



# BACK TO THE FUTURE: IDEAS FOR PLANNING FOR THE FUTURE OF WATER AND CLIMATE CHANGE

John Phillips, ENV SP

Director of Integrated Watershed  
Management

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## LOOK TO THE FUTURE— NOT THE PAST

- We are locked into some level of global warming and need to plan accordingly
- Temperature and precipitation patterns will be unprecedented in the PNW
- Past climate is no longer a good predictor of the future
- Design to the future—not the past
- Reduce your footprint



# CLIMATE ADAPTATION

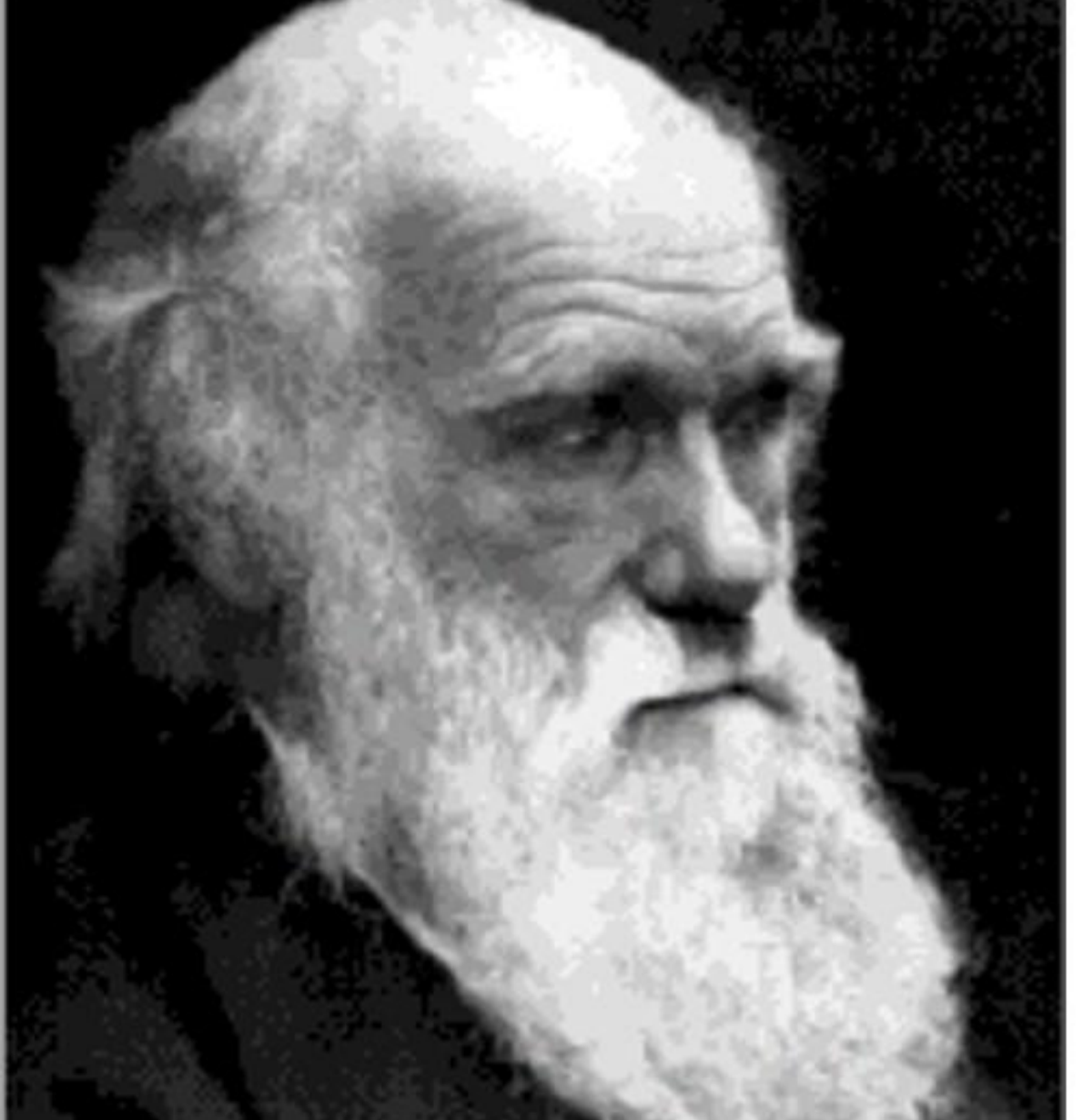




# THEORY OF EVOLUTION

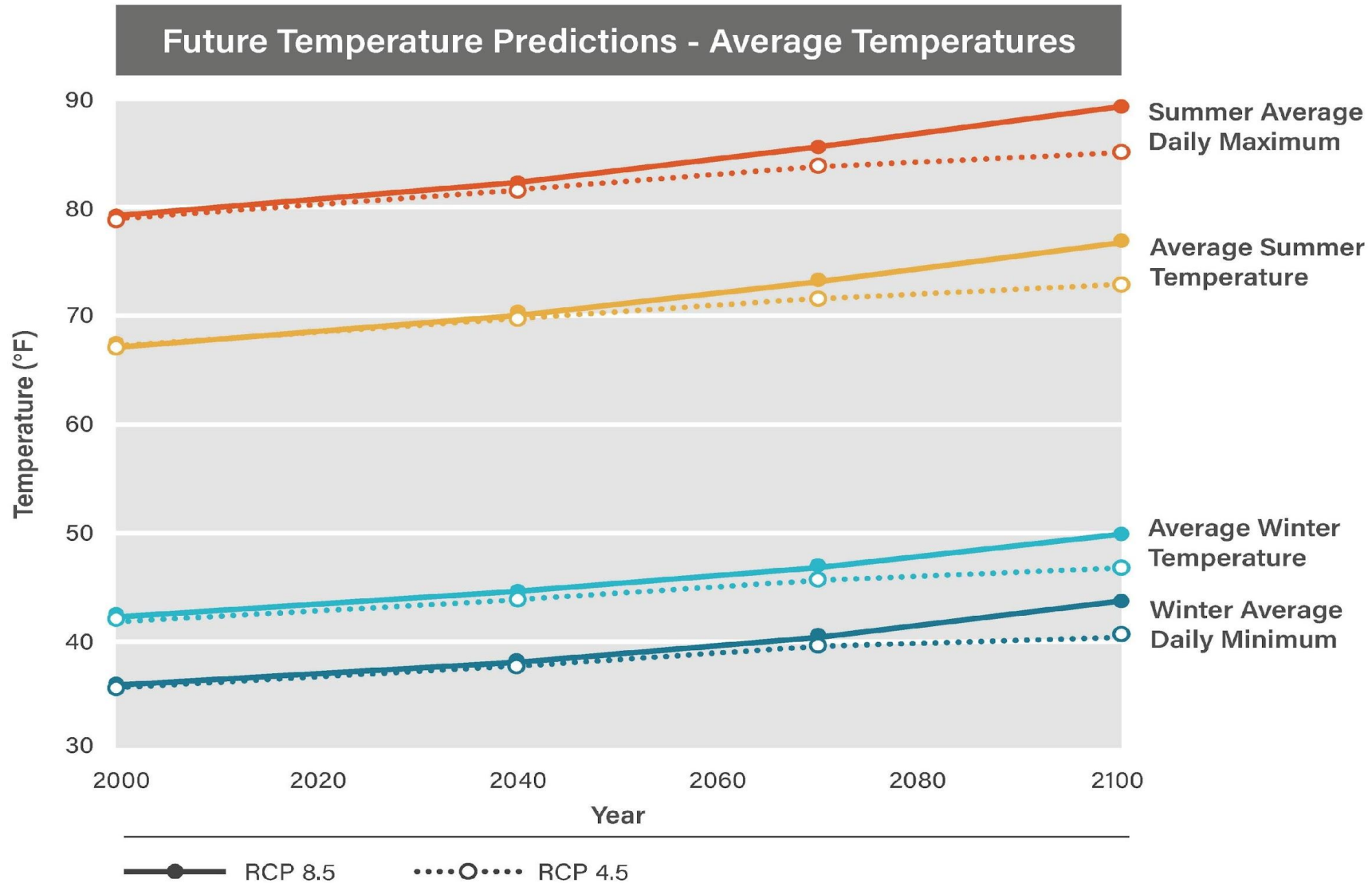
Adaptation is the transformation in living organisms that allows them to live successfully in a changing environment

Climate change presents us with a changing environment to which we must adapt



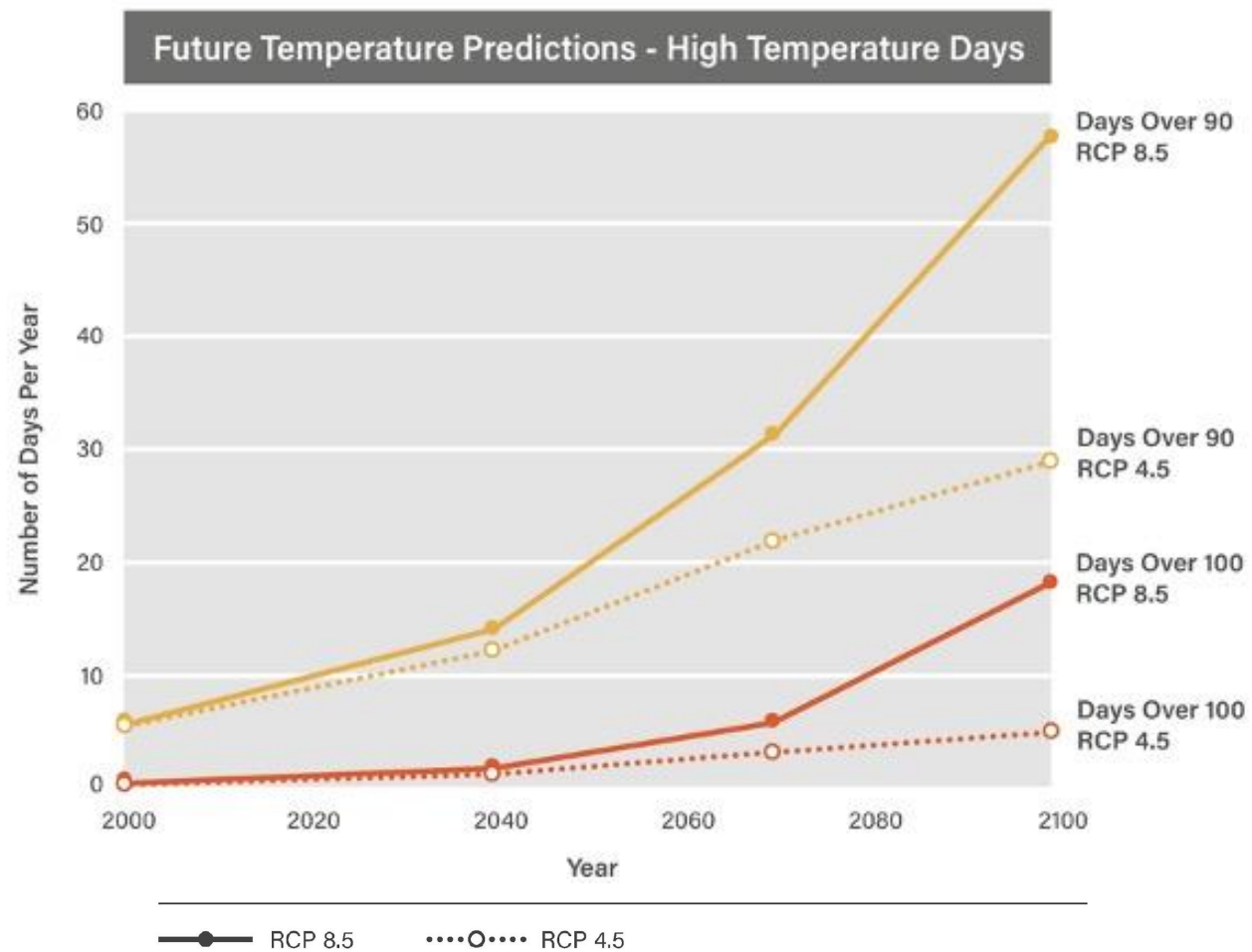


# TEMPERATURE INCREASES





# X TEMPERATURE INCREASES





# HEAT EFFECTS

## **Supply**

- Low Flow
- Toxic Algae

## **Infrastructure**

- Buckled Roads
- Cracked Pipes

## **Demand**

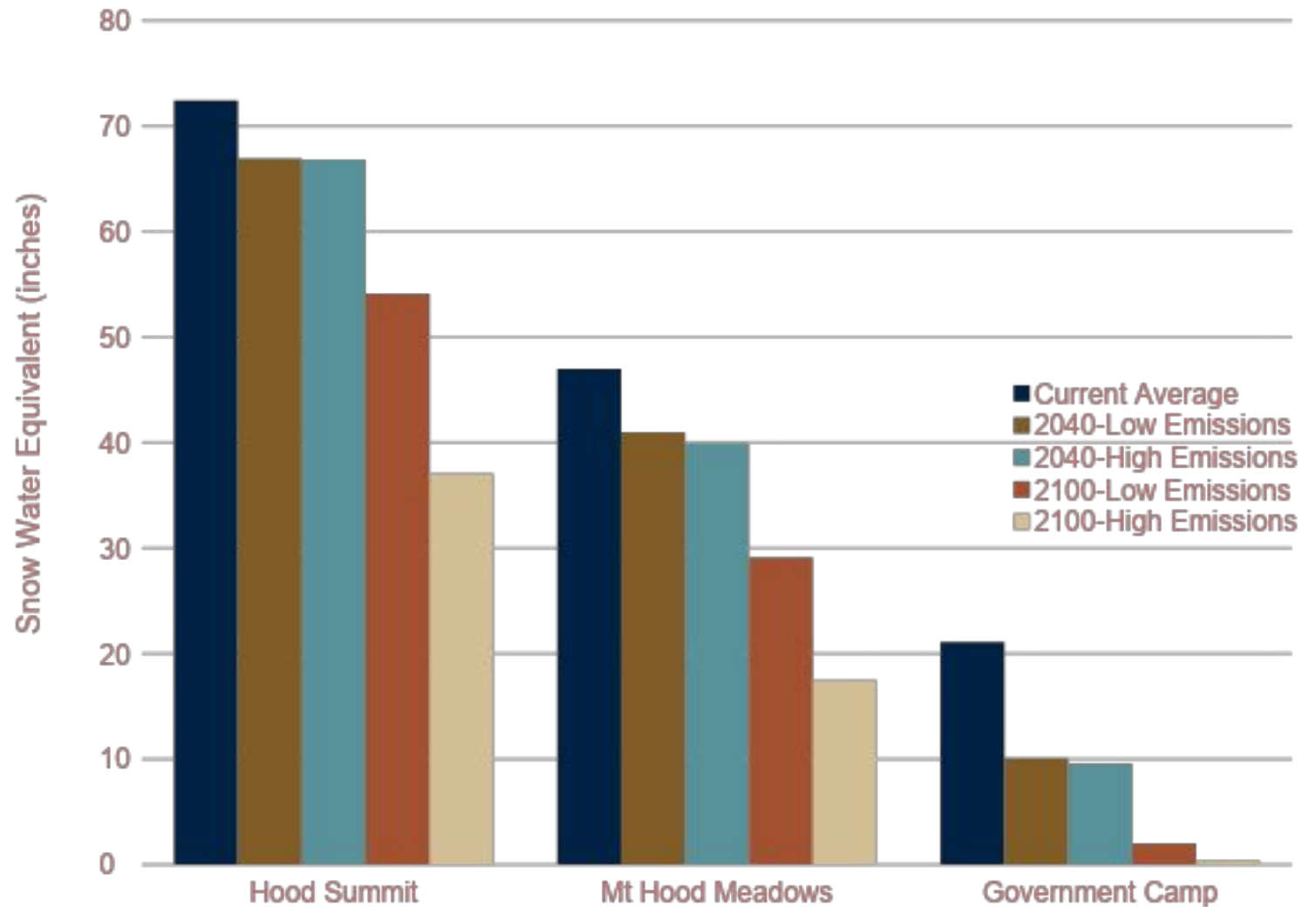
- Recreation
- Irrigation

## **Worker Safety**



# X CHANGES IN SNOWPACK

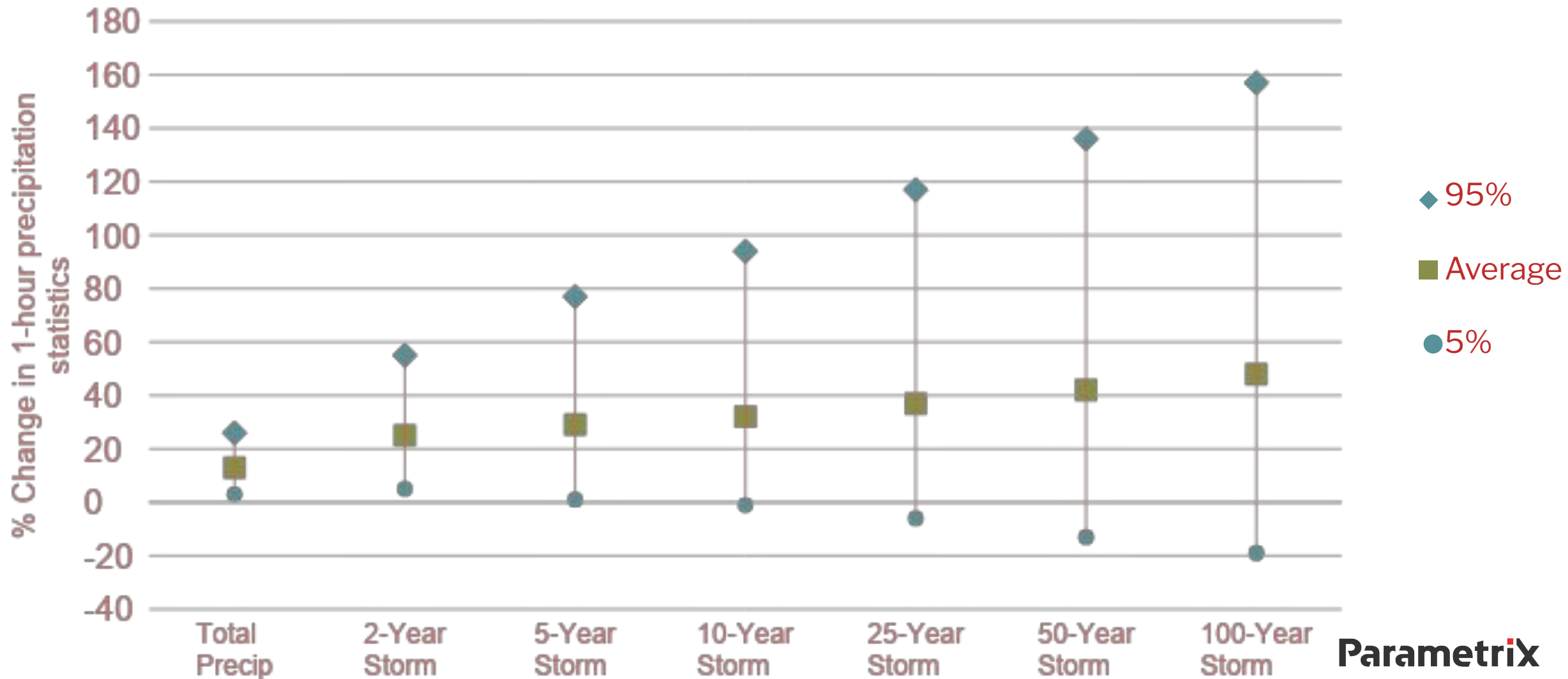
- More precipitation as rain
  - Decrease in snowfall, increase in melting
- Earlier snowmelt peaks
- Lower summer flows
- Increased water temps







# STORMS—DRAMATIC INCREASE BY 2080 (WEST)

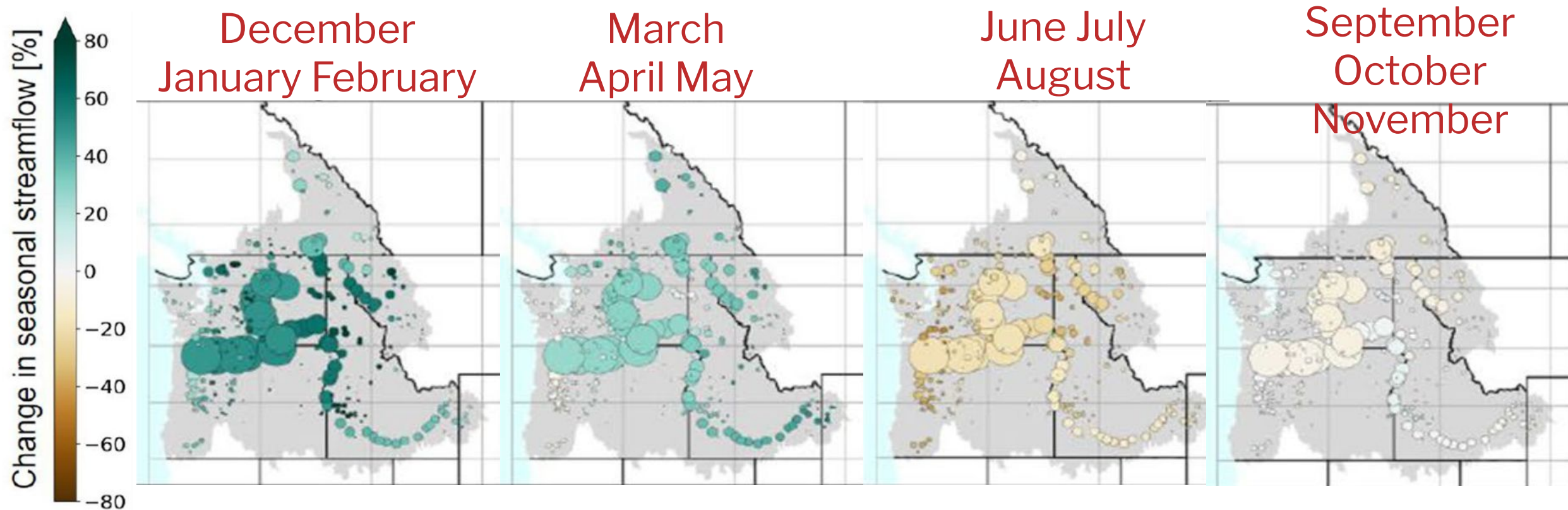


Winter flooding  
Increased stormwater  
Combined sewer overflow



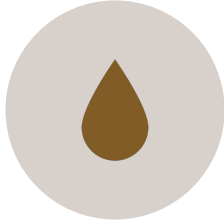


# FLOODING AND RIVER LEVELS



Data From ACOE RMJOC-II Part II: Reservoir Regulation and Operations—Modeling and Analyses

# X WHAT CAN WE DO?



**Improve Water Efficiency**



**Enhance Infrastructure Resilience**



**Invest in Nature-Based Solutions**



**Strengthen Transboundary Cooperation**



**Develop Climate-Resilient Policies**



**Utilize Technology and Data**

# GREENHOUSE GASES & WATER





# WHAT IS A GHG INVENTORY?

## GHG Inventory 101

- **Accounting of greenhouse gases (GHGs)** emitted to or removed from the atmosphere **during a specified period** for an organization or geographic boundary.
- GHGs are in large part from the **combustion of fossil fuels**, but also include emissions from other sources like **refrigerants, wastewater treatment, waste disposal, and land use change**.
- GHG inventories provide an **emissions baseline** and a **means to track emissions reductions over time and progress toward goals**.

Greenhouse Gas	Chemical Formula	Global Warming Potential
Carbon Dioxide	CO <sub>2</sub>	1
Methane	CH <sub>4</sub>	28
Nitrous Oxide	N <sub>2</sub> O	265
Other high-GWP gases	CFCs, HFCs, SF <sub>6</sub> , etc.	up to 24,000
Source: IPCC 5 <sup>th</sup> Assessment Report, 2014, 100-year values		



# GHG INVENTORY BASICS

## What is 1 MT CO<sub>2</sub>e?

**A Metric Ton of Carbon Dioxide Equivalent – a way to normalize GHG gases to CO<sub>2</sub>.**

One MT CO<sub>2</sub>e is equal to any one of the following:\*

- One passenger vehicle driven 2,500 miles
- 13% of one US home's energy use for a year
- 46 propane cylinders for home BBQs
- 1.2 acres of forest sequestration for 1 year





# GHG INVENTORY BASICS

## Operational control

**SCOPE 1**  
**DIRECT**  
EMISSIONS FROM  
SOURCES (ON SITE)



**SCOPE 2**  
**INDIRECT**  
EMISSIONS FROM  
ENERGY / UTILITIES



## Purchasing decisions

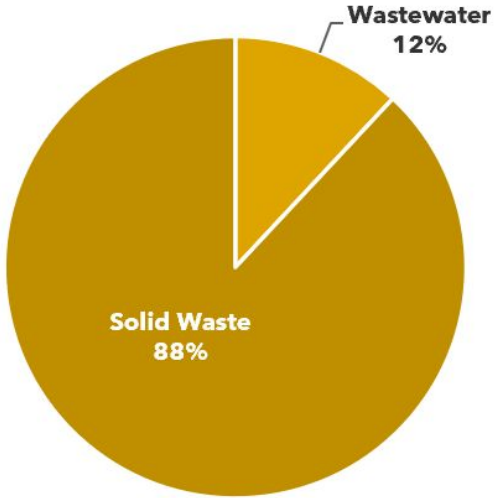
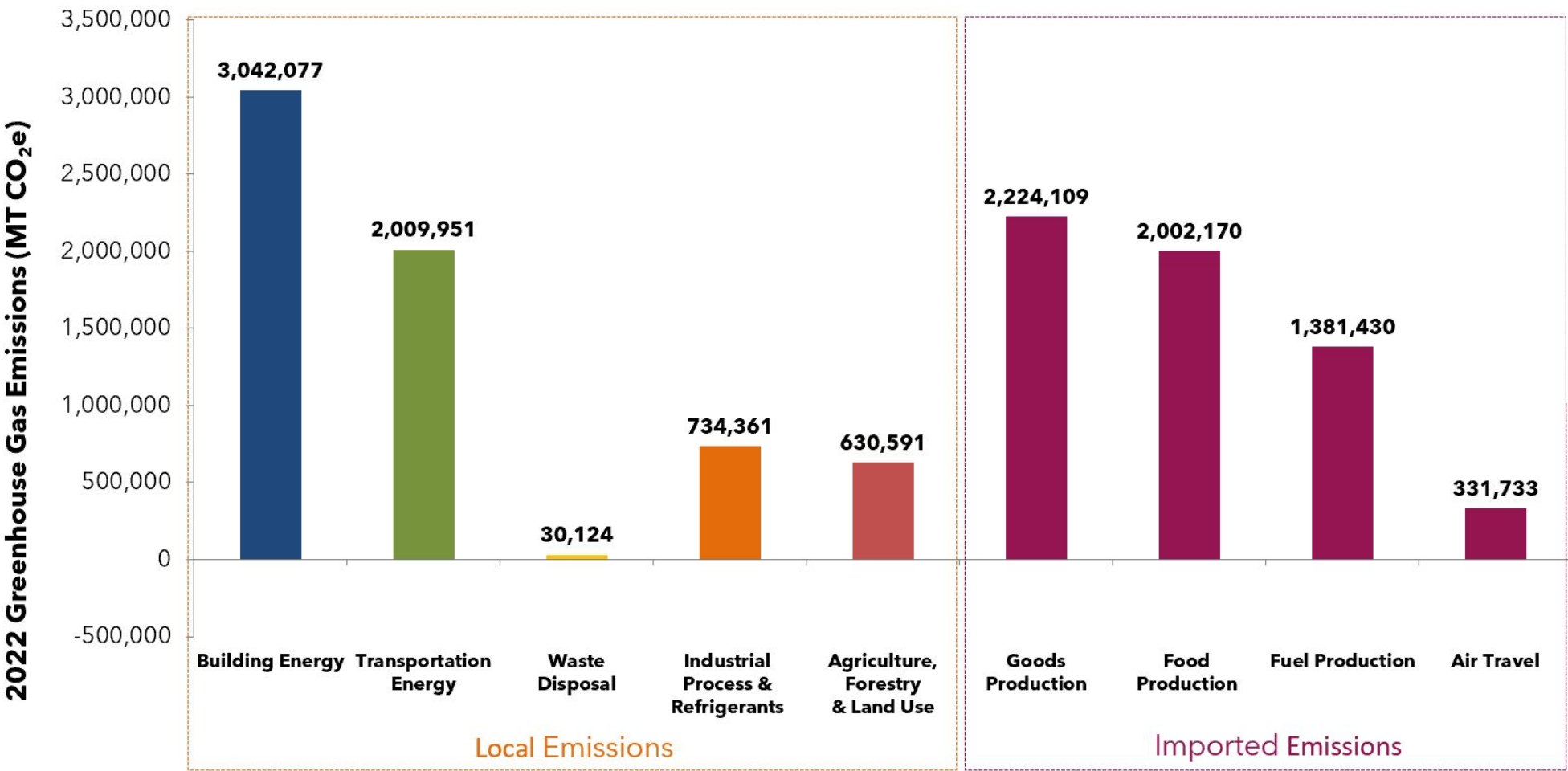
**SCOPE 3**  
**INDIRECT**  
EMISSIONS OF THE CHAIN  
SUPPLY OR SERVICE





# WASTEWATER EMISSIONS IN THE COMMUNITY

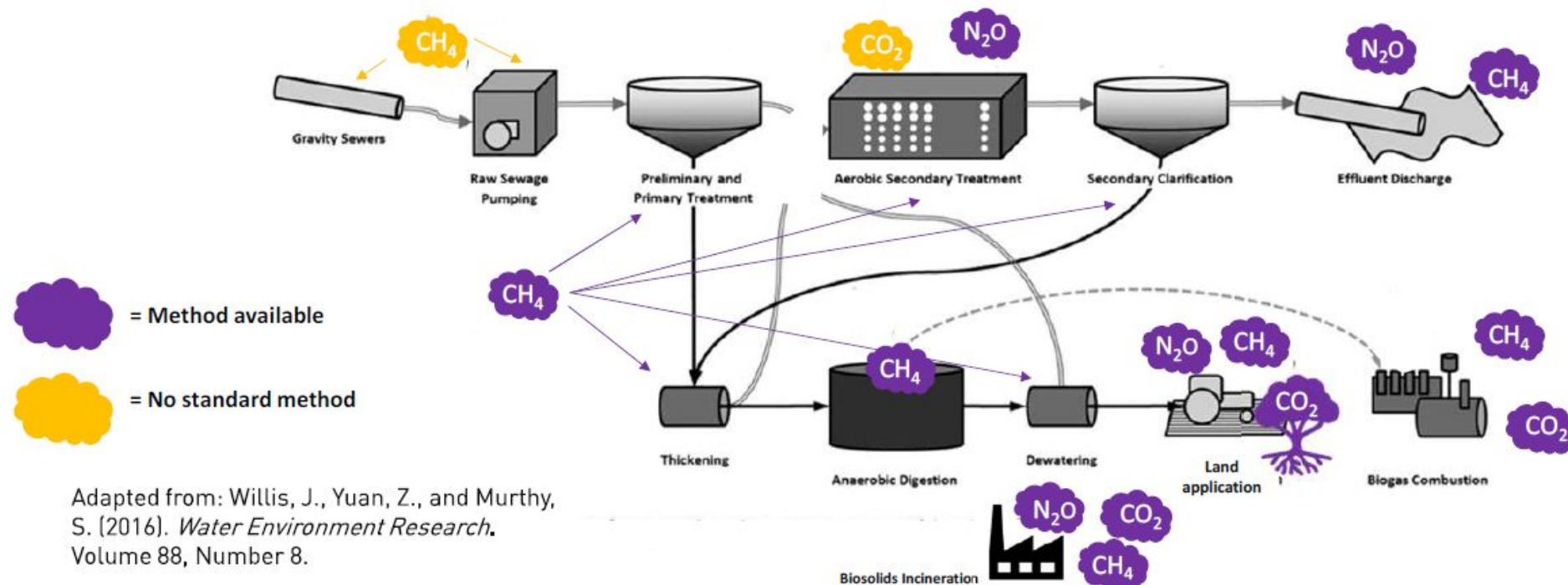
In Washington County, wastewater process emissions are .03% of total





# WWTP GHG EMITTING ACTIVITIES

## Sources of WWRF GHGs







## NEXT STEPS

### Where do I go from here?



- Explore options to **assess emissions** that may be underestimated or not accounted for in the current protocols.
- Look at what options you have **to reduce or sequester emissions** – whether for your own operations or someone else.
- Create **GHG reduction targets** based in science.



# INTEGRATED PLANNING FOR MUNICIPAL WATER



# INTEGRATED PLANNING

## WHAT IS

Transportation

WWTP

NPDES  
Permit

MS4

SDWA –  
Drinking  
Water

Land Use –  
GMA

- Way to prioritize and sequence capital improvement projects to
  - Achieve the greatest environmental and human health improvements
  - Avoid investments in projects that provide little to no benefit
  - Fit within a community's ability to pay (financial capability)



# INTEGRATED PLANNING TASK FORCE



## Integrated Planning Roadmap

- Presentations at WEFTEC
- Panel discussions
- APWA, ASCE, AWWA
- NACWA and US Conference of Mayors
- EPA HQ Staff
- Ecology engaged



# Parametrix

Community Building

Cultural Resources

Environmental

Funding & Grant Assistance

Project Delivery

Survey & Geospatial Services

Sustainable Solutions

Transportation

Visualization

Water

John Phillips

206-940-8769

[jmphillips@parametrix.com](mailto:jmphillips@parametrix.com)

[Parametrix.com](http://Parametrix.com)

