sensors: Water Temps.
- Our findings shared with the Quinault Nation and National Science Foundation:


Cabela's



4) DO data collected Sept. 11 – Oct. 6, 2014 by Sea Bird 37 SMP IDO mounted 1 meter above se
is located approximately 2.8 km. west-northwest of Quinault River mouth.



ig. 5) DO data collected Sept. 11 – Oct. 6, 2014 by Sea Bird 37 SMP IDO mounted 1 meter above seafloo
ite is located approximately 12.7 km. west-northwest of Quinault River mouth.

The OCNMS mooring data suggests a persistent hypoxic event was in effect in early to m
Quinault River mouth and beach study sites but less so at t

quality data will be needed to establish relationships.

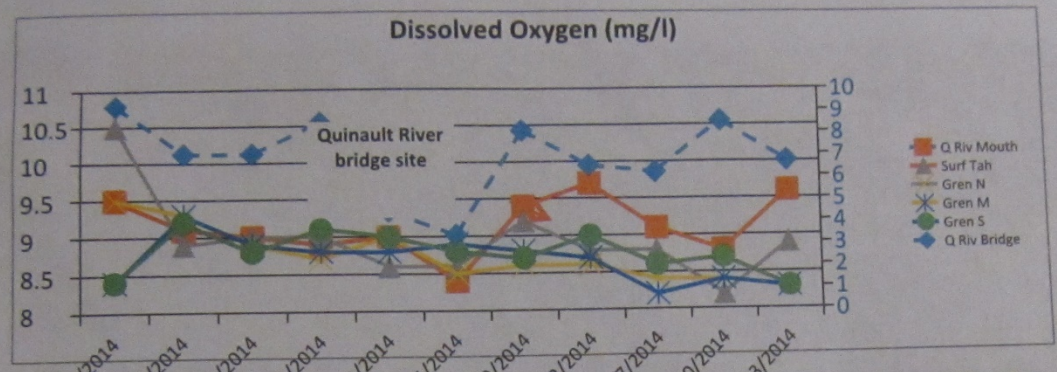


Fig. 1) Dissolved oxygen data collected by Taholah School students Sep. 11 – Oct. 13, 2014. Quinault River bridge site is associated with secondary axis (right side). All other sites relate to main axis.

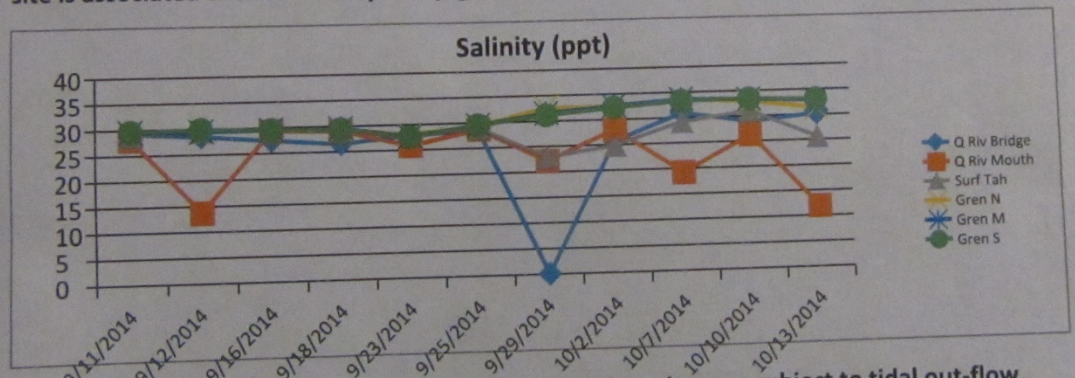
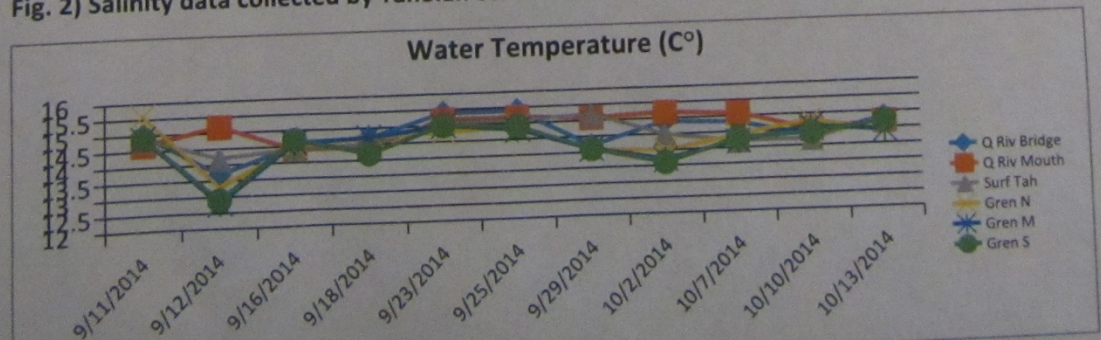


Fig. 2) Salinity data collected by Taholah School. In-river sites are subject to tidal out-flow.



Groups we work with:

- U of Washington: Megan Bang
- U of Oregon, Janet Hodder
- W.W. University, N.W. Indian College: Jude Apple
- U. of Connecticut: Kevin Joy
- NOAA-Nicole Harris
- Quinault Nation Marine Scientist: Joe Schumacker
- Nature Conservative Groups
- NASA-Weather and Climate, and Others


GRUNDENS

STEM Education Innovation Alliance

Science, Climate & Environment Day
February 14, 2018

SUMNER HIGH SCHOOL

Sumner, Washington | Sumner School District

– Presentation Slides –

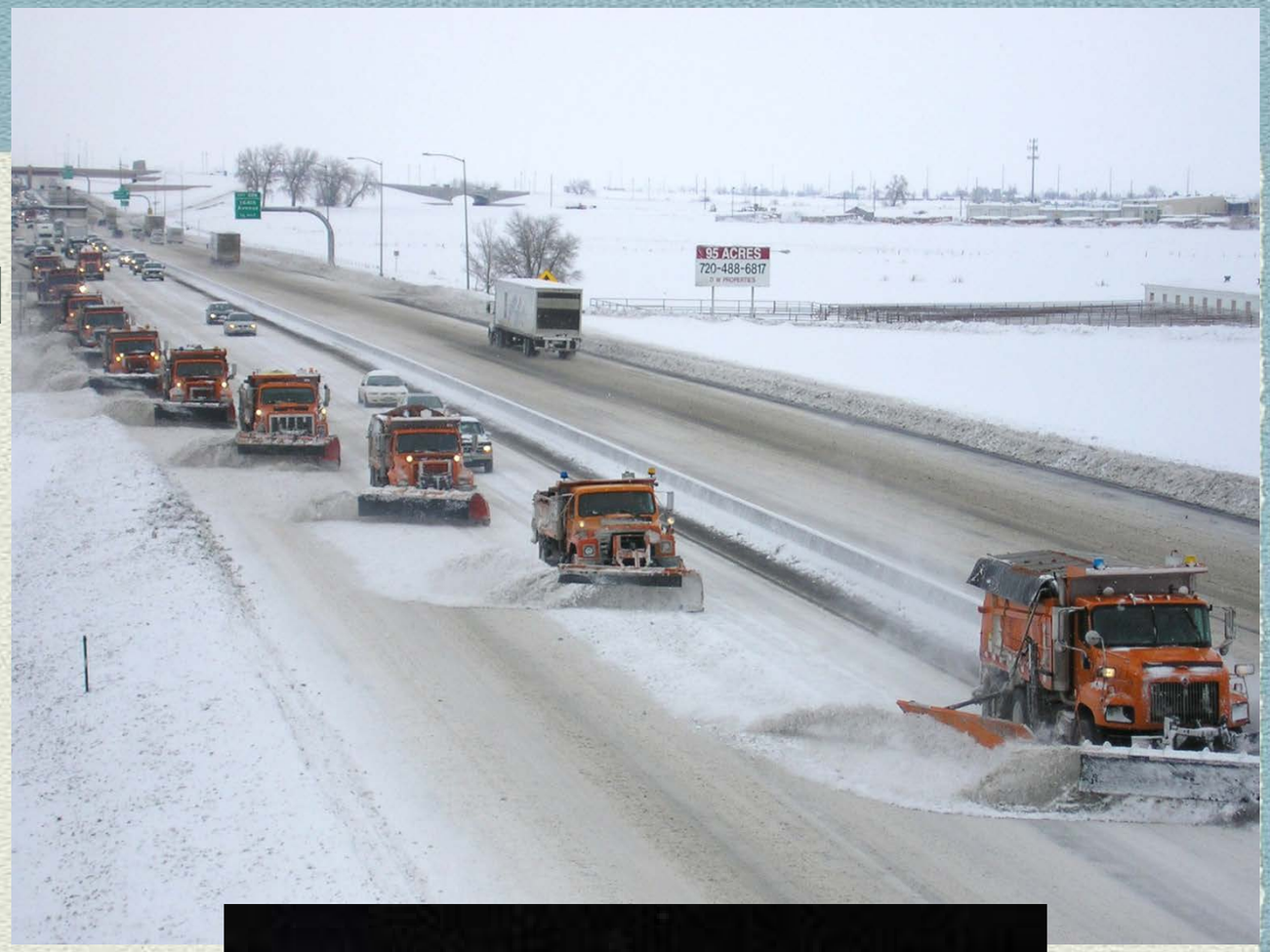
The Biological Hazards and Toxicity of Chloride Road Deicers to Ceriodaphnia Dubia

The Biological Hazards and Toxicity of Chloride Road Deicers to Ceriodaphnia Dubia

Makenzie Campbell & Kate Harris
Sumner High School

Introduction

- Chloride deicers are spread on roadways every single day across the nation
- Kaushal et Al “streams” study
- Different concentrations of chloride deicers can be tested on a species of water flea
- The significance of Dubia



Problem Statement & Hypothesis

<u>Problem Statement:</u>

What will the toxicity of different concentrations of sodium chloride deicers be to Ceriodaphnia Dubia, tested in the contexts of RDW as well as highway runoff?

<u>Hypothesis:</u>

If the concentrations of 100 mg/L, 316 mg/L, 1000 mg/L, 3155 mg/L, and 10000mg/L are tested, then the lethal concentration that kills 50% of the population will be between 3155 mg/L and 10000 mg/L.

Methods

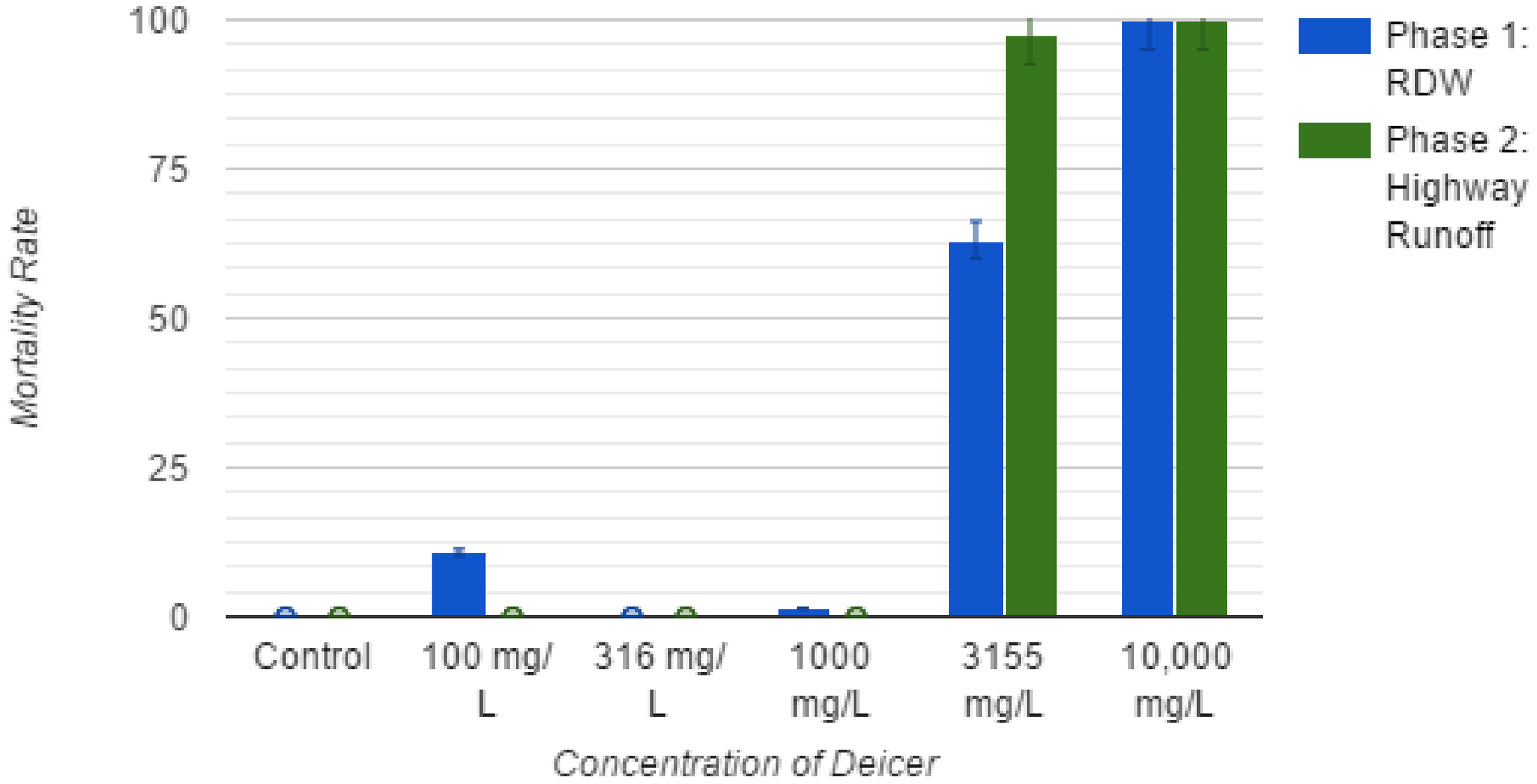
- Separate the groups: Control, 100mg/l, 316mg/l, 1,000mg/l, 3,155mg/l, and 10,000mg/l
- Weight and fill respective amounts of deicing salts into beakers with RDW
- After solution has been created, pour 25 mL into each beaker
- Place ten Dubia into each beaker
- Place in incubator and wait for 48 hours
- After 48 hours, calculate mortality rate and collect results
- Repeat experiment with highway runoff

Data

Table 3: Average Percent Mortality of Ceriodaphnia Dubia (Phase 1 & 2 Compared)

Concentration	Phase 1: RDW	Phase 2: Highway Runoff
Control	0	0
100 mg/L	10.8	0
316 mg/L	0	0
1000 mg/L	1.38	0
3155 mg/L	63.1	97.4
10,000 mg/L	100	100

Average Percent Mortality of Ceriodaphnia (Phases 1 & 2 Compared)



Conclusions

- Hypothesis not supported (LC50 was approx. 2,115mg/L instead of the estimated 3,155 - 10,000mg/L
- At 3,155mg/L concentration there was a 63.1% mortality in the RDW sample, but a 97.4% in the HR
  - Synergism
- Impact on the food chain
- Environment Canada
- Further research? Hydraulic fluids or engine oils

Impacts of Climate Change

- Polar ice caps are melting
- Coral reefs are being bleached and dying
- Heat waves and natural disasters
- It is more difficult to grow crops in areas that no longer have enough precipitation resulting in food insecurity
- Warmer environments trap smog, particulate air pollution

Connection to climate change

- Chemicals that are being used by humans are having a direct negative impact on aquatic organisms.
- This is another way that climate change is having a negative impact on our environment.

Human Impact

- As humans try to adjust to the effects of climate change, we are making it even worse.
  - De-icers
  - Increase in water usage
    - Watering lawns
    - Recreation
      - Pollution in recreational waters
  - Heating and cooling
    - Wood Burning fireplace

Value in Education

- We need to be open to doing more research about finding ways to handle the effects of climate change that are less harmful to the environment.
  - Example: Natural ways to ensure that the roads are safe and protected as opposed to using chemical de-icing salts.

Connection to education

- Support STEM education and connections with community partners
- Students become engaged in this work
- Students develop a passion from a young age
- They will be inspired to create change for future generations

WASHINGTON STEM
REIMAGINING SCIENCE, TECHNOLOGY, ENGINEERING + MATH EDUCATION

Thank you

STEM Education Innovation Alliance

Science, Climate & Environment Day
February 14, 2018

COLTON HIGH SCHOOL

Colton, Washington | Colton School District

– Presentation Slides –

Soil Health Benefits of Cover Crops and Grazing Cover Crops

Red Barn Farms, Colton WA

Our farm in Colton, WA, settled by my grandparents in 1901.
I'm the 5th generation of Meyer family living in our home and farming our land.

CrossSlot is one type of no-till drill

A no-till drill seeds into the previous year's harvested crop without disturbing the soil

Typical crops grown on our farm

Winter wheat ready to harvest

Spring wheat growing through winter wheat stubble

Garbanzos being harvested, about 1 bean per pod

Our Cover Crop Field

Our 18-species cover crop was selected to provide good cattle feed and improve soil fertility. It will be added as the 4th crop in the overall rotation.

No-till farming places seed & nutrients in one pass into last year's crop residue and roots, without disturbing the soil. The new plant grows up through the slot.

Benefits of No-Till

Eliminates erosion because crop residue and root structure keep soil in the field

Residue and cover crops keep ground covered year round and protected from wind storms

Reduction of Diesel & Greenhouse Gas Emissions

Home Page

NRCS - CROPLAND ENERGY TOOL

GREENHOUSE GAS EMISSION CHANGES FROM FIELD INPUTS

Landowner: Palouse Scenario #1 | Field Area: 2500 ac | Date: 1/1/2017

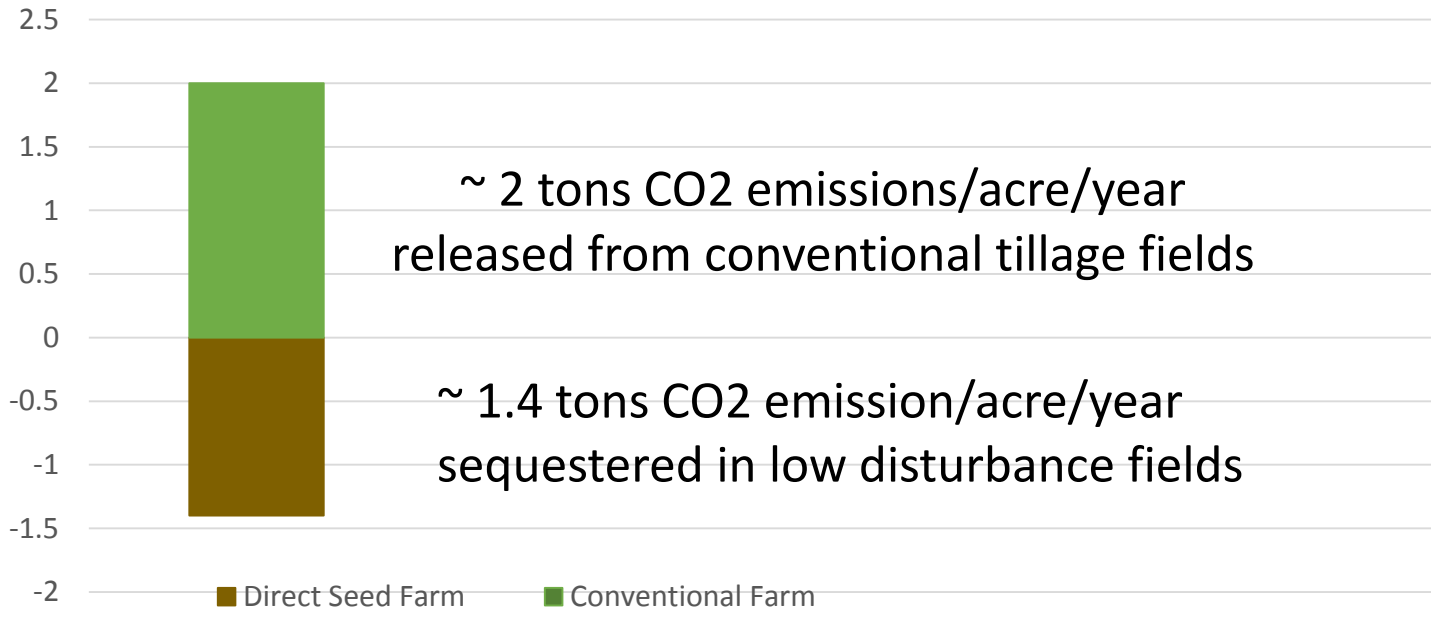
Field Location: Whitman Co., WA | Field ID: 1 | Latitude:

Longitude:

Energy Input	Units	Value	CO_2 [lb]	N_2O [lb]	CH_4 [lb]	Total CO_2 [lb]	SO_2 [lb]	NO_x [lb]
Liquid								
Diesel	Gal	14300.0	319,989.7	6.94	39.73	322,973.9	4.08	257.40

Based on the Cropland Energy Estimate Tool developed by USDA NRCS, and used to analyze my uncle's farm. Results: Our farm uses 14,000 less gallons of diesel and emissions are reduced by 322,000 pounds each year compared to a high-disturbance farm in our region.

Carbon Sequestered In Direct Seed Fields



~ 2 tons CO2 emissions/acre/year
released from conventional tillage fields

~ 1.4 tons CO2 emission/acre/year
sequestered in low disturbance fields

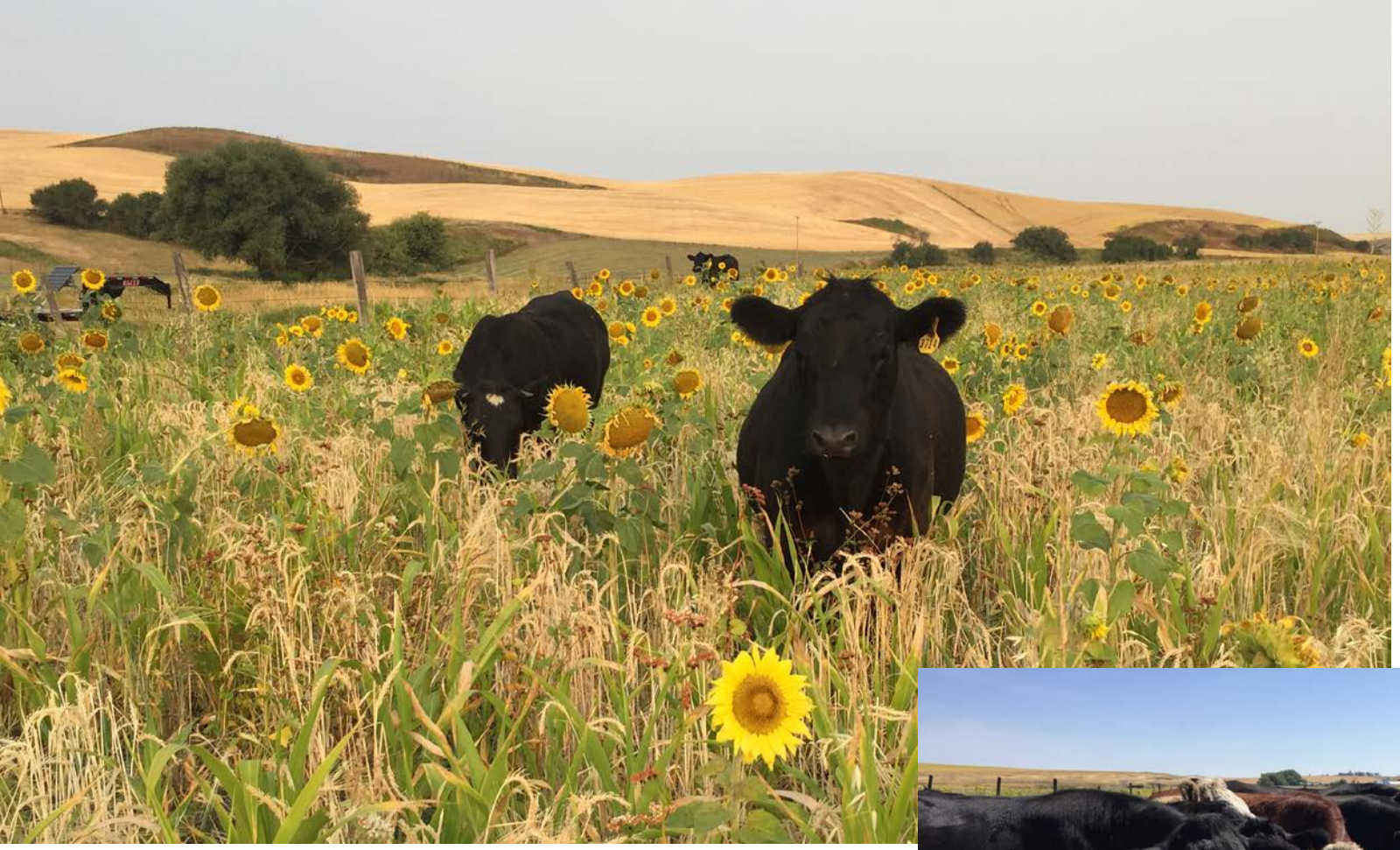
APPLIED ECOLOGICAL SERVICES

native energy

Based on research conducted by Applied Ecological Services and Native Energy,
a direct seed field can sequester 1.4 tons of CO2/acre/year.
That equals 3500 tons or 7 million pounds of CO2 sequestered on my uncle's 2500 acre farm.

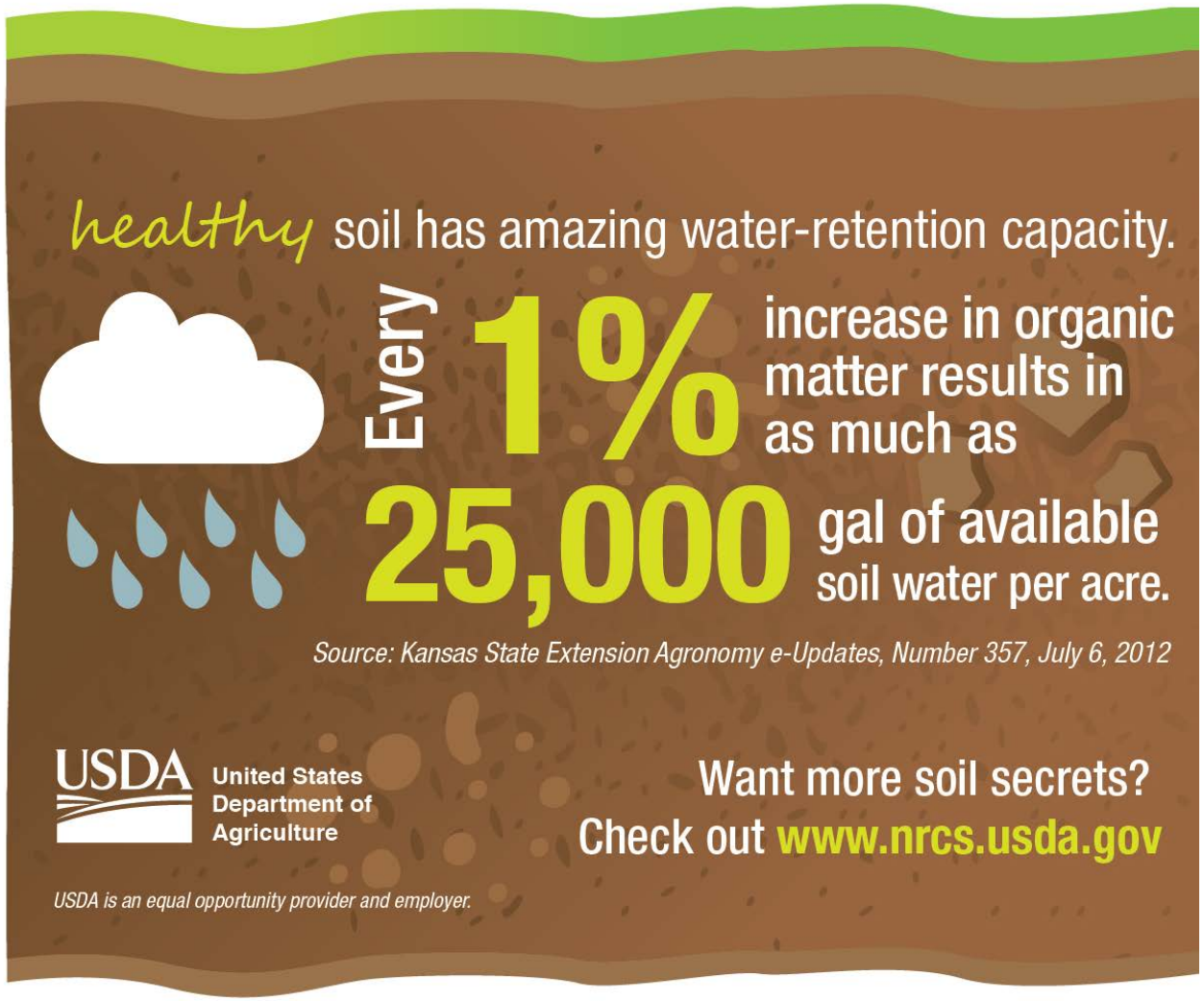
Electric fence had to be installed around the entire field, by installing the fence posts, running 3 – 5 wires, and installing the support stakes. The fencing crew was my family and cousins.

Cattle were excited to enter the cover crop field that averaged about 4 feet tall when they started grazing. They gained an average of 3 pounds per day.



Cattle grazing in late summer, cattle drinking from the mobile solar-powered watering system, radishes have long tap roots to bring nutrients back to the topsoil

Healthy soil facts



Project Conclusions

1) Double the amount of cattle to graze

2) Spring wheat crop's average net income is $39/acre and grazing cattle net income is $20/acre

3) Soil health benefit to planting a cover crop

4) Further document the increase of organic matter and carbon sequestration and reduction of greenhouse gas emissions and use of fossil fuels

Thank you for this opportunity

Jackson Meyer

Future Farmers of America

Colton, WA

STEM Education Innovation Alliance

Science, Climate & Environment Day
February 14, 2018

TESLA STEM HIGH SCHOOL

Redmond, Washington | Lake Washington School District

– Presentation Slides –

Operation Sustain

Operation Sustain

Teacher advisor names: Mike Town and Melissa Wrenchey

Name of team: Operation Sustain

Student names: Rayan Krishnan, Anne Lee, Parth Nain, Isaac Perrin, Fred Qin, Suchi Sridhar

School name: Tesla STEM High School

School city and state: Redmond, Washington

Principal name: Cindy Duenas


TRD
TUNDRA


Attitude is a little thing That Makes a
THINK LIKE A SCIENTIST
Layers of the Earth
THE ENGINEERING DESIGN PROCESS
SET A GOAL
MAKE A PLAN
SEAT SACK

4. Post Office

5. Police station

What is the source of electricity & how is it made?

Bacteria in polluted water breathe electrons which can be turned in electricity.

Which of these energy sources are considered *renewable*?

What is electricity? What makes electricity? If you know some sources, name them.

Electricity is a power or an energy to power up things to work. Electricity is made up of ~~a chemical with~~ electrons that zoom through the air or different places.

5. houses hotals

What is the source of electricity & how is it made?

It comes from wires.

Which of these energy sources are considered *renewable*?

You look up at the sky and see a it's full of a foul-smelling haze called smog.

How did it get there and how can it go away?

From pullotion, stop Dellating

What are two ways that you can prevent this pollution?

1. PICK UP TRASH!
2. Don't leave things on the floor.

You look up at the sky and see a it's full of a foul-smelling haze called smog.

How did it get there and how can it go away?

It got there by all the trash and it can go away by picking up the trash.

What are two ways that you can prevent this pollution?

1. Picking up trash

2.

You look up at the sky and see a it's full of a foul-smelling haze called smog.

How did it get there and how can it go away?

the wind car push it there and push it away

What are two ways that you can prevent this pollution?

1. block the wind
2. ?

Is there a benefit to having more people living in apartments rather than houses?

BEFORE QUIZ

Day 1 ☐ Day 4

Teacher Name [redacted] Claire Date 10/30/17

Seattle is destroyed in a surprise earthquake and you are hired to rebuild it! What are the 5 most important parts you want to include in your design?

1. Houses concrete.
2. [redacted]
3. I don't know.
4.
5.

What is the source of electricity & how is it made?

I don't know

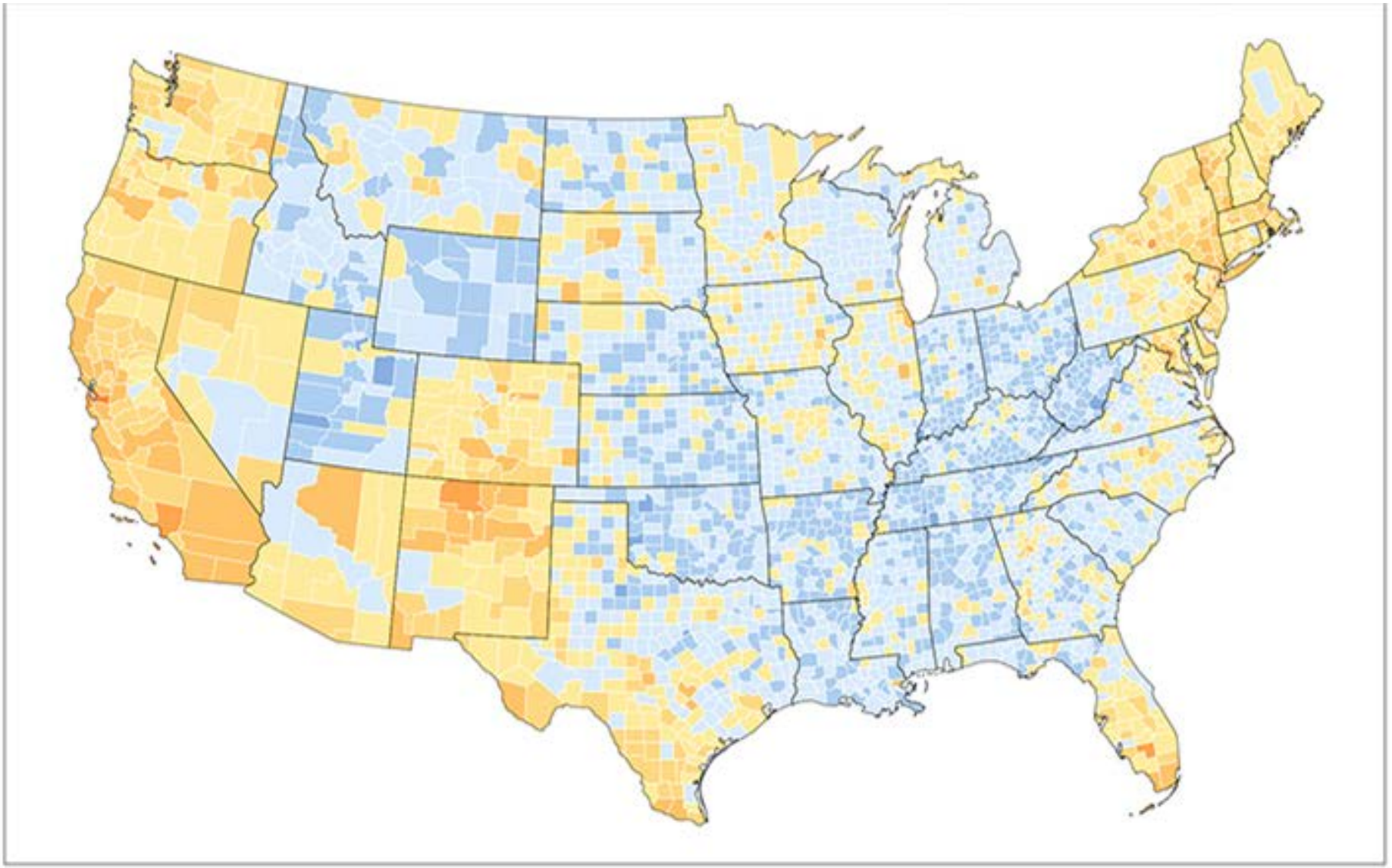
Which of these energy sources are considered *renewable*?

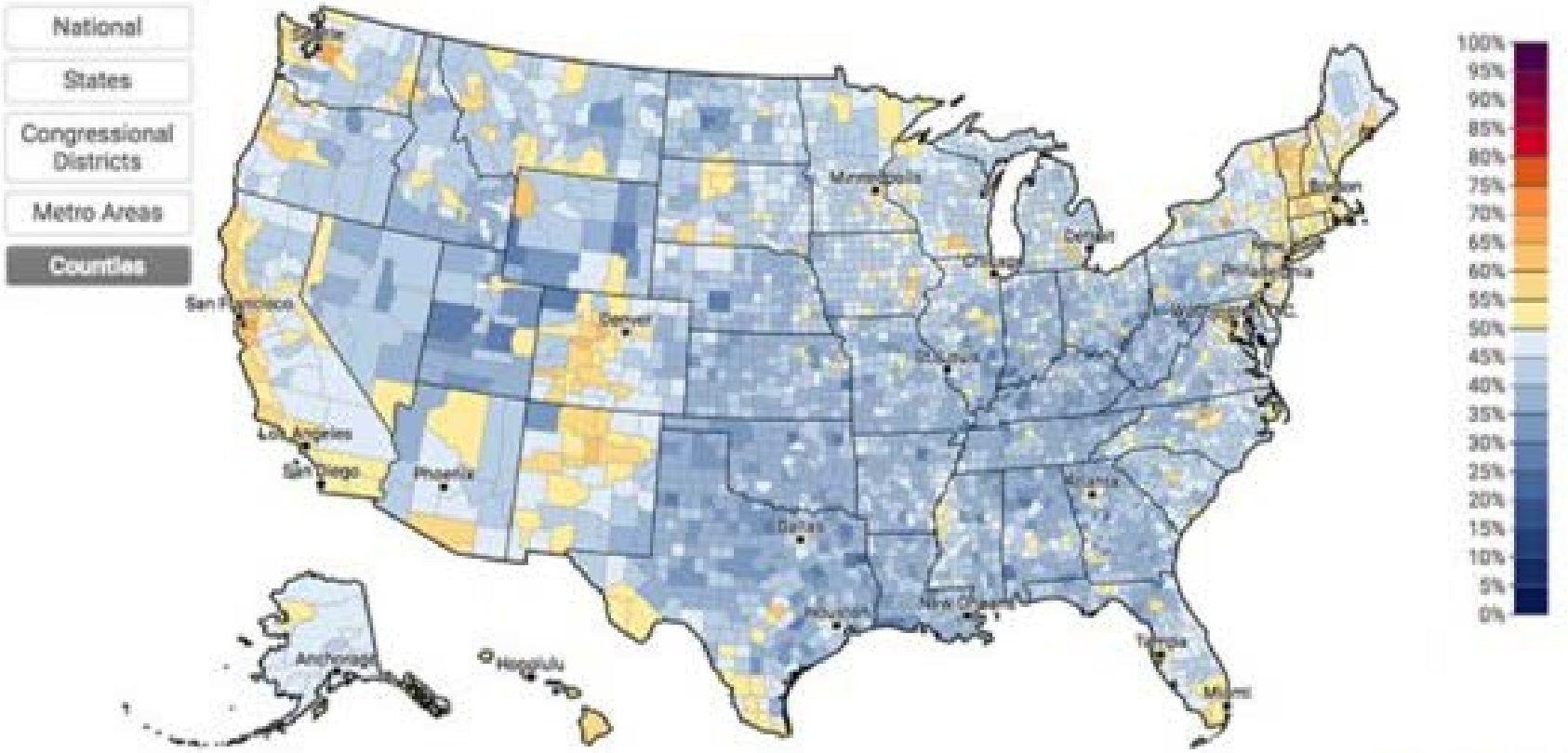
☐ wind ☐ nuclear ☐ natural gas
☐ solar I don't ☐ coal know

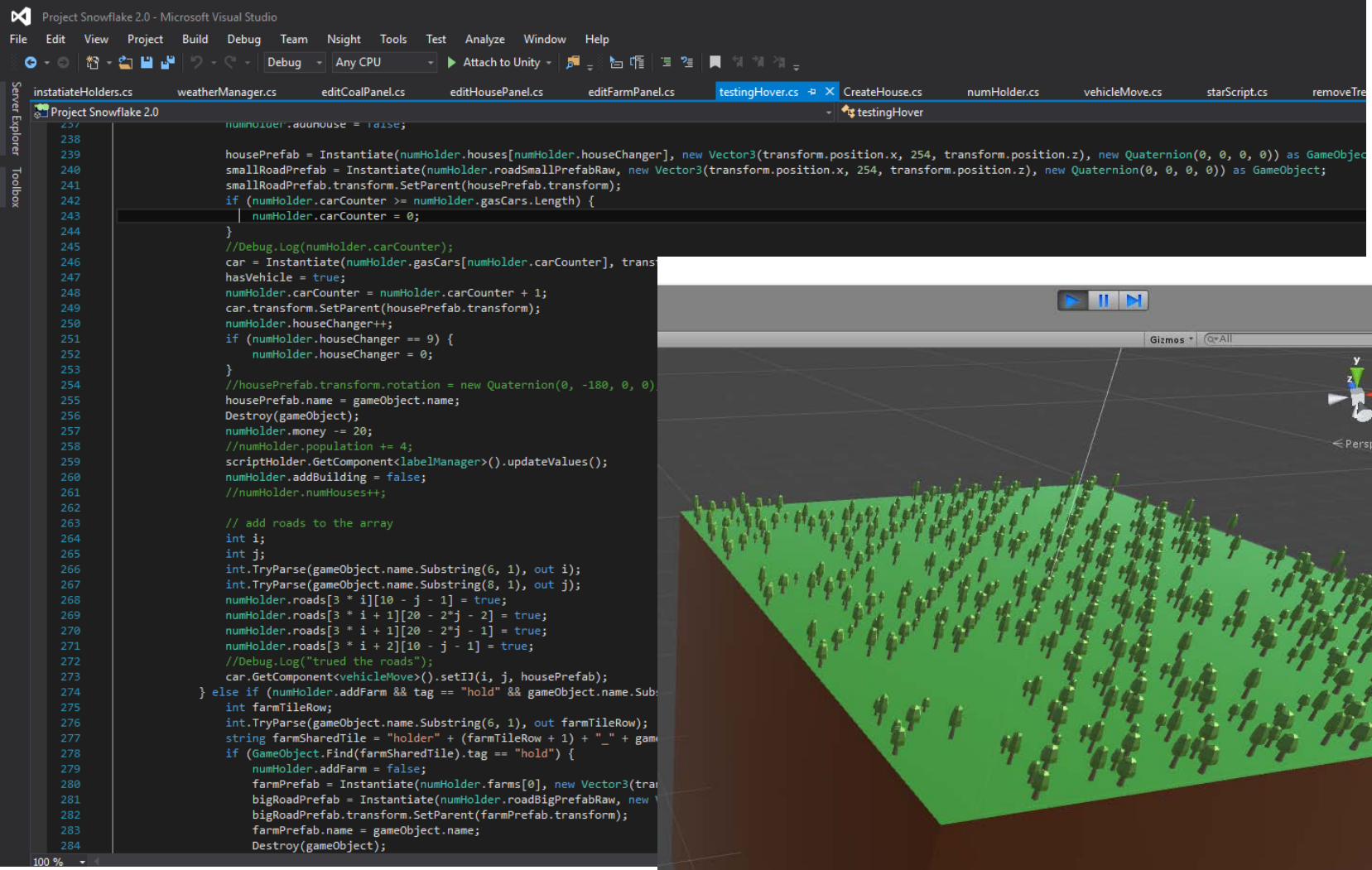
Your class is taking a trip to Olympia. What are three different types of transportation could you use? Which one do you think you should use?

1. Charter buses 2. buses 3. I don't know

We should use charter buses because I don't know.


Estimated % of population by county (2014)
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95


National
States
Congressional Districts
Metro Areas
Counties
100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
Minneapolis
Detroit
Chicago
Boston
Philadelphia
San Francisco
Denver
Los Angeles
San Diego
Phoenix
Dallas
Houston
Atlanta
Miami
Anchorage
Honolulu


Project Snowflake 2.0 - Microsoft Visual Studio
File Edit View Project Build Debug Team Nsight Tools Test Analyze Window Help
Debug
Any CPU
Attach to Unity
instatiateHolders.cs
weatherManager.cs
editCoalPanel.cs
editHousePanel.cs
editFarmPanel.cs
testingHover.cs
CreateHouse.cs
numHolder.cs
vehicleMove.cs
starScript.cs
Project Snowflake 2.0
testingHover
housePrefab = Instantiate(numHolder.houses[numHolder.houseChanger], new Vector3(transform.position.x, 254, transform.position.z), new Quaternion(0, 0, 0, 0)) as GameObjec
smallRoadPrefab = Instantiate(numHolder.roadSmallPrefabRaw, new Vector3(transform.position.x, 254, transform.position.z), new Quaternion(0, 0, 0, 0)) as GameObject;
smallRoadPrefab.transform.SetParent(housePrefab.transform);
if (numHolder.carCounter >= numHolder.gasCars.Length) {
numHolder.carCounter = 0;
}
//Debug.Log(numHolder.carCounter);
car = Instantiate(numHolder.gasCars[numHolder.carCounter], trans
hasVehicle = true;
numHolder.carCounter = numHolder.carCounter + 1;
car.transform.SetParent(housePrefab.transform);
numHolder.houseChanger++;
if (numHolder.houseChanger == 9) {
numHolder.houseChanger = 0;
}
//housePrefab.transform.rotation = new Quaternion(0, -180, 0, 0)
housePrefab.name = gameObject.name;
Destroy(gameObject);
numHolder.money -= 20;
//numHolder.population += 4;
scriptHolder.GetComponent<labelManager>().updateValues();
numHolder.addBuilding = false;
//numHolder.numHouses++;
// add roads to the array
int i;
int j;
int.TryParse(gameObject.name.Substring(6, 1), out i);
int.TryParse(gameObject.name.Substring(8, 1), out j);
numHolder.roads[3 * i][10 - j - 1] = true;
numHolder.roads[3 * i + 1][20 - 2*j - 2] = true;
numHolder.roads[3 * i + 1][20 - 2*j - 1] = true;
numHolder.roads[3 * i + 2][10 - j - 1] = true;
//Debug.Log("trued the roads");
car.GetComponent<vehicleMove>().setIJ(i, j, housePrefab);
} else if (numHolder.addFarm && tag == "hold" && gameObject.name.Sub
int farmTileRow;
int.TryParse(gameObject.name.Substring(6, 1), out farmTileRow);
string farmSharedTile = "holder" + (farmTileRow + 1) + "_" + game
if (GameObject.Find(farmSharedTile).tag == "hold") {
numHolder.addFarm = false;
farmPrefab = Instantiate(numHolder.farms[0], new Vector3(tra
bigRoadPrefab = Instantiate(numHolder.roadBigPrefabRaw, new
bigRoadPrefab.transform.SetParent(farmPrefab.transform);
farmPrefab.name = gameObject.name;
Destroy(gameObject);
100 %
Hierarchy
Create
GameScene
ValueHolder
ScriptHolder
World
Holder
House_1_1 (2)
House_1_1 (3)
House_1_1 (4)
Science_Final_1
Gizmos
Persp
Project
Create
co2_bad
co2_good
energy
food
money
moneyDown
science
singleTree
Scenes
Scripts
checkObjectScipts
EditManagers
CameraMovement
CreateHouse
homeScript
instatiateHolders
labelManager
numHolder
onHover
removeTreePanel
starScript
symbolDestroy
testingHover
vehicleMove
weatherManager
windmillRotate


Money: 42$
Science Level: 0
Population: 8
ESC


Money: -100$
Science Level: 2
Population: 14
Remove Tree?
-10$
Yes
Cancel
ESC

EDUCATION STANDARDS

GRADE 4

Next Generation Science Standards

4-ESS3-1. - Earth and Human Activity: Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

4-ESS3-2. - Earth and Human Activity: Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

3-5-ETS1-1. - Engineering Design: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

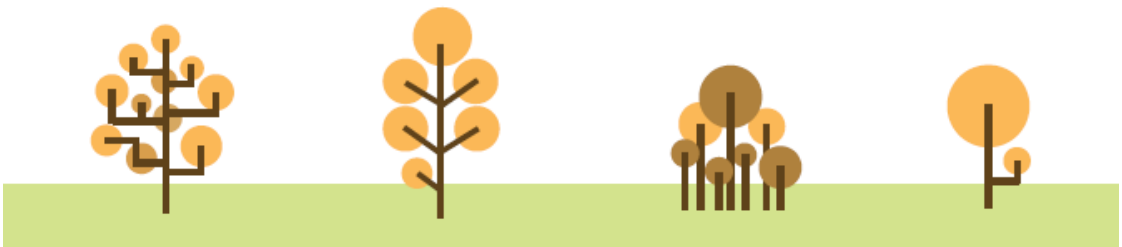
3-5-ETS1-2. - Engineering Design: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Common Core State standards

Data Gathering and Analysis: Interacting with a simulation/model to answer questions and make predictions

Innovate: Use models and simulations to explore systems, identify trends and forecast possibilities.

Operate Systems: Develop skills to use technology effectively.




LOANER

OPERATION SUSTAIN
EDUCATOR'S CURRICULUM GUIDE

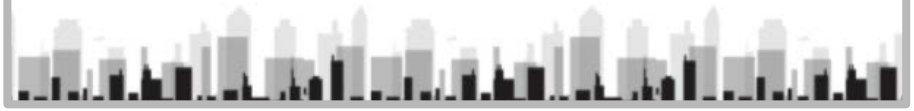
TEACHER EDITION

Spring of 2018

OPERATION SUSTAIN LAUNCHKIT

STUDENT EDITION

Spring of 2018



THE GAME

Algorithms

This section is useful for understand how the algorithms in the game works so you may answer questions, but should not be revealed to students.

WATER: Look at the blue bar called 'Water' to see the status. Water is gotten and used by houses and farms which have aquifers and require water. Every 12 seconds or 1 'day', farms will take a large portion of the collected water. Students can be more efficient with water by click on the gear wheel and using the sliders to set the amount of water the houses and farms use.

FOOD: Food is indicated by the orange bar. Food is gotten in stages. Farms need to move up one stage to grow and once they are ready to be harvested, they will automatically give food to the collection and move back to the first stage. As a general rule of thumb, if there are more than 4 houses per farm, the students will see their population is always hungry.

ENERGY: Energy is shown by the yellow bar. Students start out with a science level of 1 and must use the coal to get energy first. Electricity is instantaneous meaning if it's produced in a second, it has to be used in that same second (as opposed to food which is stored and used). Generally, no more than 5 houses per coal plant. When students get higher science levels, they will get access to other energy sources which are Nuclear, Wind and Solar. Nuclear does not produce emissions but it is expensive and takes a large sum of money every day. Wind consistently produces a lot of energy. Solar only produces electricity in the day and is relatively inefficient if unupgraded. When students upgrade solar, they will get a batter that allows for storage and more electricity will also be produced from greater efficiency.

SCIENCE: Science is indicated in the top left corner. Science is attained with the Science Institutions. Science can only be earned when the city has a positive amount of money and a population greater than 0. Just like in real life, science will cost the city money. More science institutions will improve the rate at which science is attained.

THE GAME

Concepts

1. Pollution can be reduced either through planting more trees or through preventing carbon emissions from being created it the first place.

2. Taxes are a method for getting money for the city. High taxes can get more money for a city but they might make citizens unhappy and similarly, low taxes may make the citizens happier but it would be difficult to make money for the city.

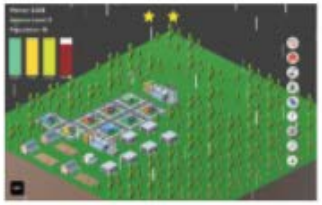
3. Solar panels are relatively weak in the beginning and are useless in the dark but from innovation in science, solar panels can produce more electricity and store it in batteries for times of darkness.

4. Citizens can make the choice to use public transport or electric cars to reduce the city's carbon emissions.

5. Building dense cities with apartments over houses is beneficial for cost and energy.

6. With pollution, it is very difficult to get a keep a high population or make a significant amount of money.

7. Nuclear energy may produce lots of energy without creating pollution, but it does cost a lot of money to maintain.



FOUR DAY LESSON PLAN

Day 1

This section provides an fully defined lesson play for using the Operation Sustain simulation in four, one hour lessons.

Objective - Take the initial quiz to see improvement and become acquainted with how the game works.

- Print the quiz (see resources section) and provide it to students. Most students will be frustrated and won't know the answers to questions so reas sure them that the quiz is not graded and that it's acceptable to write "I don't know" for the before quiz. Most students will finish in about 15 minutes.

- Next, assist students in powering up and signing in to laptops to begin using the simulation. Teach the students how to use the simulation using the instructions above.

- If there are not enough laptops for each students, have students pair up or form groups of three for each laptops. Many students will want to do this even if they have their own laptop.

- Ensure they have the game code ('0000000') and click on the 'Classic Mode.

- Students will most-likely have questions. Use the Frequently Asked Ques tions section below to answer such questions.

FOUR DAY LESSON PLAN

Day 4

This section provides an fully defined lesson play for using the Operation Sustain simulation in four, one hour lessons.

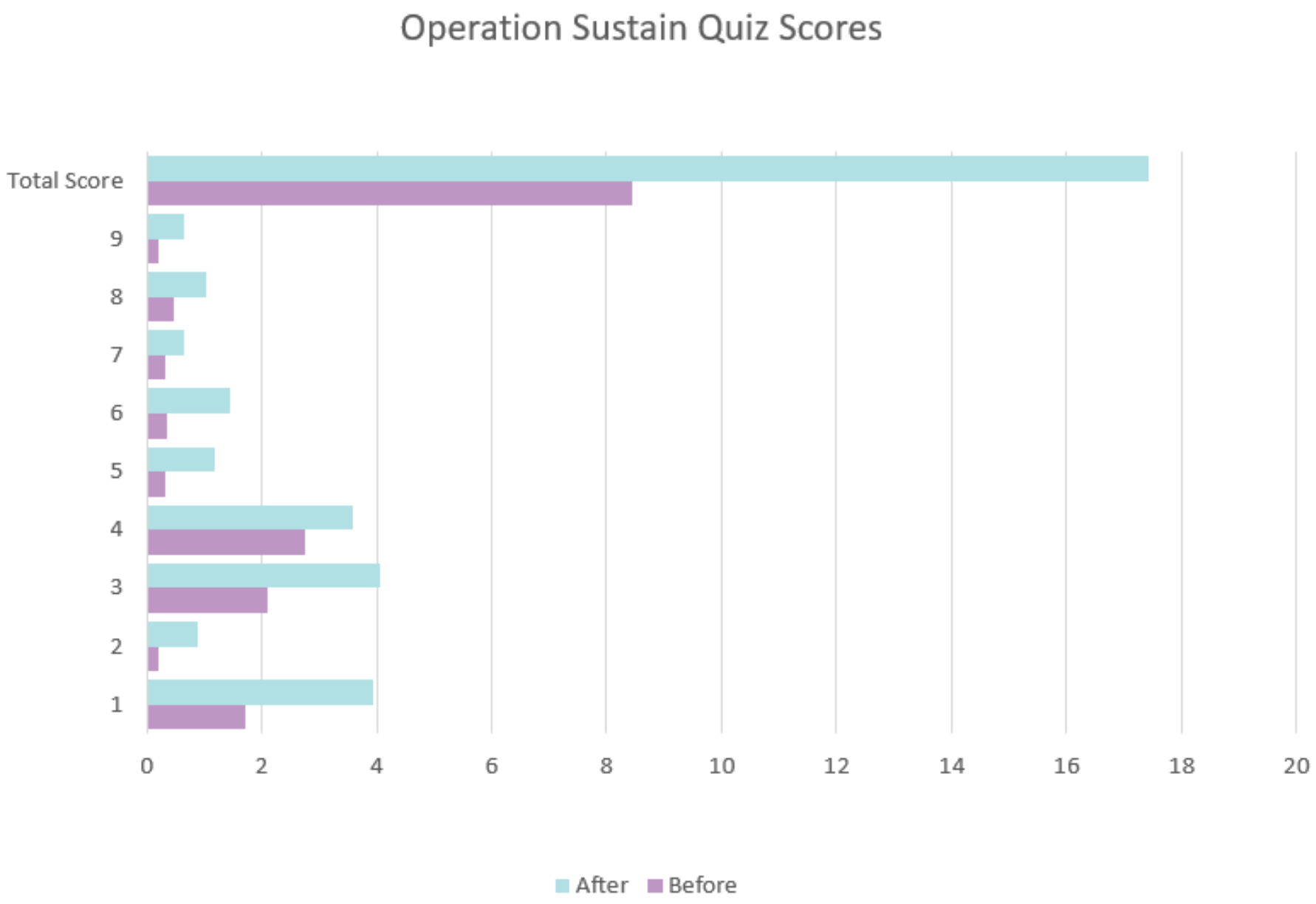
Objective - Answer any final questions and quiz students to see improvement.

- For the first thirty minutes, have students play the game in any format they want.

- Ask students to make sure they ask questions if there is any topic they are uncertain about before the quiz.
Provide students with the quiz and have them answer to the best of their ability.

- If there is extra time in class, show them how they can download the game at home.

  Go to the website: https://www.asustain.org/download
  Use the password 'LWSD' and follow the directions listed.


Operation Sustain Quiz Scores
Total Score
9
8
7
6
5
4
3
2
1
0
2
4
6
8
10
12
14
16
18
20
After
Before


adidas
adidas
adidas
04

You look up at the sky and see a it's full of a foul-smelling haze called smog.

How did it get there and how can it go away?

+2 it could get there from coil power, and it can go away if we start using solar, wind, and water powered energy

What are two ways that you can prevent this pollution?

1. use o the energy sources

+2 2. try to conserve energy

What is the source of electricity & how is it made?

A nuclear, or coal plant or a windmill or solar panel.

+1 They are made using natural resources such as wind or sun.

Your class is taking a trip to Olympia. What are three different types of transportation could you use? Which one do you think you should use?

1. Car 2. bus 3. electric car

+4

We should use bus because even if it might cause more pollution than a car, there are more people riding on it.


Heron

STEM Education Innovation Alliance

Science, Climate & Environment Day
February 14, 2018

TESLA STEM HIGH SCHOOL

Redmond, Washington | Lake Washington School District

– Presentation Slides –

Schools Under 2C

Tesla STEM High School

Schools Under 2C - MISSION

Increase awareness about the **impacts and solutions** of climate change through the **education of students**. We pledge to meet the standards stated in the Paris Climate Accord by **reducing greenhouse gas emissions** in **schools all around the world.**

PARIS CLIMATE ACCORD

2015 - November 30th to December 11th - 195 countries met at COP21 (21st Conference of Parties)

- Countries with individual goals/plans
- Threshold global temperature: 2°C (3.6°F)

Climate Change Education at Tesla STEM

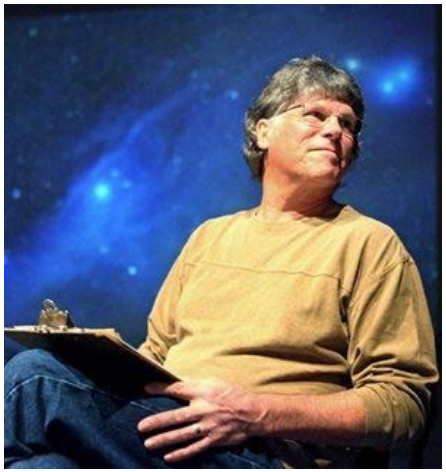
AP Environmental Science

Content and science based with a global perspective

Environmental Engineering and Sustainable Design & UW Global Warming

Application Based and Solution Oriented

** The classes are based around current events and their implications on the environment and solutions to the climate problem



OUR ORGANIZATION...

Components - Leadership

Mentor: Mr. Town
Leadership: President, Vice President
Communication
Internal Organization and Transparency
Media
Newscasts, Social Media, and Publicity
Graphics
Publicity, Toolkits, Branding
Technology
Website and App development
Outreach
Reaching to Schools, Partnerships, Green Team Coordination
Compliance
Data analysis and Calculations
Event Coordination
Organizing events

In-Class Presentations

In-Class Presentations

GreenHouse Gas Reduction Plan

Composting

Lighting

Recycling

Heating

Transportation

SCHOOLS UNDER 2°C

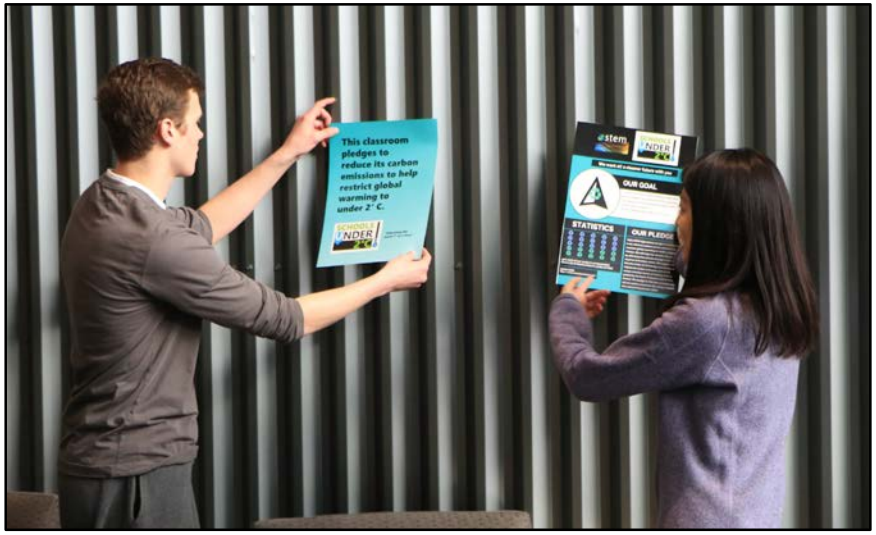
LAUNCH KIT

Compliance Plan: COMPOSTING/RECYCLING

- Coordinated with King County Green Schools
- Implemented Composting
- Taught students sorting
- Daily Measurements

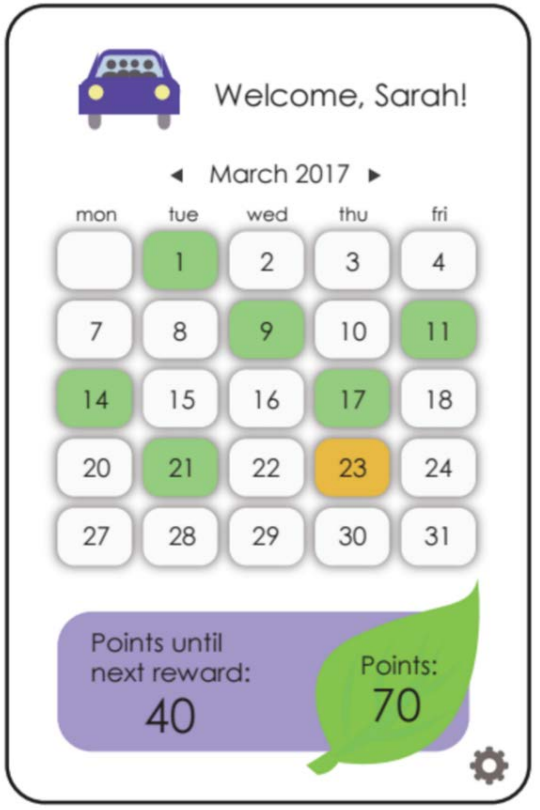
Compliance Plan: LIGHTING

- Used McKinstry PowerDashboard
- 1.2 lbs CO_2 per kWh
- Teacher meetings and Audits
- Periodic updates and check-ins
- 100% teacher participation



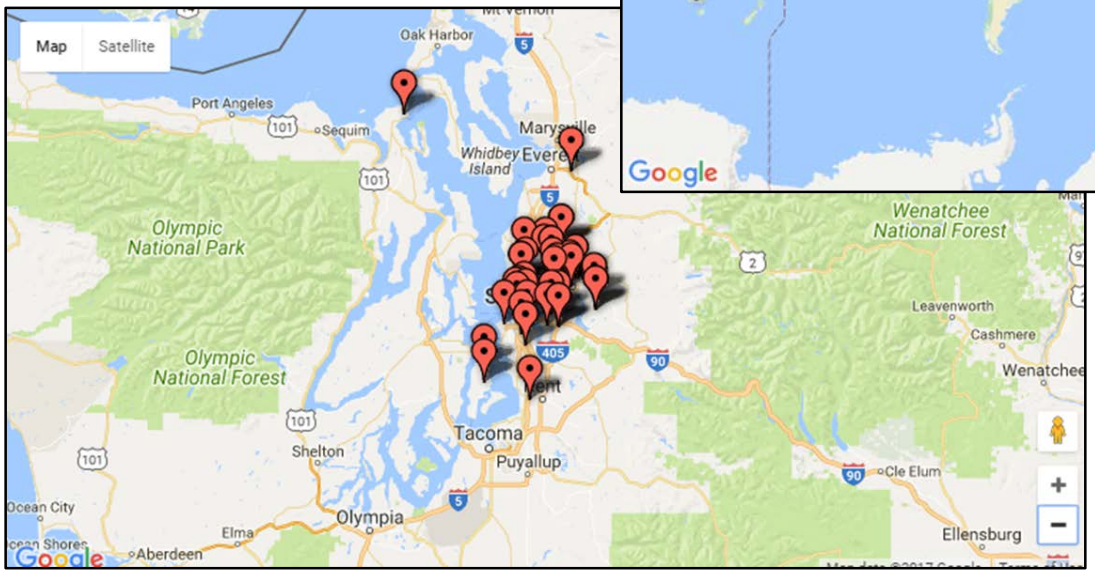
Compliance Plan: TRANSPORTATION

- Goal is to reduce car use
- Partnership with City of Redmond
- Demo and Testers
- Release: Spring 2018



Successes - SPREAD OF IMPACT

- Over 50 schools!
- International Impact
  - India, Austrailia, Bangladesh



Successes - PRESIDENTIAL ENVIRONMENTAL YOUTH AWARD

Successes - MEDIA ATTENTION AND RECOGNITION

Pacific County Youth Alliance

Strengthening Youth through the Power of Community

COMMUNITY SPOTLIGHT

DECEMBER 8TH *ISSUE 8*

Students Present at Ilwaco High School Steps to Go Green

by Bree Shinkle

On December 1st, three students from Schools Under 2C presented to fellow high school

amount, specific levels dependent on the county. As of June 2017, the United States withdrew from the

Lead Your School in Taking Climate Action!

Menu REPORTER

News Sports Life Business Opinion Letters to the Editor

Jeff Philip (back middle in beige shirt) of the Environmental Protection Agency Region 10 stands with Tesla STEM High students while they are honored for their "Schools Under 2C" project on this spring. STEM instructors are also pictured at the ceremony at the Redmond school. Courtesy of Jon Knorr

Tesla STEM's Schools Under 2C program exceeds expectations

Menu REPORTER

News Sports Life Business Opinion Letters to the Editor

STEM High School designs 'Schools Under 2C°' program

Wednesday, May 17, 2017 12:41pm | NEWS

Successes - LOCAL PARTNERSHIPS

FURTHER ACTIONS

- Organizing a Green Team Kick Off
  - More school participation
- Mobile Application
- Monitor schools reductions
  - Outreach team to go back to each school regularly
  - Compliance team to bring global reductions into the spectrum
- Working with networks (SA, YESC)
- Expand our impact!

SCHOOLS UNDER 2°C

THANK YOU

This classroom pledges to reduce its carbon emissions to help restrict global warming to under 2° C.

SCHOOLS UNDER 2°C

"Educating the world 1° at a time"

Educating the world 1° at a time

Pledge

Tesla STEM High School pledges to participate in an effort to reduce our carbon emissions to meet the United Nations goal of maintaining global warming under 2 degrees Celsius.

SCHOOLS UNDER 2°C

Staff and students will meet America's Paris Accord commitment of a 28% carbon reduction by reducing our school's carbon footprint by 1 ton per month.