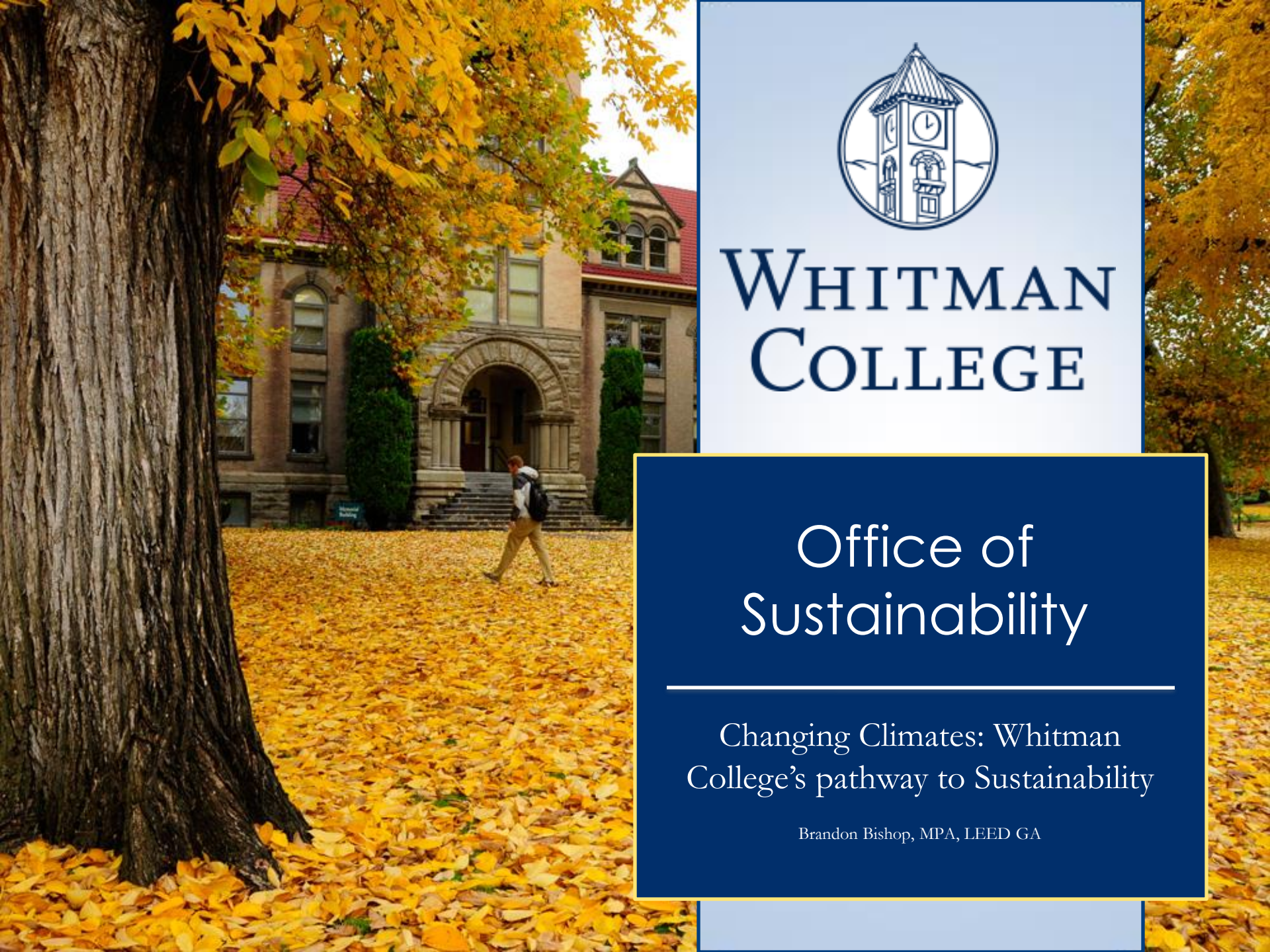


WHITMAN COLLEGE

Office of Sustainability

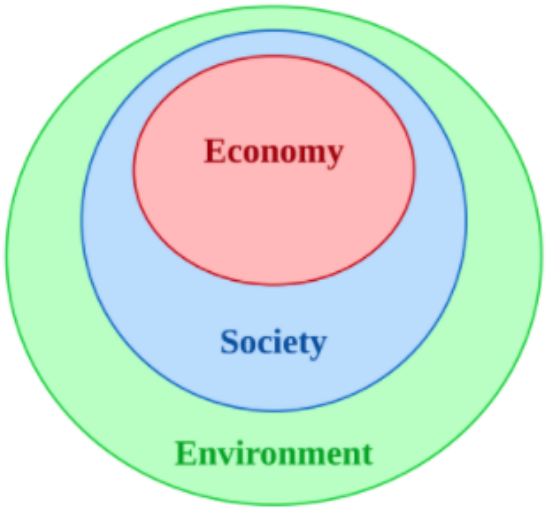
Changing Climates: Whitman College's pathway to Sustainability

Brandon Bishop, MPA, LEED GA

What is Sustainability?

Sustainability is a difficult term to define given its diverse use. Typically sustainability focuses on a wide range of societal, economic, and ecological factors. Traditionally sustainability is seen as a balance which provides for the continued function and equilibrium of the planets natural systems with those of society.

Sustainability is:



...Meeting the needs of the present generation without compromising the ability of our future generations to meet their needs (Brundtland, 1987)

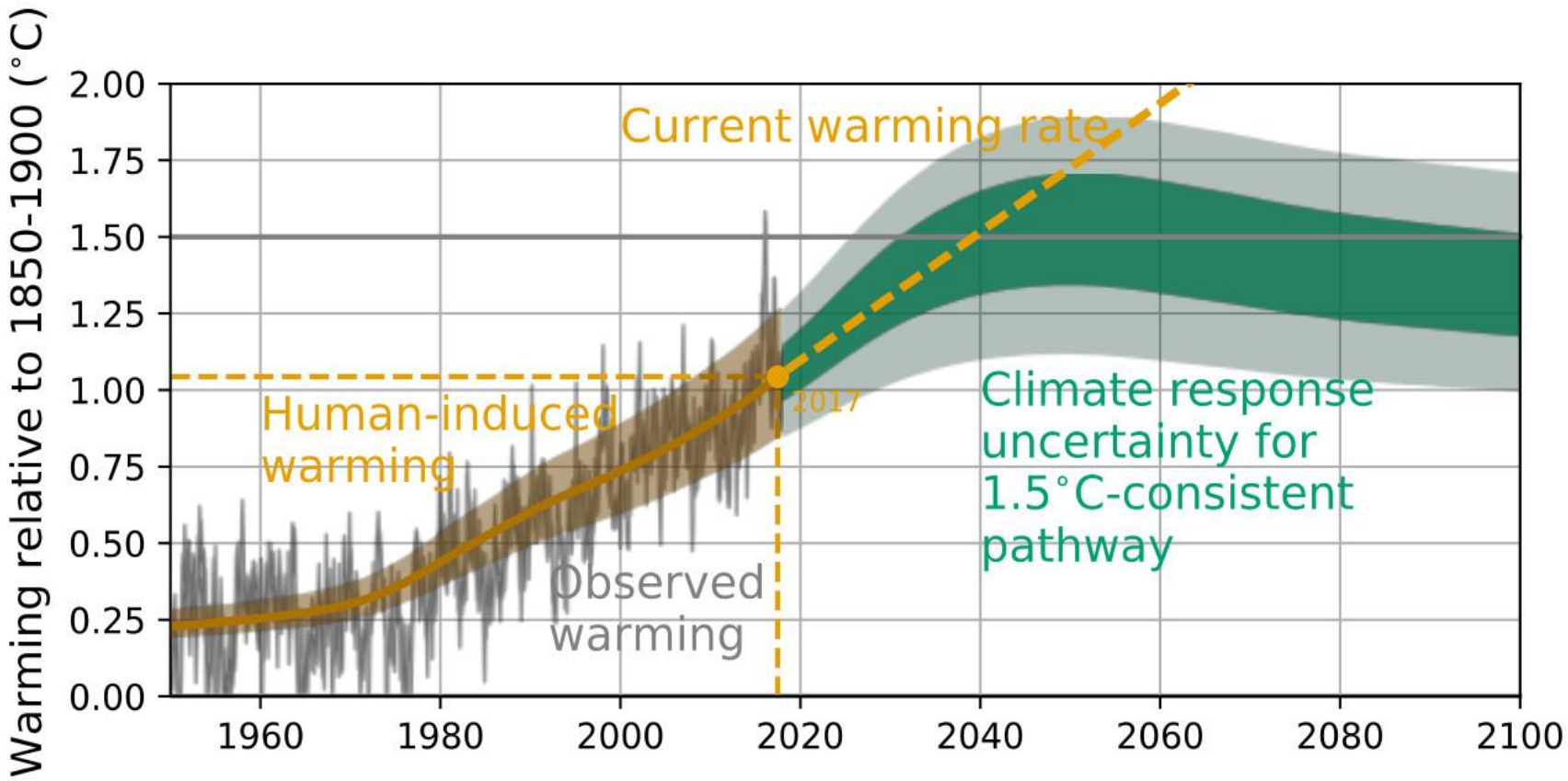
...Improving quality of life and equity within the human situation, while supporting our environmental systems.

...Respecting nature, universal human rights, and economic justice.

Intergovernmental Panel on Climate Change Releases New Report

- We currently have 12 years to reduce greenhouse gas emissions by 48%. Failure to meet this mark will result in catastrophic climate change. (change over 2 C)
- Climate change is occurring and will continue to occur as a result of emissions. It is unlikely that we will maintain levels below 2 C (3.6 F) at current rates.

Current Warming Rates



Source: IPCC Special Report on Global Warming of 1.5°C, Chapter 1 – Technical Annex 1.A, Fig. 12

Multiple Climate Models

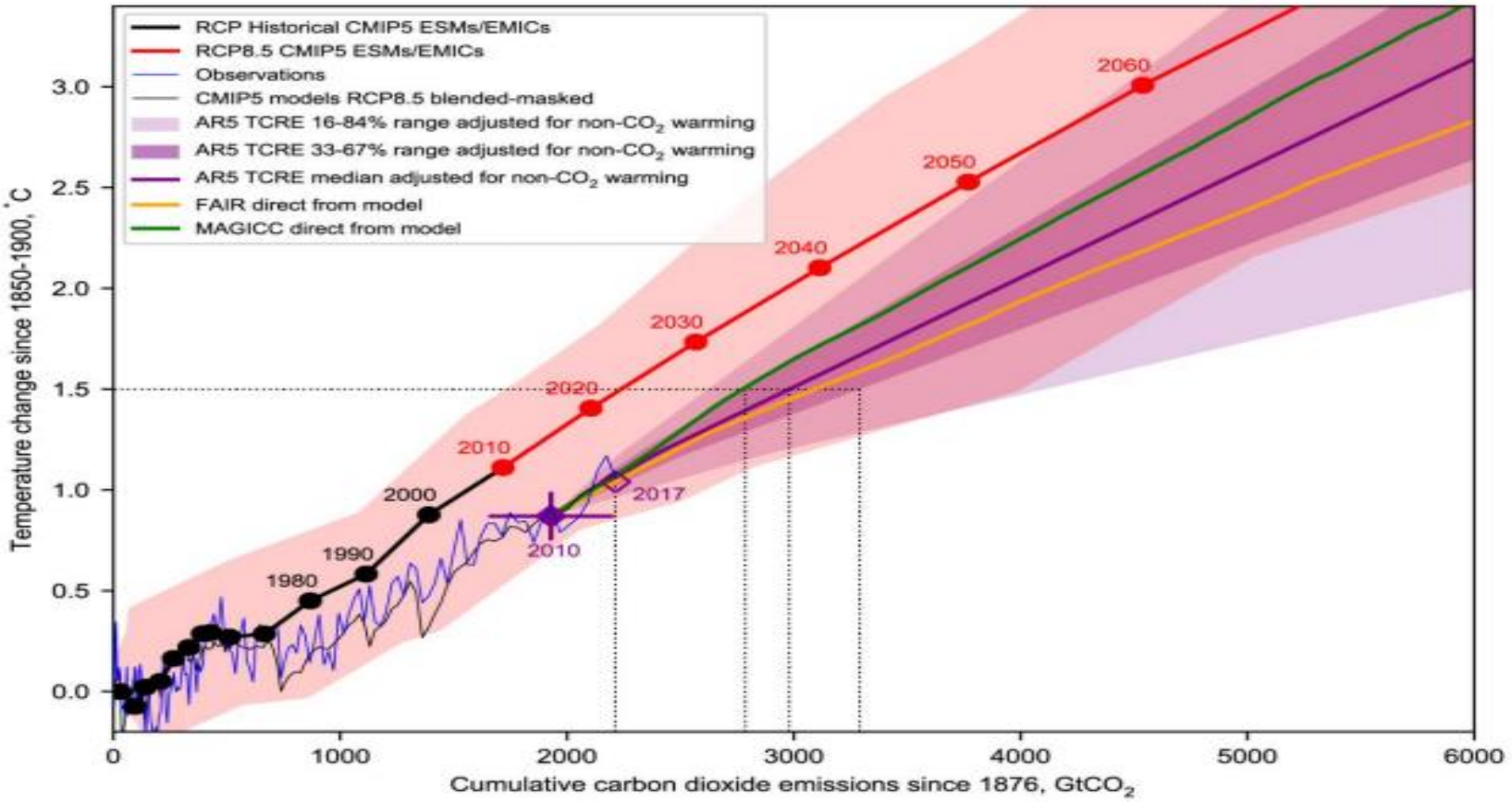


Figure 2.SM.3: This figure follows Figure 2.3 of the main report with two extra lines on each showing FAIR (orange) and MAGICC (green) results separately. These additional lines show the full model response averaged across all scenarios and geophysical parameters.

National Highway Safety Report, 2018

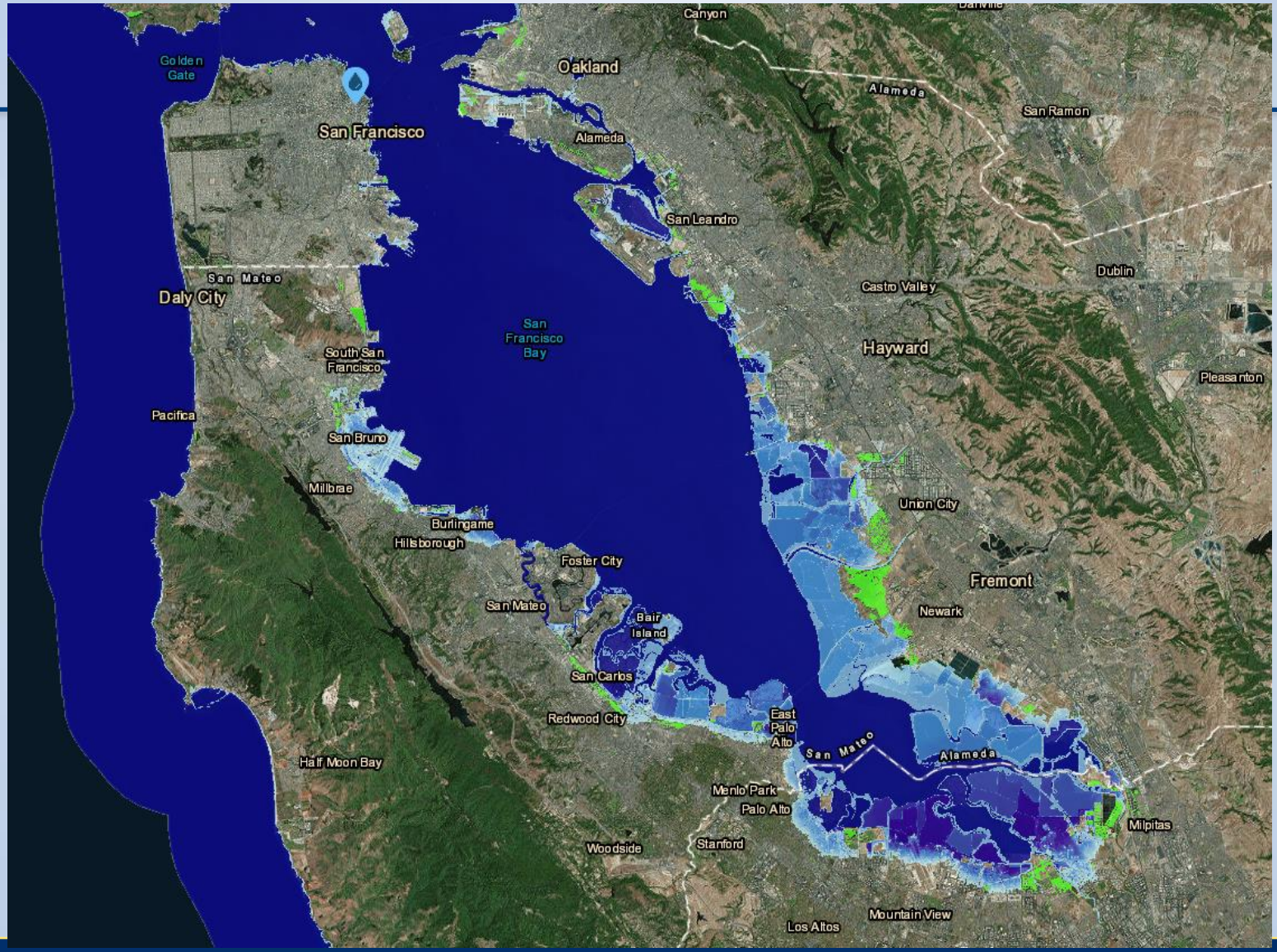
- "The emissions reductions necessary to keep global emissions within the carbon budget could not be achieved solely with drastic reductions in emissions from the U.S. passenger car and light truck vehicle fleet but would require drastic reductions in all U.S. sectors and from the rest of the developed and developing world."

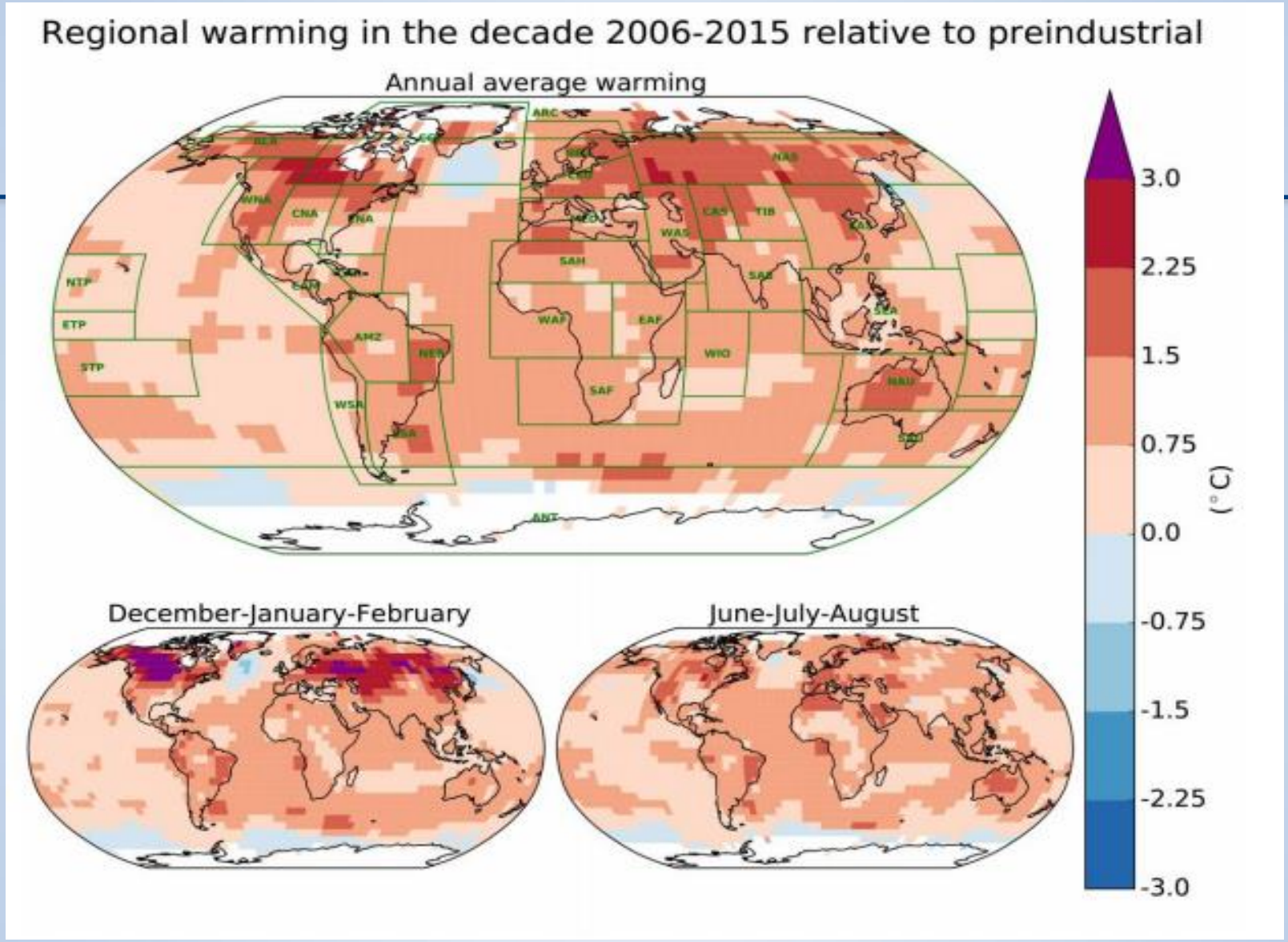
	CO2 Concentration (ppm)		Global Mean Increase in Surface Temp (F)	
Scenario	IPCC WGI (2100)	MAGICC (2100)	IPCC WGI (2081-2100)	MAGICC (2100)
RCP8.5	936	938	6.66 F	7.56 F

National Highway Safety Report Climate Model Average (No Action Scenario)											
CO2 Concentration (ppm)			Global Mean Surface Temp. Increase (F)			Sea-Level Rise (inches)			Ocean pH		
2040	**2060**	**2100**	**2040**	**2060**	**2100**	**2040**	**2060**	**2100**	**2040**	**2060**	**2100**
479.04	**565.44**	**789.11**	**2.317**	**3.614**	**6.27**	**9.00**	**14.39**	**30.03**	**8.410**	**8.35**	**8.22**

Source: Draft Environmental Impact Statement, National Highway Safety Administration 2018

NOAA Sea Level Rise Viewer (30” rise)

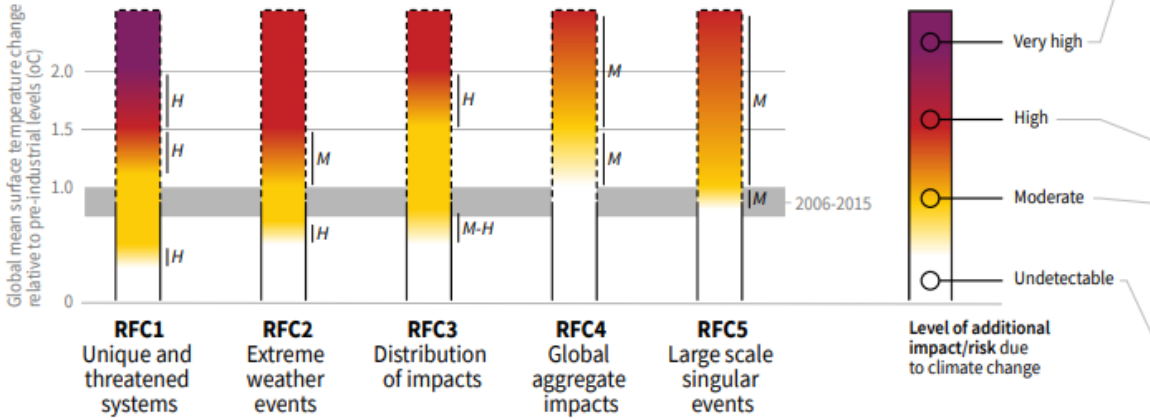




Source: IPCC Special Report on Global Warming of 1.5°C,

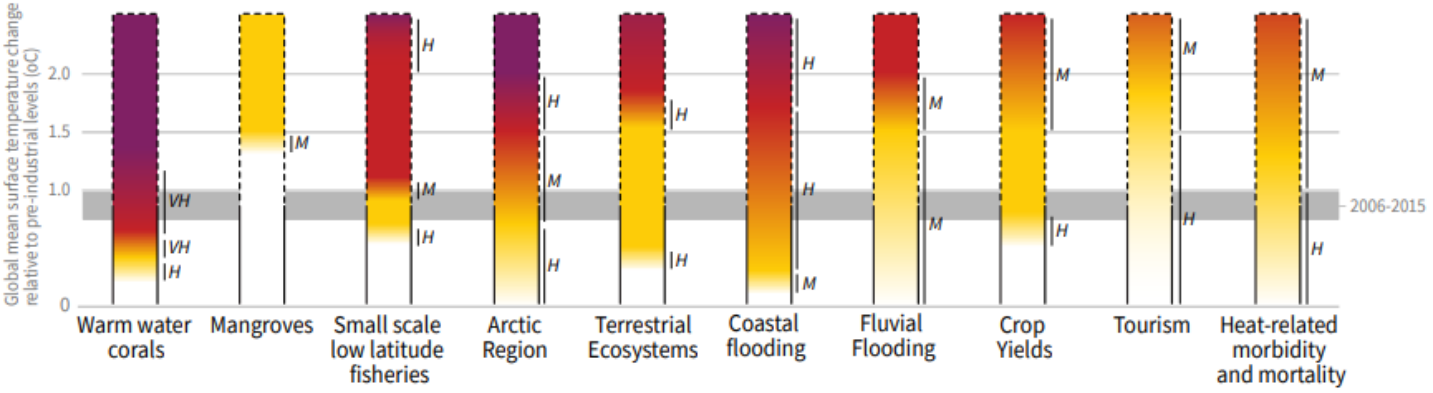
Five Reasons For Concern (RFCs) illustrate the impacts and risks of different levels of global warming for people, economies and ecosystems across sectors and regions.

Impacts and risks associated with the Reasons for Concern (RFCs)

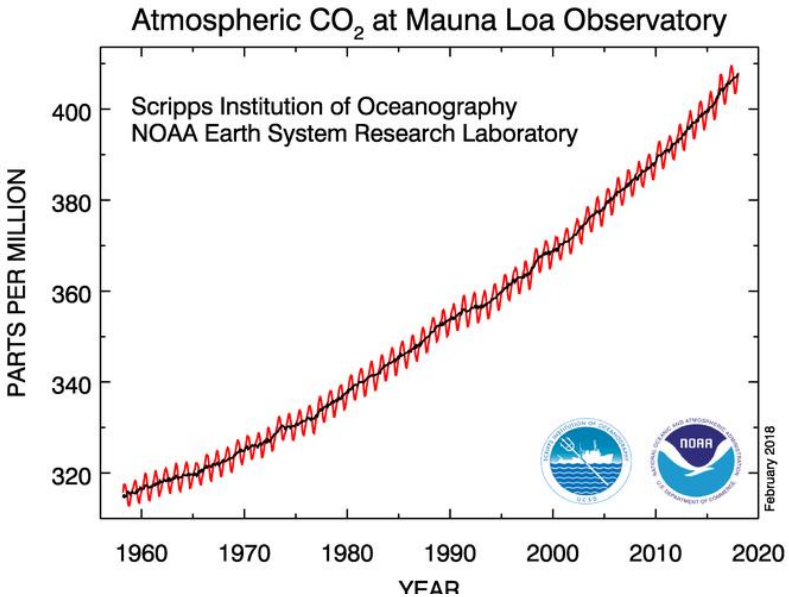


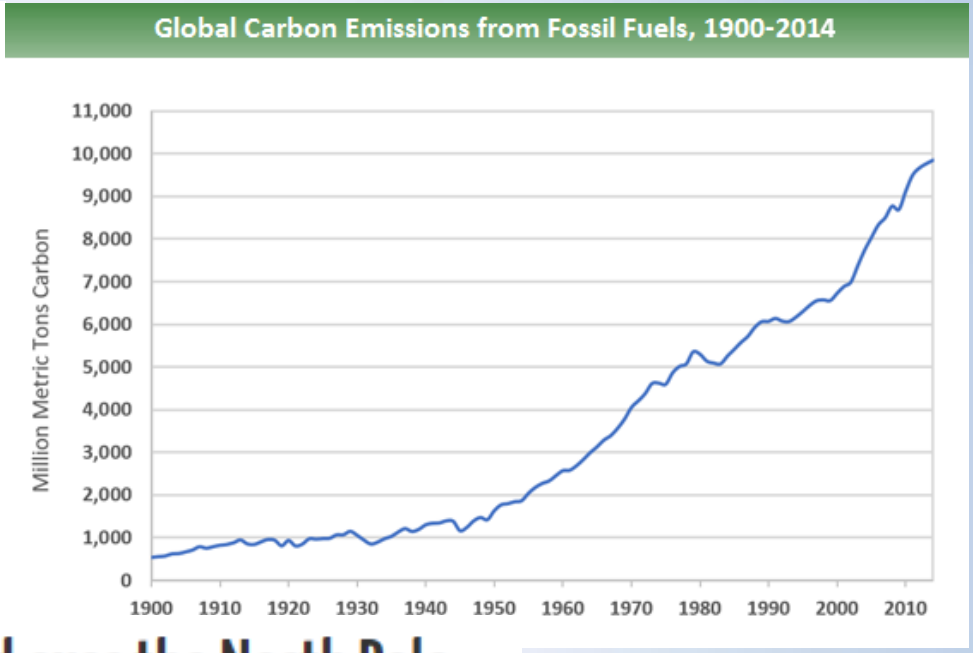
Purple indicates very high risks of severe impacts/risks and the presence of significant irreversibility or the persistence of climate-related hazards, combined with limited ability to adapt due to the nature of the hazard or impacts/risks.
Red indicates severe and widespread impacts/risks.
Yellow indicates that impacts/risks are detectable and attributable to climate change with at least medium confidence.
White indicates that no impacts are detectable and attributable to climate change.

Impacts and risks for selected natural, managed and human systems



Greenhouse Gas Emissions





Freakishly warm air has again surged over the North Pole, and sea ice is breaking up north of Greenland

By Tom Yulsman | February 26, 2018 4:58 pm

Global warming is slowing Atlantic Ocean circulation, study finds

SCIENCE • ENVIRONMENT

Extreme Heatwaves Killed Half of the Great Barrier Reef's Coral in 2 Years, Study Says

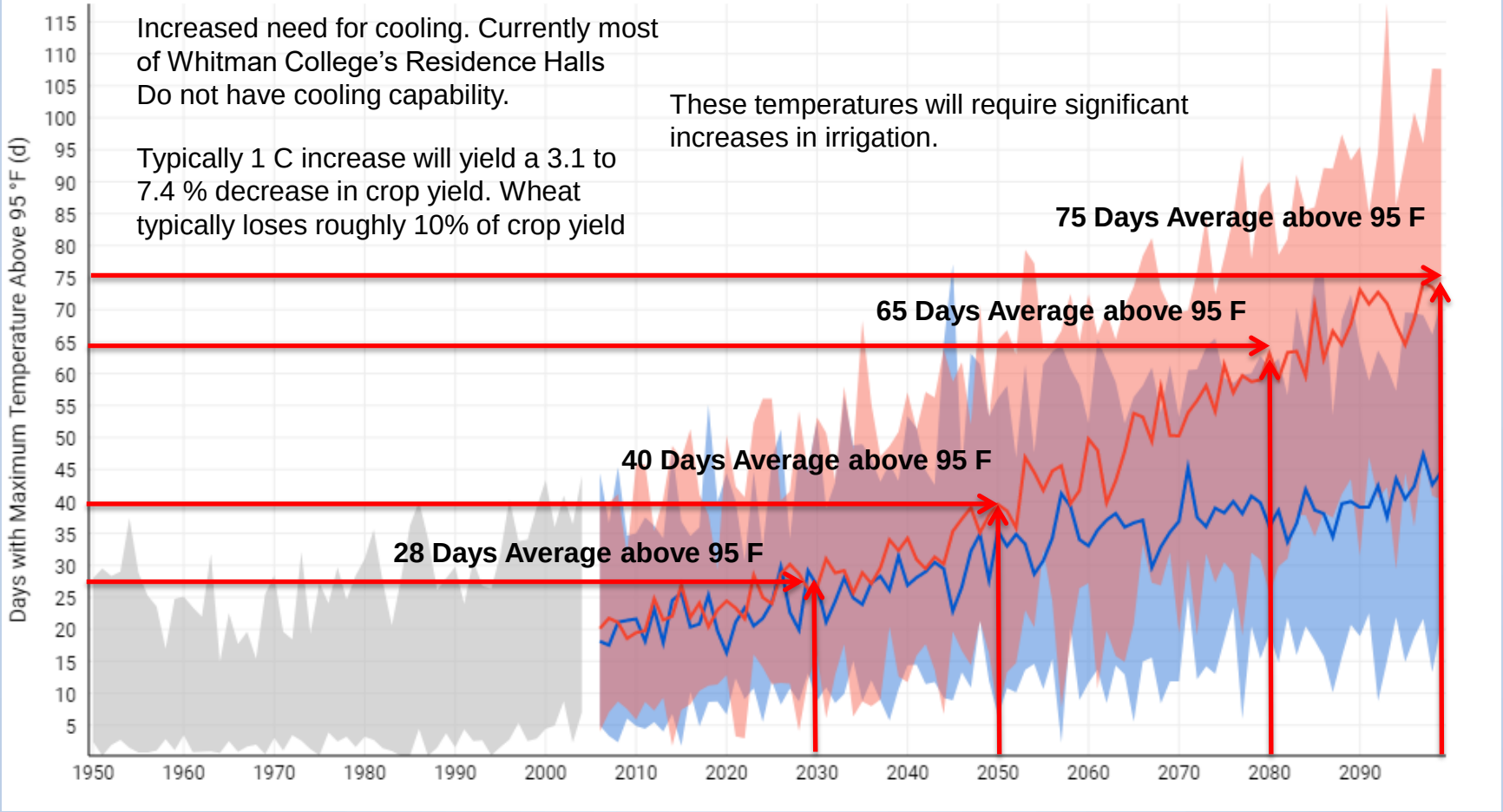
Salt-Water Fish Extinction Seen By 2048

Climate Change in the Walla Walla Region?

- "Global climate models project that the current warming trend will continue throughout the 21st century in the Blue Mountains. Compared to observed historical temperature, average warming is projected to be 2.4 to 3.1 C (5.58 F) by 2050 and 3.2 to 6.3 C (11.34 F) by 2100, depending on greenhouse gas emissions."
- "Decreasing snowpack and declining summer flows will alter timing and availability of water supply, affecting municipal and public uses."
- "Gradual changes in the abundance and distribution of tree, shrub, and grass species throughout the Blue Mountains"

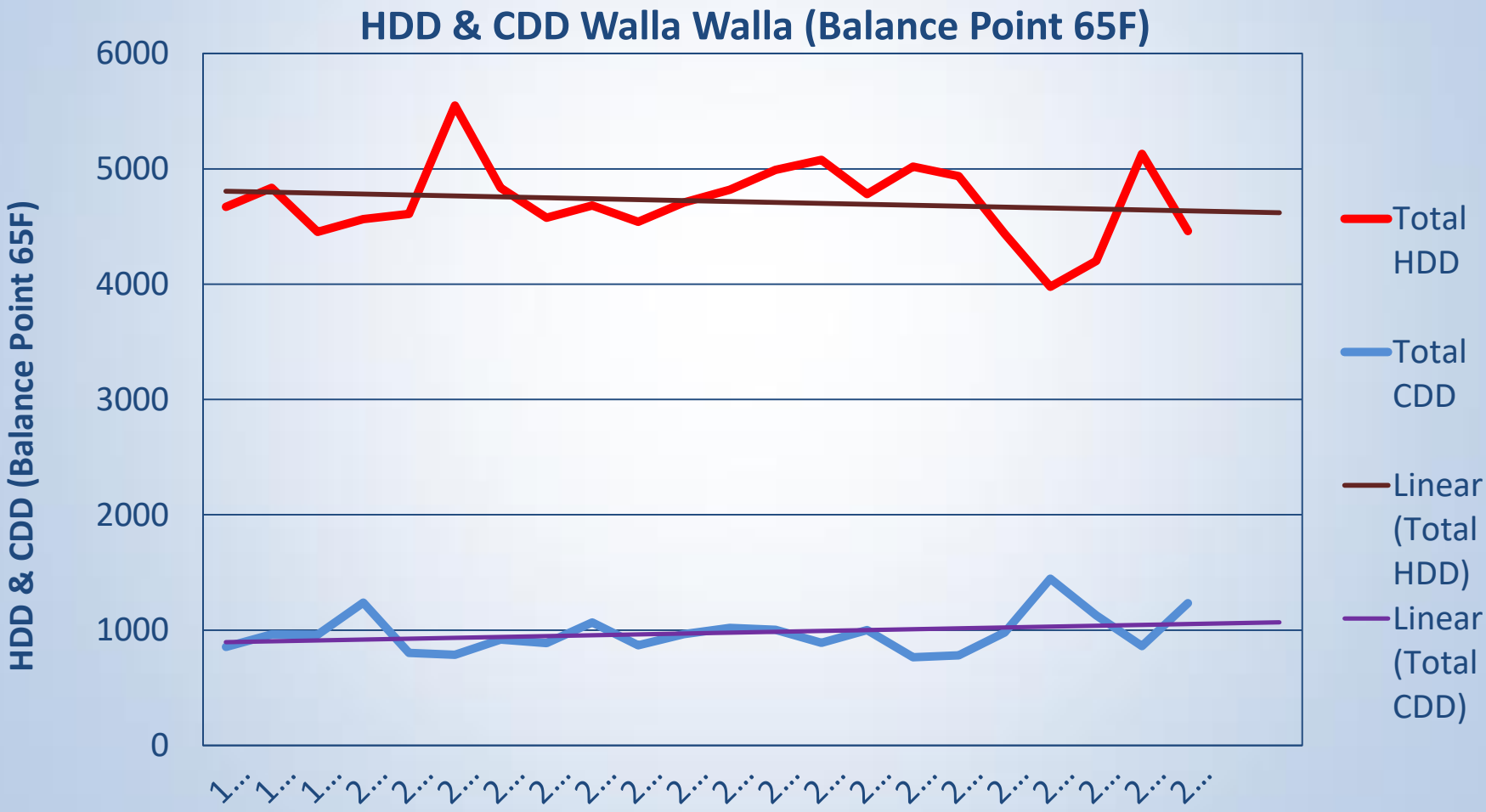
USDA, Climate Change Vulnerability and Adaptation in the Blue Mountains Region, 2017

Projected Days above 95° F in Walla Walla County under low and high emissions model.

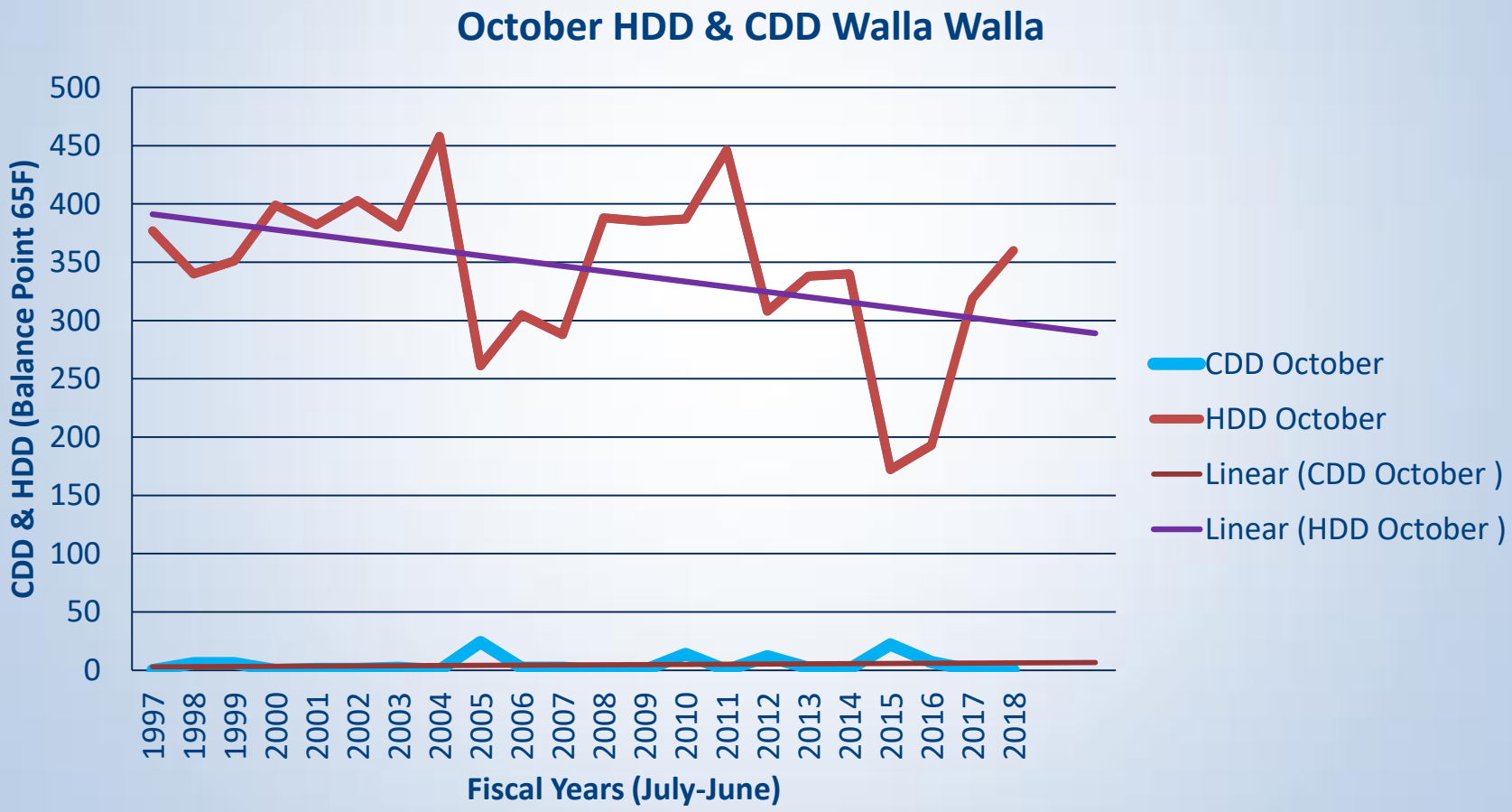


NOAA, US Climate Resilience Toolkit, 2017

Current Heating Degree Day Observations at Whitman College



Most of the Change is being observed in seasonal transitions



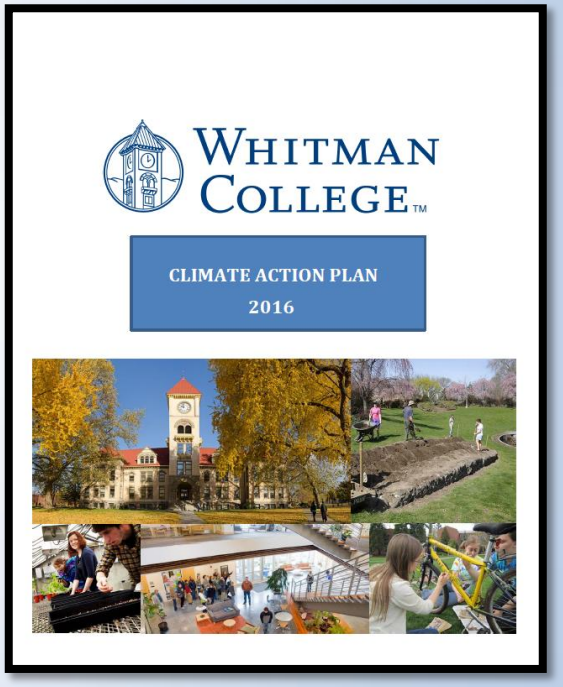
Whitman College Environmental Principles

Recognizing the impact Whitman College has on the environment and the leadership role Whitman College plays as an institution of higher learning, the college affirms the following environmental principles and standards, which shall be consulted to explore the practical ways Whitman College can promote an environmentally conscious campus.

- To reduce the amount of non-recyclable materials, to reuse materials when possible, and utilize recycled materials.
- To consider the eco-friendliest science and technology available to decrease our environmental impact.
- To continue to build an energy-efficient campus in the 21st century.
- To patronize companies that are active in their defense of the environment from further degradation.
- To encourage individuals' environmental accountability through programs of environmental education.
- To consider environmentally friendly options when they exist and are practical in decisions regarding developmental projects.
- To further the use of reused materials, recyclable materials, and the Internet for campus communications.
- To encourage and request food service to make environmentally friendly decisions in purchasing food and supplies, reducing waste, and reusing materials.
- To maintain campus grounds through the employment of bio-friendly substances and services.
- To strive to improve upon current practices so we may harmonize the trends of the industrial world with the natural environment.

Climate Action Plan-2016

- Minimize energy consumption of campus buildings
- Maximize onsite and offsite renewable energy production
- Minimize emissions of vehicles owned or operated by the College
- Minimize emissions from paid campus travel
- Minimize emissions associated with goods and services purchased by the College
- Minimize landfill-bound waste from the College by diverting as much as possible through reduction, reuse, recycling, and composting.
- Integrate climate action and learning together to create positive behavior change that reduces emissions among students, staff, and faculty alike, as well as campus visitors
- Become a beacon of sustainability and climate action in the region

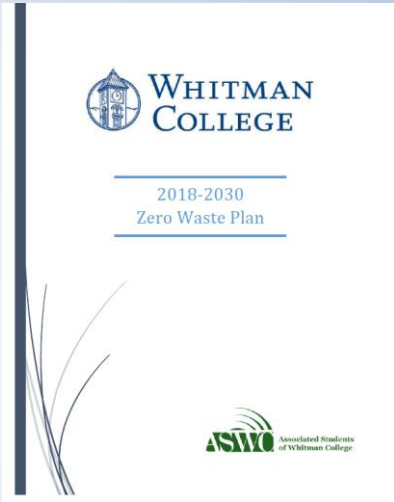


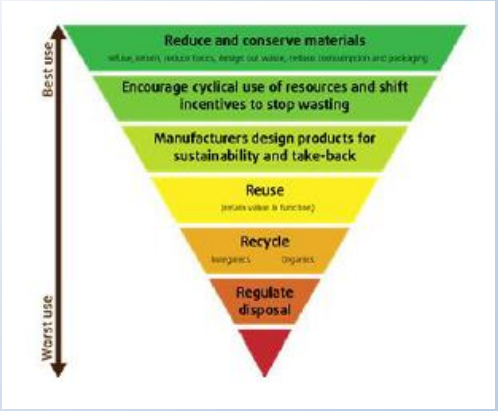
Whitman is a Signatory of the Grand Coalition Statement on the Paris Agreement: "We Are Still In"

- **1.** In the absence of Federal support, states, cities, colleges and universities and businesses will pursue ambitious climate goals, to ensure that **the U.S. remains a global leader** in reducing emissions.
- **2.** In the U.S., the **actors that will provide the leadership** necessary to meet our Paris commitment **are found in city halls, state capitals, colleges and universities and businesse**s.
- **3.** We will **remain actively engaged with the international community** as part of the global effort **to hold warming to under 2° C** and to accelerate the transition to a clean energy economy that will benefit our security, prosperity, and health.

Zero Waste Plan-2017

- In 2017 the ASWC Student Senate and the President's Sustainability Advisory Committee endorsed a campus Zero Waste Plan.
- The Zero Waste Plan recommends that our campus Waste Diversion rate increase from 50% to 90% by 2030.
- Mandatory Recycling at all campus events.
- Unify all campus waste bins.
- Develop a purchasing guide for the campus.
- Reactivate the campus Vermicompost program.
- Ensure an E-Peat Gold Standard or Energy Star certification on all electronic purchasing.
- Strive for a 70% diversion rate on all construction projects
- Implement onsite composting
- Develop a central purchasing plan.
- Ensure I2SL Green Laboratory Standards.
- Implement Greywater Recycling Program.

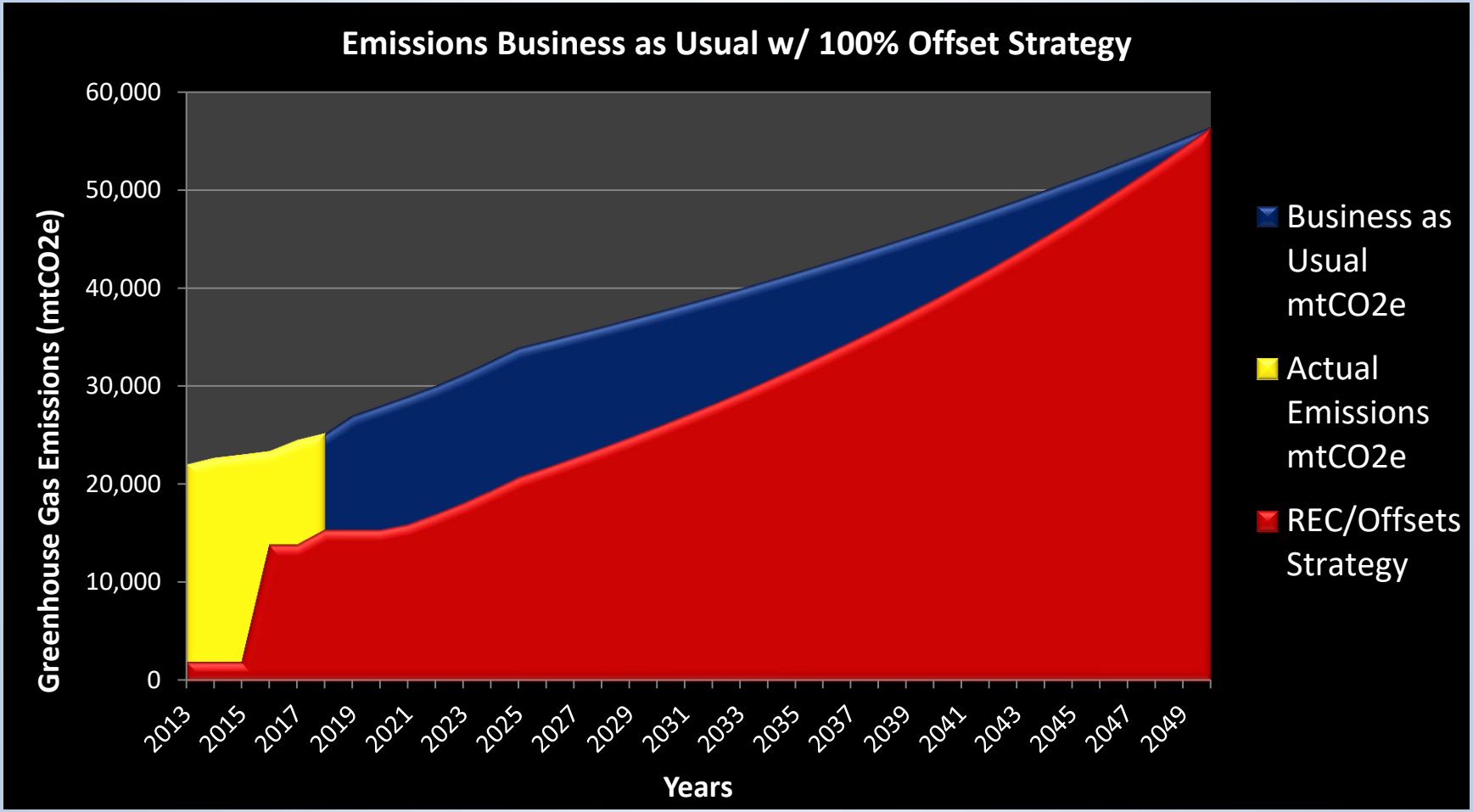




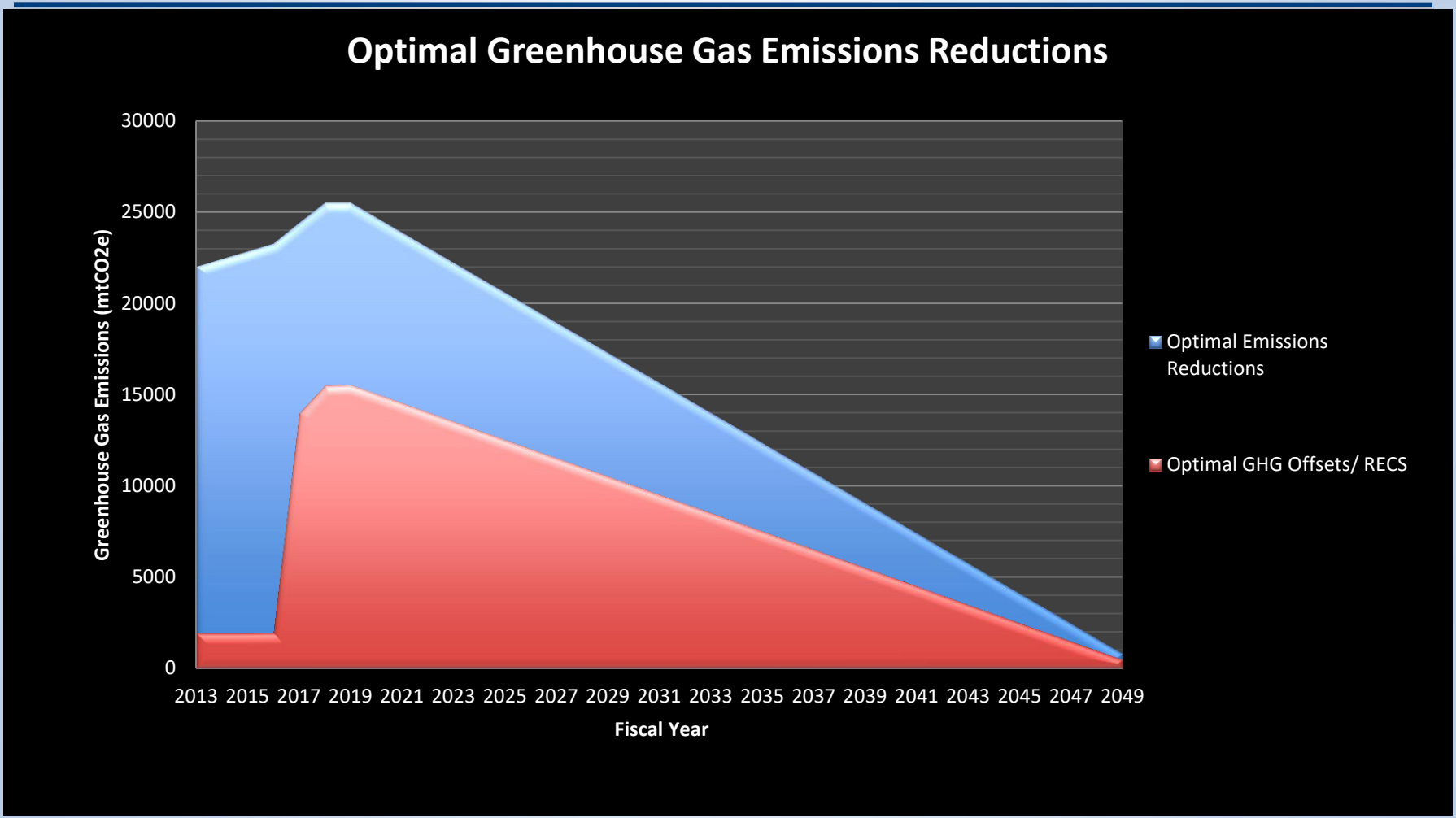
Whitman by the Numbers

Students (FTE)	1,471.2
Faculty & Staff (FTE)	~478
Main Campus Acres	117 Acres
Building Space	1,127,333 SQFT
Living at Whitman Project	87,500 SQFT
Campus Farm Properties	~22,000 Acres
Attributable greenhouse gas emissions	24,526.5 MTCO2e
Greenhouse Gas Emissions per student (FTE)	16.67 mtCO2e per Student IHE average per student 7.67mtCO2e
Annual Utility Budget	~ $1.6 million
Campus Annual Waste	252.73 Tons
Urban Forest	+1,565 Trees

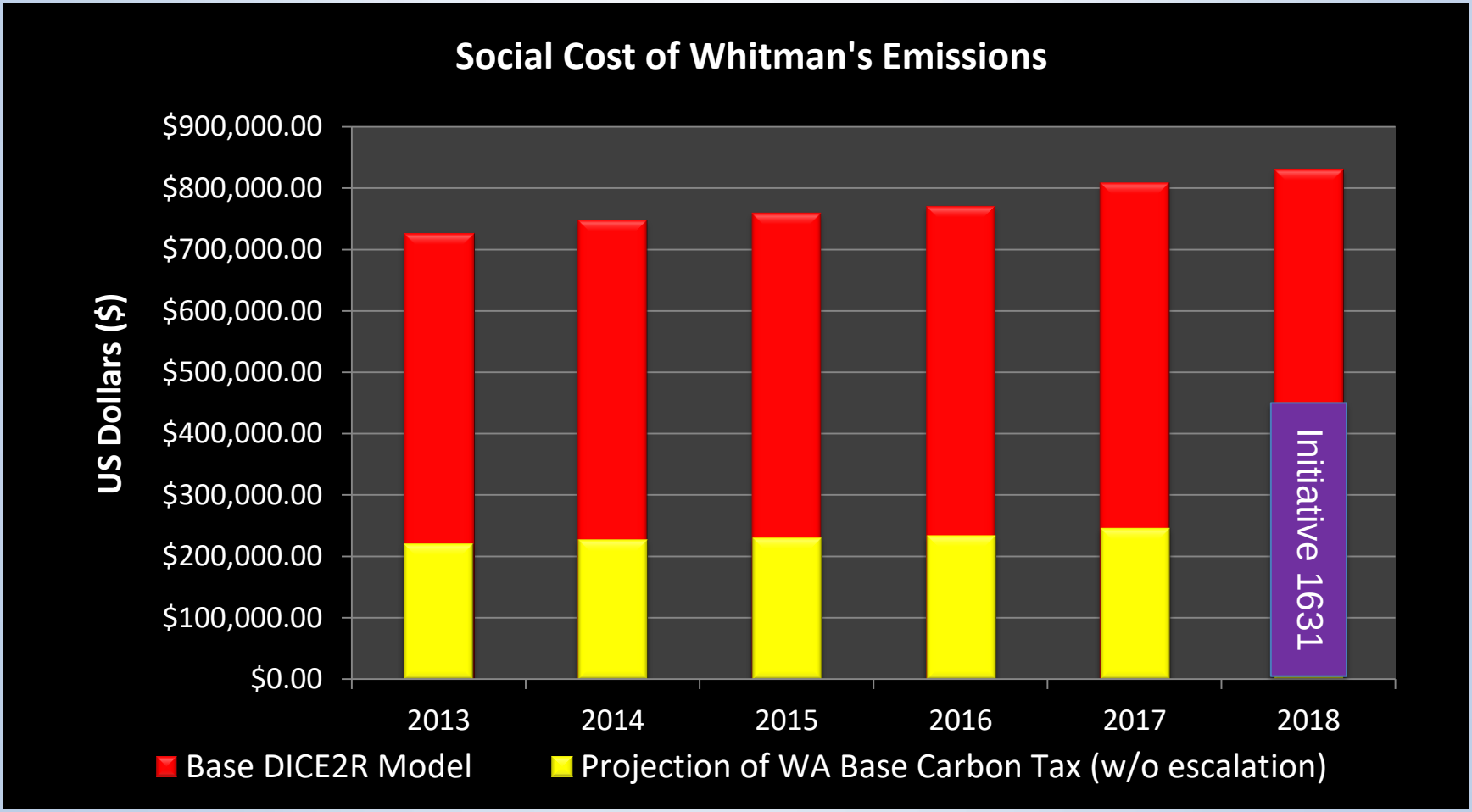
Whitman College Greenhouse Gas Emissions



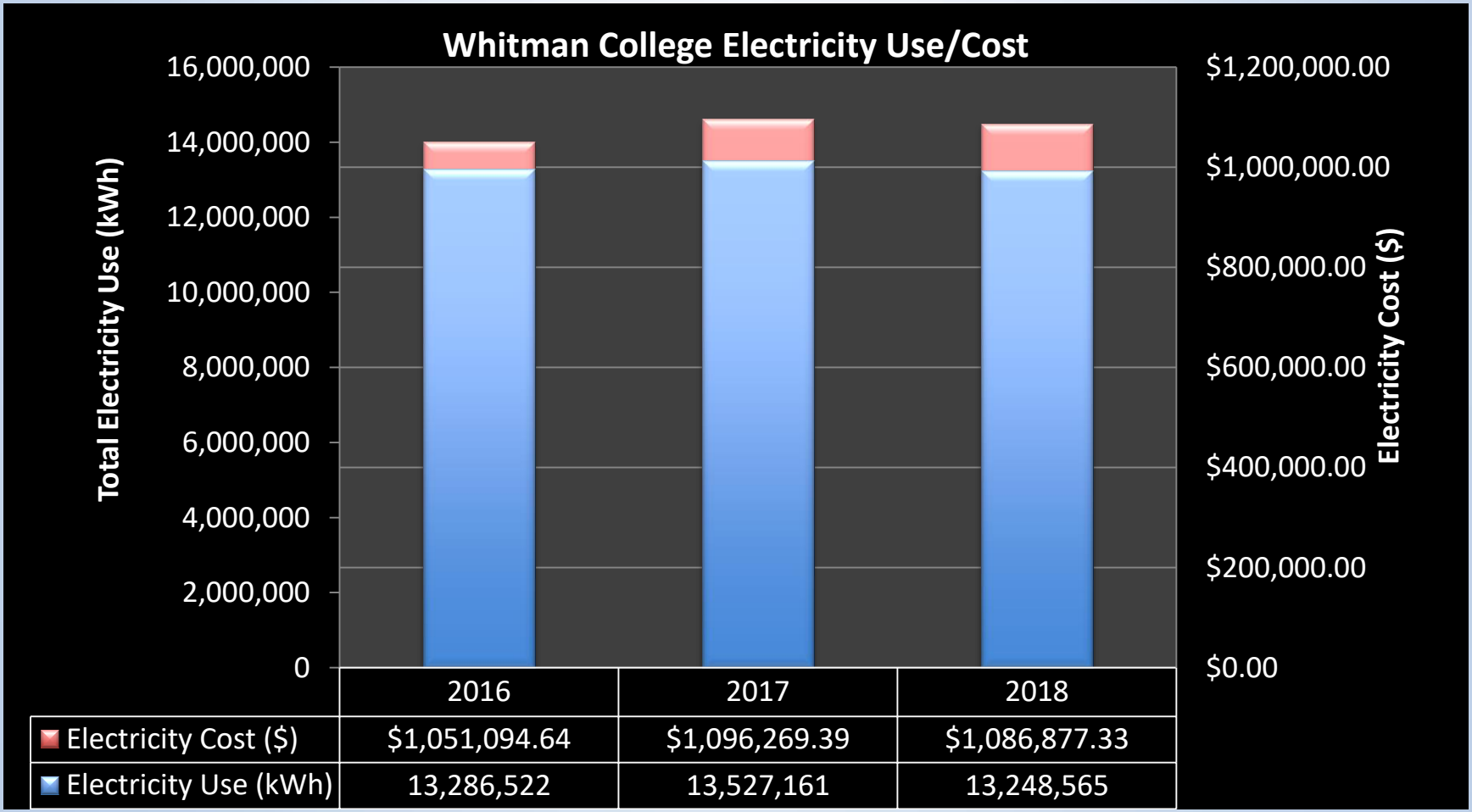
Optimal Greenhouse Gas Reductions



Global Externality of Whitman's Emissions

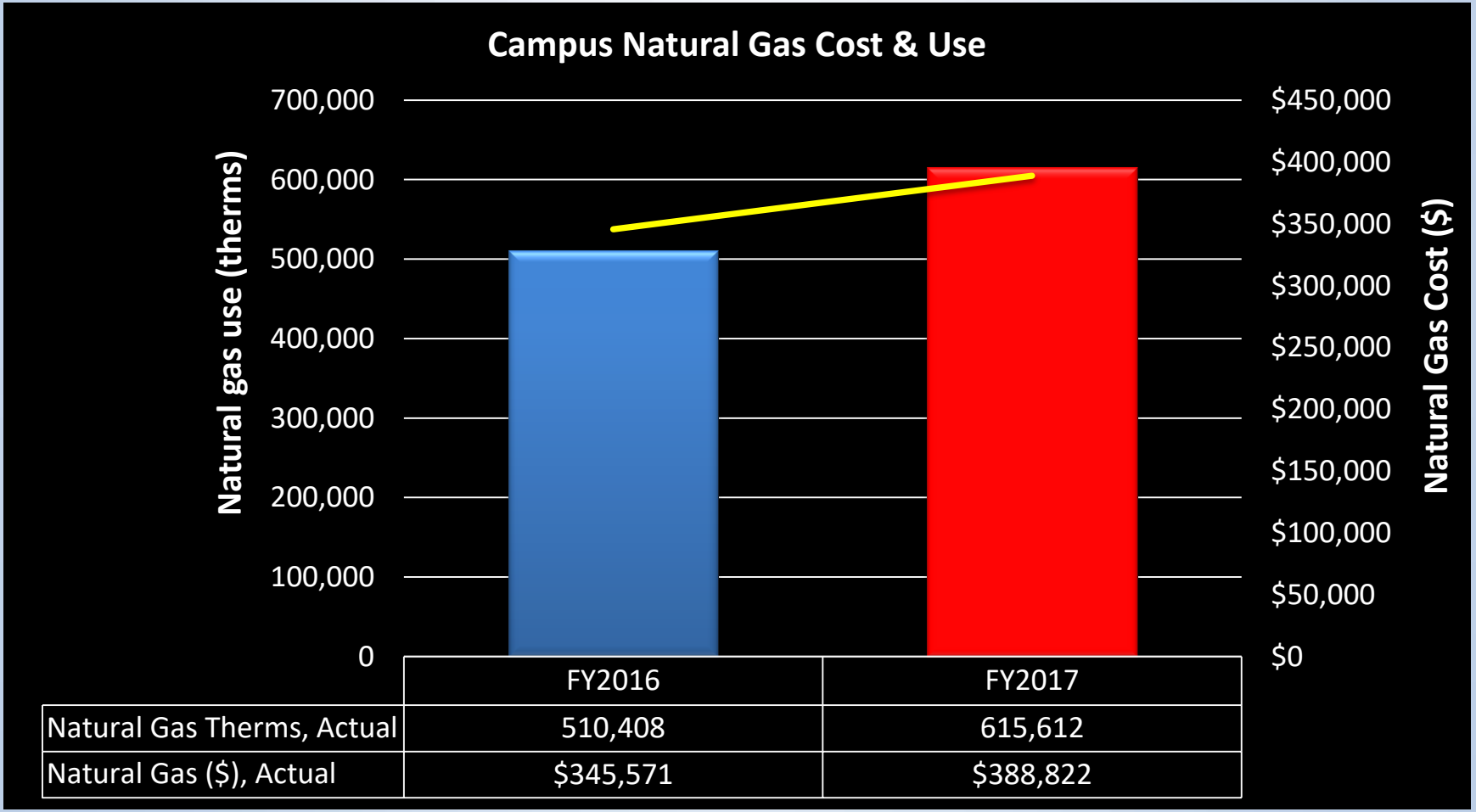


Campus Electricity Use/Cost



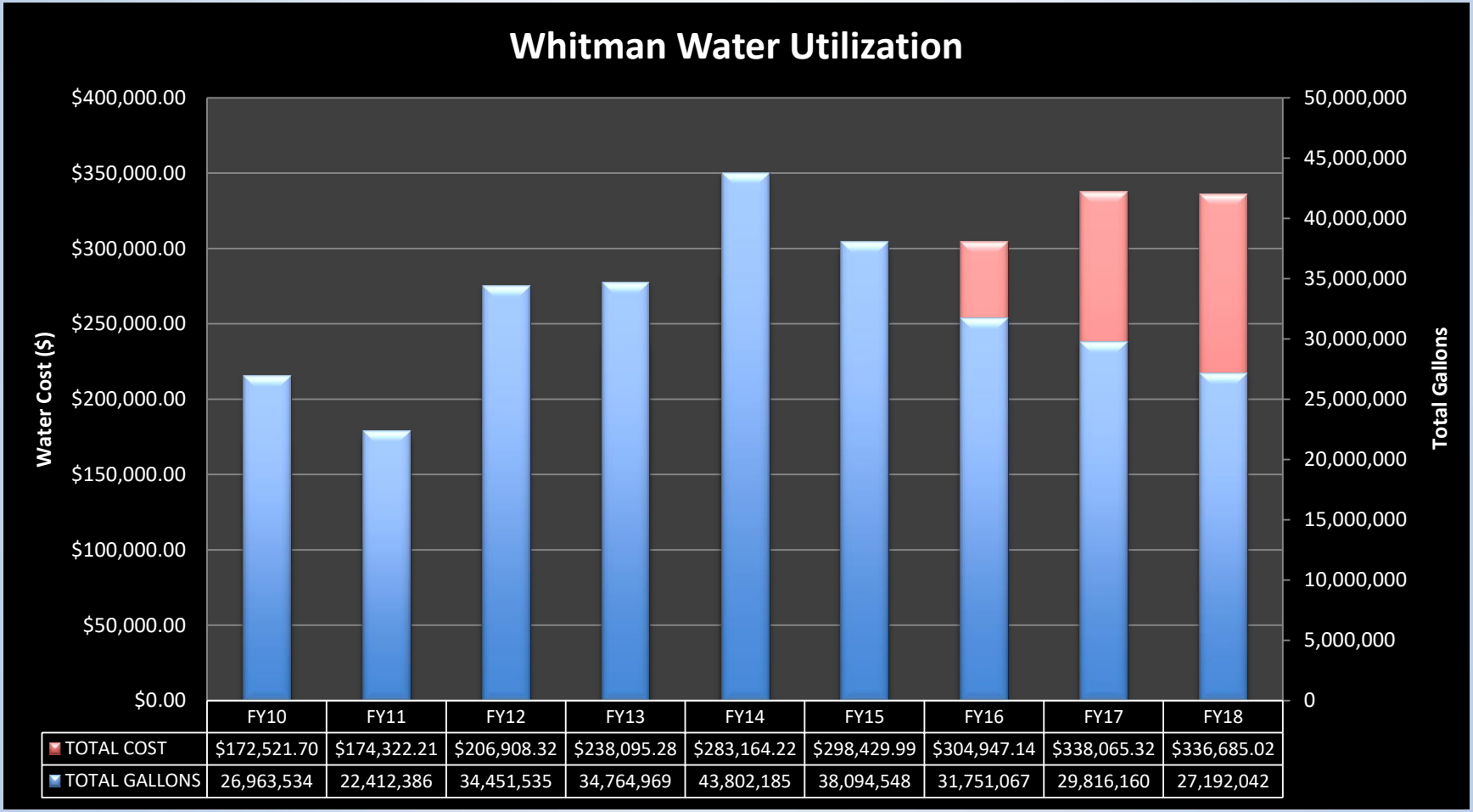
	2016	2017	2018
Electricity Cost ($)	$1,051,094.64	$1,096,269.39	$1,086,877.33
Electricity Use (kWh)	13,286,522	13,527,161	13,248,565

Campus Natural Gas Use/Cost



	FY2016	FY2017
Natural Gas Therms, Actual	510,408	615,612
Natural Gas ($), Actual	$345,571	$388,822

Campus Water Use/Cost



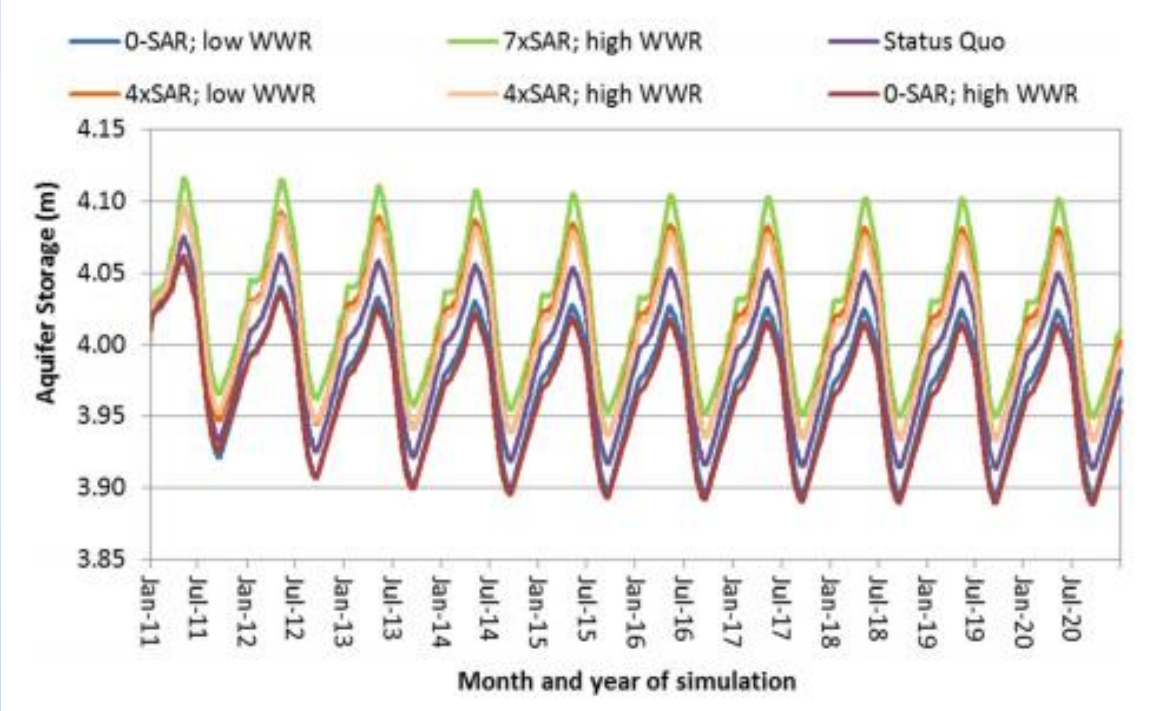
	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18
TOTAL COST	$172,521.70	$174,322.21	$206,908.32	$238,095.28	$283,164.22	$298,429.99	$304,947.14	$338,065.32	$336,685.02
TOTAL GALLONS	26,963,534	22,412,386	34,451,535	34,764,969	43,802,185	38,094,548	31,751,067	29,816,160	27,192,042

Hall of Science Deep Water Well

- Installed on April 5, 1962
- 1,202ft Deep taps Deep Aquifer
- Maximum pump capacity 530 gals per min
- Static level 142’ in 2007/ 64’6” in 1961
- Water Temperature 72F
- Over 3,462,336.25 Gallons of use annually
- Annual cost savings to college $42,867.19
- Installation of improved irrigation system

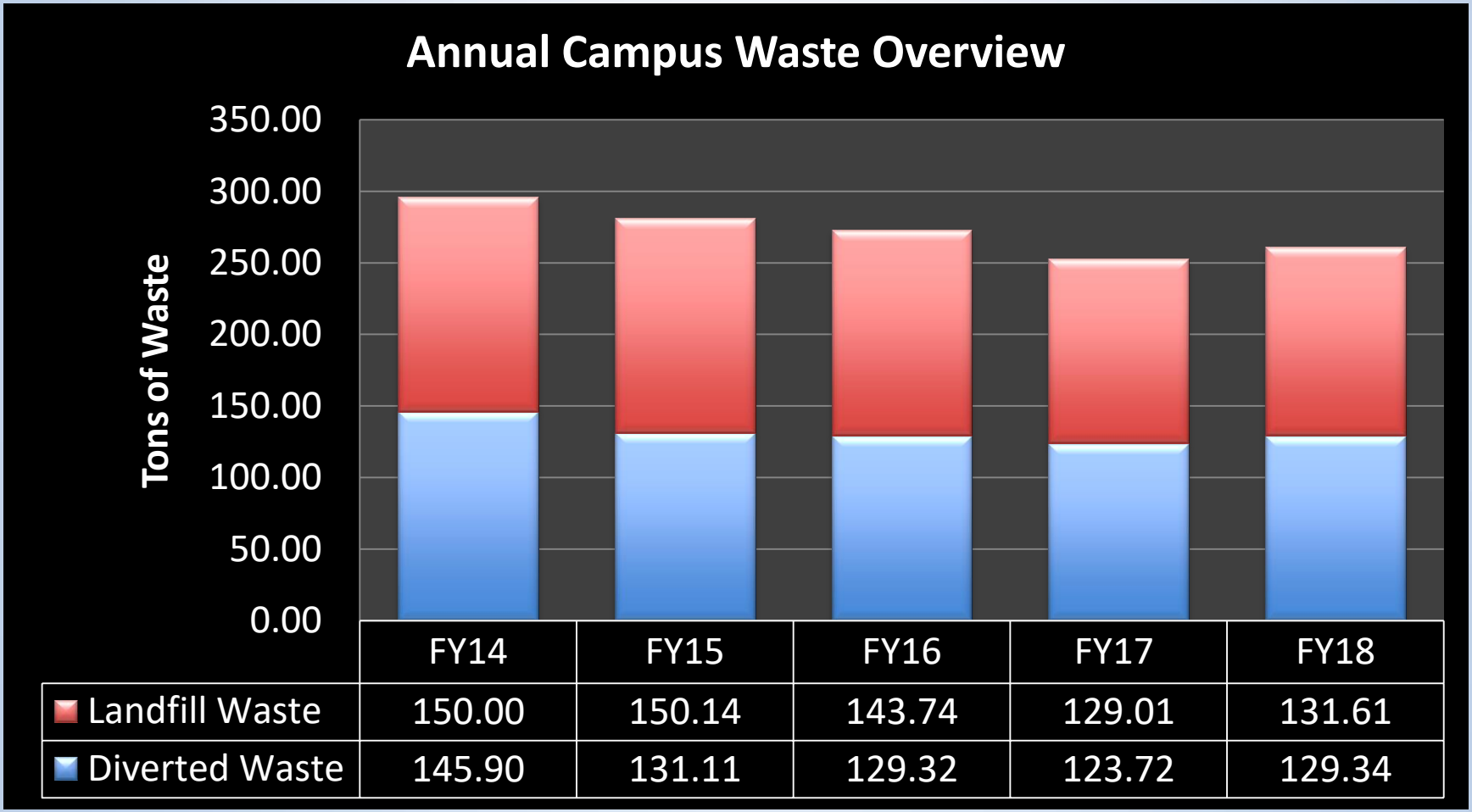
Walla Walla Valley Declining Aquifer Supply

- "Monitoring well records from WWBWC, USGS, and Oregon Water Resources Department, show that aquifer levels in the basin declined an average of 4.8 cm/year from 1950 to 2012."
- Managed aquifer recharge under current conditions "will continue to decline under Status Quo scenario (continuation of current practices)"



Source: Scherberg, J., Baker, T., Selker, J. S., & Henry, R. (2014). Design of Managed Aquifer Recharge for Agricultural and Ecological Water Supply Assessed Through Numerical Modeling. *Water Resources Management, 28*(14)

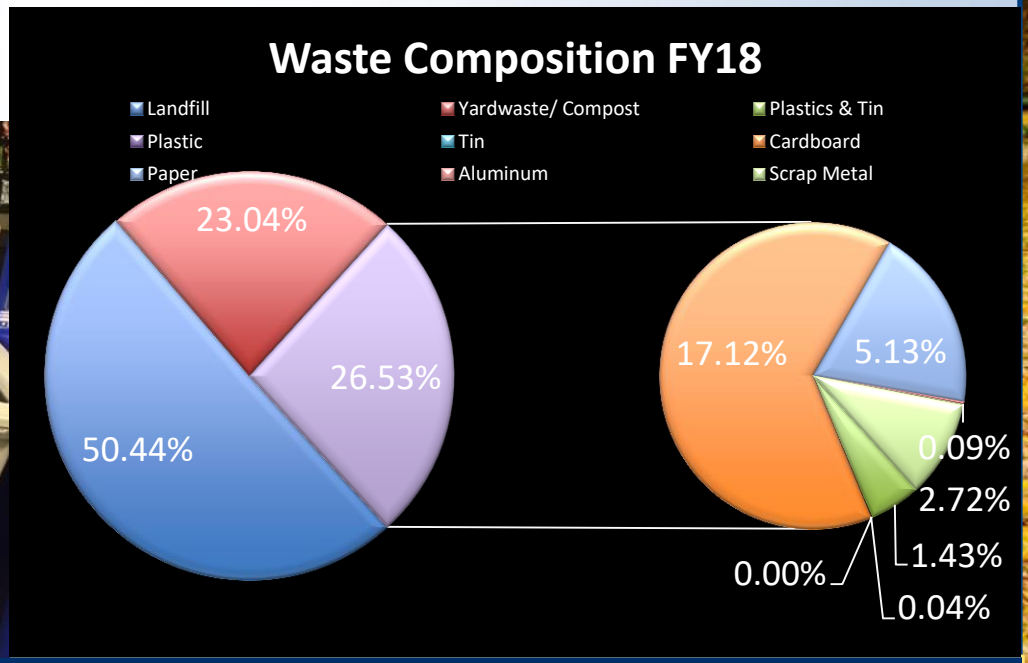
Campus Waste Stream



	FY14	FY15	FY16	FY17	FY18
Landfill Waste	150.00	150.14	143.74	129.01	131.61
Diverted Waste	145.90	131.11	129.32	123.72	129.34

Campus Zero Waste

- With limited regional recycling services our Campus processes a majority of our recycled materials. The Zero Waste Center collects, sorts, and transports over 70 tons of recycled materials each year and runs a small worm composting program.
- All campus yard waste is hauled to the landfill for composting.
- Students can take some compostable items to the Organic Garden.
- The campus focuses on purchasing to reduce our overall waste.



Renewable Energy Credits

Whitman currently purchases 17,400,000 kWh of American Wind Renewable Energy Credits. These credits are Green-E certified and offset 100% of our campus electricity usage.

- Whitman College is part of the EPA Green Power Leadership Club
- In 2017-18 Whitman began purchasing carbon offsets for Natural Gas.
- By 2020 Whitman will offset 100% of our electricity use and 100% of our Natural Gas usage.

EPA GREEN POWER PARTNER

CERTIFIED RENEWABLE ENERGY

Green-e.org

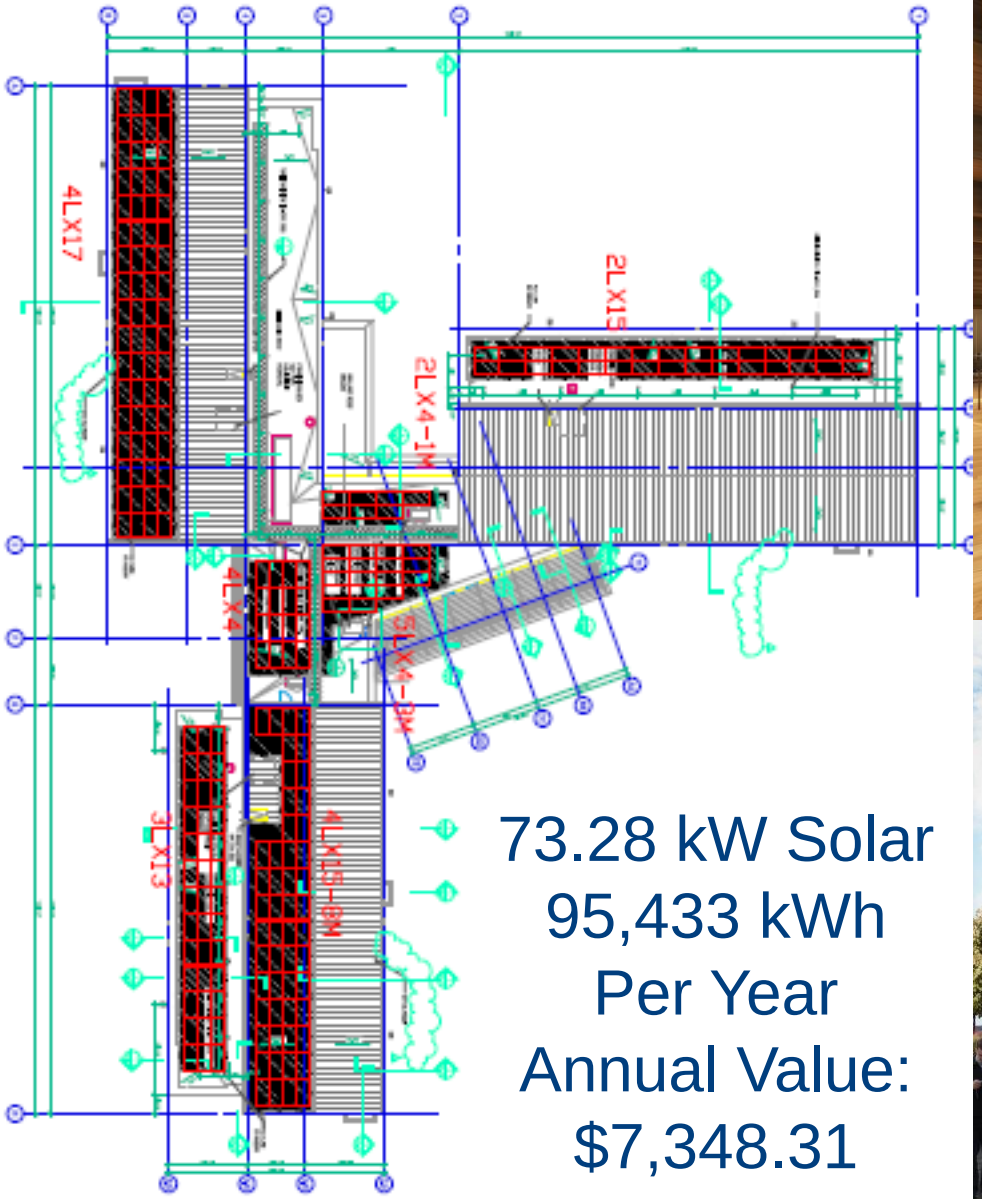
CLIMATE ACTION RESERVE

Renewable Energy Generation

- Bratton Tennis has 21kW of Solar Panels.
- In 2018 we will add 130kW of capacity.
- Our farm property is home to over 70 wind turbines.
- We are exploring more rapid rollout of renewables within the next 5-10 years. Developing a plan to rollout roughly 50-70kW annually.

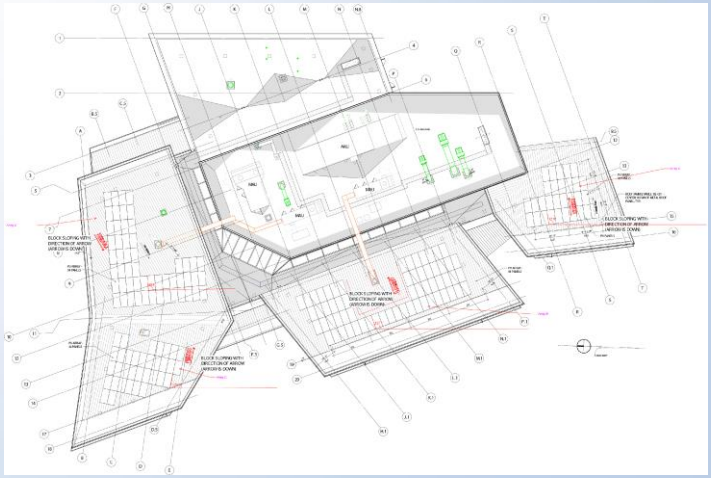
Sustainability Features of Living at Whitman Project

Features	Residence Hall	Cleveland Commons
Onsight Storm Water Management	Design specified for 25 year event. This will reduce the flow of site pollution into the watershed	Design specified for 25 year event. This will reduce the flow of site pollution into the watershed
Use of Light colored pavers and roofing material to reduce urban heat island	An index was selected appropriate to region to ensure maximum thermal gain and reduction in heat island effect.	An index was selected appropriate to region to ensure maximum thermal gain and reduction in heat island effect.
Irrigation Systems and plant selection that reduce irrigation demand on the campus deep well.	Design reduction is 54% over standard design	Design reduction is 52% over standard design
Use of Low flow plumbing fixtures to reduce potable water use.	Design reduction of 43% will reduce water use and overhead.	Design reduction of 46% will reduce water use and overhead.
Use of energy efficient design and renewable energy strategies. Including enhanced building envelope, day lighting, aluminum clad windows, LED and lighting controls, aggressive heat recovery, and photovoltaic integration.	Building energy reduction of 62% resulting in substantial operational savings. Overall operation cost reduction. Heating load is likely under projected by engineering firm.	Building energy reduction of 12% resulting in operational savings. Equipment selection and air handling demand creates an energy intensive space similar to the Hall of Science.
Purchase of Green Power (RECs) to offset 100% of building energy use	Incorporated in rating	Incorporated in rating
Construction Practices aimed at 50% waste diversion	Incorporated into construction plan still pending.	Incorporated into construction plan still pending.
Use of Recycled and Regional Material	Significant use of regional and recycled material still pending.	Significant use of regional and recycled material still pending.
Use of Low VOC adhesives, sealants, paintings, coatings, flooring systems and composite wood and agrifiber products.	We are monitoring all items that are incorporated into building design to ensure occupant health.	We are monitoring all items that are incorporated into building design to ensure occupant health
Integration of LEED educational signage and building metering.	Building will have integrated water, natural gas, electric, and solar panel metering to monitor systems and engage building occupants.	Building will have integrated water, natural gas, electric, and solar panel metering to monitor systems and engage building occupants.
Bike Racks and an Electric Vehicle Charging Station	This project is designed using multimodal transportation methods.	This project is designed using multimodal transportation methods.



73.28 kW Solar
95,433 kWh
Per Year
Annual Value:
$7,348.31

Cleveland Dining Commons



58 kW Solar Capacity, 66,792 kWh, $5,143

New Solar Panels

Vehicle Charging Stations and Retrofits

- Society of Physics Students: Have converted a 1987 Chevy S10 into a new electric recycling truck.
- The campus installed its first electric vehicle charging stations as part of the Living at Whitman initiative.

Whitman College and Sustainability Benchmarking

- Starting in Fall of 2016 Whitman College became a full member of the Sustainability, Tracking, Assessment, and Ratings System (STARS).
- The STARS system is the most comprehensive Sustainability benchmarking tool within higher education.
- STARS has over 695 participants on six continents. AASHE's STARS participants report achievements in four overall areas: 1) operations 2) academics, 3) engagement and 4) planning, administration.

On March 1, 2017-Whitman College received a Silver STARS rating by the Association for the Advancement of Sustainability in Higher Education.

AMERICA'S GREENEST SCHOOLS

Sierra's annual "Cool Schools" ranking

Building Energy Use & Monitoring

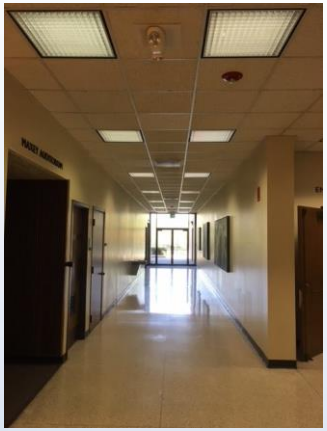
- Currently we spend around $1.17 per SQFT in energy costs. Our lifecycle fund focuses on building maintenance. Through this maintenance cycle we upgrade buildings systems. With more efficient systems saving the institution money and reducing our emissions.
- Verification and tracking is done using building metering & Sub-metering.
- Energy Dashboards are at Prentiss Hall, Olin Hall, Cleveland Commons, and Stanton Hall.
- Implementation of an institutional set point policy for thermostats.

LED Lighting Upgrades:
Baker Center
Recycling Center
Physical Plant
Reid Campus Center
Exterior box lights
Reid Campus Center

In Progress:
Douglas Hall
Hall of Music

Lighting Retrofit Status

- Olin Hall– HVAC, Lighting Retrofit 2016~ $30,000
- Baker Faculty Center, Lighting Retrofit 2017~ $310
- Douglas Hall- Entry LED Retrofit 2018
- Reid Campus Center Pendulums 2018 (completed)
- Penrose House 2018 (not yet funded)
- Deactivation of excess lighting in Science 2017
- Maxey West Lobby-Lighting Retrofit 2018 (completed)



Maxey West:
Resulted in a 46.6% reduction in energy
Annual Savings: $282
Incentives received: $511
Project Cost: $1,318.23
Return on Investment: 2.86 years

Exterior Post Lighting Retrofit

	Unit KWH	Total Units	Total Electricity KWH	Total Cost
MH175	764.86	74	56,600	$4,358.17
LED	218.53	74	16,171	$1,245.18

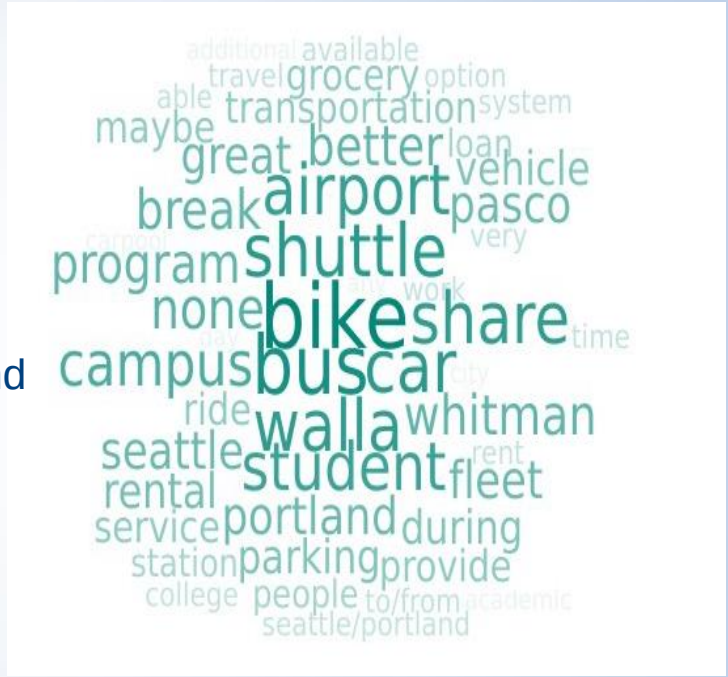
Annual Savings	Project Cost	Return on Investment
$3,112.99	$4,276.46	1.37 Years

10 Year Operation Savings	Energy Savings Annually
$26,865	40,429 kWh

Annual Green House Gas Reduction	Status
30.1 MTCO2e or 32,919 lbs of coal not burned	Project Completed

Bike Share & Multimodal Transportation

- In 2016 the campus Bike Share opened with 8 Fuji Captiva Bikes. We are slowly expanding to 15 bikes.
- The bike share has around 900 rentals annually.
- A campus Transportation survey was conducted of students, staff, and faculty in 2017.
- All residence halls have bike storage.
- The campus has over 50 bike parking areas.
- There is a dedicated bike shop for students, staff, and faculty.



Student Projects & Loan Fund

- The Green Action Fund is a $50,000 campus revolving loan fund utilized to sponsor student, staff, or faculty initiated sustainability projects.
- Current student projects include:
- Zero Waste: Electric Truck
- Demonstration Wind Turbine
- Bike Share Bikes
- Vermi-Composting

Student Organic Garden and Glean Team

The Glean Team is a student club that gleans 35,000 to 59,000 pounds of food produce annually throughout the Walla Walla Valley. They were recently recognized by the Blue Mountain Action Council for their work.

The Organic Garden works to foster an environment filled with agricultural experimentation. The organic garden acts as a community source for students to grow food and gain valuable skills.

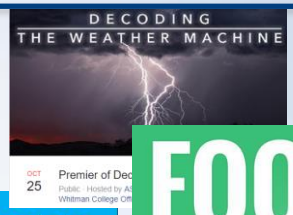
FOOD RECOVERY NETWORK

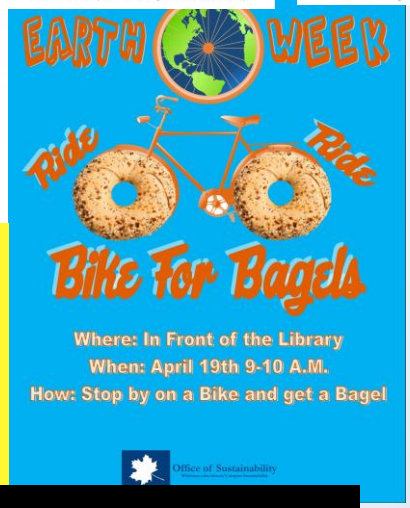
FIGHTING WASTE. FEEDING PEOPLE.

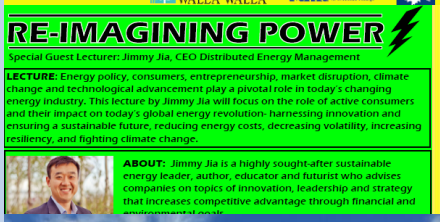
The Campus Climate Coalition leads our campus Food Recovery efforts. Through their activities they recover over 2,099 lbs. of food per semester. This food is given to local charities to help feed those in need.

Engaged Student Body for Change

Sustainability Programming







Whitman College Sustainability Memberships and Recognitions

Brandon Bishop
Office of Sustainability
Email: bishopbj@whitman.edu
Phone: (509) 522-4439
More Info: Whitman.edu/sustainability
Follow us on Facebook: Facebook/WCSustainability

QUESTIONS, COMMENTS?