SNOWPACK Data Analysis
LIST of LESSON INQUIRIES

Sustainability Ambassadors
Rapidly advancing a sustainable future

Entry Point Inquiries Across the Curriculum

Equity and Environmental Justice

- With less SNOWPACK we will have more forest fires with more days in August and September of extremely hazardous air pollution. How will this environmental risk amplify existing vulnerabilities for low income and BIPOC communities?
- Shrinking SNOWPACK is a result of human-caused climate change. Who is advocating for the environmental justice solutions at the root of this systemic problem? Who is working on building a just transition from an extractive economy to a restorative economy, one that works for all people?
- What can we learn from the Washington State Environmental Health Disparities Map?
- How is King County Leading with Equity?
- How does economic and political power flow in our city, county, state and federal government? What is my agency in local democracy?
- What are the interests of local businesses in maintaining the status quo vs investing in a just transition? How green are local green businesses? Who are the BIPOC entrepreneurs and business leaders in this space? As a consumer, can I change the system with my purchasing power?
- How can we accelerate a just transition in Washington State?

Tribal Treaty Rights

- What are the rights guaranteed in treaties signed in the 1850's?
- What is the status of these rights today related to salmon, land and water resources? Are they being honored?
- What was the Boldt decision?
- How has snowpack changed since signing the treaties, and how has this affected salmon, forests, land and water resources that tribes depend on?
- What actions are local tribes taking to mitigate climate change and build resilience for mitigating its impact?
    - Tribal Vulnerability Assessment Resources
    - Tulalip Tribe Climate Change Resources

- Indigenous Tribes at Forefront of Climate Change Planning in the U.S.
- Tribes Use Western and Indigenous Science to Prepare for Climate Change

Biology, Ecosystems, Environmental Science

- How can we analyze SNOWPACK data to identify historical patterns and project future trends?
- Based on projected SNOWPACK trends, what are the ecosystem and species impacts in our bioregion?
- What are the climate impacts expected in our Puget Sound Bioregion? How am I both the problem and the solution for this situation?
- How are local hydrological patterns changing? With the same amount of precipitation moving through the water cycle, but with higher temperatures due to increasing levels of carbon emissions, should we expect more water (floods) in the winter when we don't need the water, and more droughts in the summer when we do need the water?
- How does increased volume, velocity, turbidity of stream flows in the winter impact salmon spawning habitat?
- How does reduced stream flows and warmer water temperatures in the summer impact migrating salmon?
- How resilient are our local social, economic, and environmental systems and what is the relationship among them?

Chemistry

- What is the chemistry of water? How do its unique properties create a snowflake? How does SNOWPACK “pack” during the winter and spring? What changes take place at the molecular level and why is this important to our water supply in August?
- What are the chemicals and chemical processes used in water purification? What do water purification facilities actually do to supply us with clean water on a daily basis? How does our local water supply relate to SNOWPACK trends in the Cascades?
- What is the chemistry of the carbon cycle? How does this cycle shift when forest fires rage through the dry forest soils in August and September due to dry soils from diminished SNOWPACK? .
- What is the chemistry of air pollution when our season of climate-caused forest fires returns each year? What particles are in the air? When we inhale these particles, how do they interact with the chemical processes of human biology?
- What are the top five consumer products that, if redesigned using the principles of green chemistry, would do the most to mitigate the impacts of climate change?

Language Arts

- What is my poetic response to what I now know about SNOWPACK?
- How is the media writing about the shrinking SNOWPACK in our bioregion? What's the style and word choice? How are they balancing science and politics, information and

emotion? Who are they interviewing? Are you hooked? Google: ***"record low snowpack in 2015."***

- Who are the voices leading a just transition from an extractive economy to a regenerative economy? What's the style and word choice? What is the lived experience of the writers? What is the mission of the organizations advocating for change? How are they using the written and spoken word to drive their mission? See Front and Centered | Got Green | Puget Sound Sage
- If I were to give voice to one of the following elements or species, what would be my point of view regarding our shrinking SNOWPACK? If I were a… snowflake, a drop of water, a mountain glacier, the voice of winter, spring, summer, a 500 year old cedar tree, a 200,000 year old boulder in the middle of a mountain stream, a raging forest fire, salmon, orca, oyster, eagle, bear, other...
- In 2050 I will be about the age that my parents are now. How can I apply the elements of science fiction (see climate fiction) to tell the story of what life is like. Choose one of these two scenarios. (A) We solved the problem, collaborated on equitable policy changes, innovative engineering design solutions, and new business models, so that I now live with my family in a utopian society. (B) We ignored the science, doubled down on fossil-fueled capitalism, and succumbed to our worst tribal instincts, so that I now live with my family in a dystopian society.

Civics / Geography / History / Future Scenario Planning

- Where on the map is the SNOTEL site that measures the depth of the SNOWPACK that becomes the water that I drink?
- How does the natural geography of our region shape climate conditions? How are human land use decisions impacting changes in these conditions?
- With changing patterns in our water cycle and less SNOWPACK, identify areas on a map of your watershed, where we may experience more flooding in the winter, and lower stream flows and warmer water temperatures in the summer. How will this affect property values? Infrastructure? Recreation? Salmon survival? Our Orca population?
- What are the most effective policies for mitigating the impacts of climate change? Which policies are needed at which levels of government: city, county, state, federal?
- How are cities in King County currently collaborating on climate action? What are the best ideas? How are we tracking progress? Which cities are leading?
- Does my city have a Climate Action Plan with a carbon footprint benchmark, goals for GHG emission reductions, and clear strategies for how to achieve them? See City of Seattle and also King County Strategic Climate Action Plan
- Could our class design our own Climate Action Plan? How about our school or school district? How will this align with and support our City's Climate Action Plan?
- What is the social-political-economic history of our SNOWPACK? To what extent have we built our local economy over the last 170 years around the assumption of a stable SNOWPACK filling our water reservoirs late into the summer?
- How did Native people adapt to local SNOWPACK conditions prior to colonization?
- How are local tribes today responding to climate change?

- How resilient are our social-political-economic systems for adapting to the impacts of less SNOWPACK? What are the best policies going forward? Who's working on them? See City of Seattle and also King County Strategic Climate Action Plan
- How will population increase in our region affect water supply planning?
- What elements of the Green New Deal are already being explored or implemented through policy making at the state and local level in Washington?
- Is the Puget Sound, like the Willamette Valley 180 years ago, the new "Oregon Trail" for climate refugees migrating from other states and other nations that will experience water scarcity in the coming decades?
- Can you imagine a single daily behavior in your life not related at some level to our shrinking SNOWPACK? What is your personal Climate Action Plan?

Economics, Business & Marketing

- What is the economic value of Nature's services in the Puget Sound Basin? How will SNOWPACK trends impact this dynamic system?
- What is the ecological economics foundation for the Salmon Recovery Habitat Plan for the Green Duwamish Watershed? How will SNOWPACK trends impact this dynamic system?
- How is the business community adapting to the projected impacts of climate change in our region? See Seattle Good Business Network
- Is solving climate change going to cost jobs or create jobs? What evidence can you find one way or the other. See The $26 Trillion Opportunity. See National Solar Job Census
- What are the most effective strategies for developing a sustainable business model? See B Corps Certification | Circular Economy | Microsoft Carbon Negative
- What criteria should we apply for assessing green-washing in business marketing?
- As a consumer, can I change the system with my purchasing power? See Vote with Your Dollar

Engineering Design

- How does a SNOTEL site actually work? How is it engineered to transmit critical information remotely to water resources managers?
- How is our water supply infrastructure engineered?
- What happens to our water supply infrastructure if we experience a major earthquake? Who is planning for this? How does the engineering design process kick in when we are confronted with a sudden, catastrophic disruption? See Water Supply Forum Resiliency Plan | King County Emergency Management Professionals
- Can we engineer more water storage systems to mitigate for the lack of water storage provided by our SNOWPACK?
- How can we engineer a home, school or commercial building for net zero water? Can we use our annual "rain budget" to store enough water through the winter to draw on this system through the summer? How much rain do we receive? What are the consumption needs within the building? How much storage will we need?

- Who is leading on clean energy design solutions to mitigate the impacts of climate change?
- Who is leading on sustainable transportation engineering design to mitigate the impacts of climate change? See selected engineering firms: Toole Design | Fehr & Peers | Perteet
- Who is leading on green building engineering design to mitigate the impacts of climate change? See Miller Hull Architects | Bullitt Center | Living Building Challenge
- What is Green Engineering? (EPA)

Math

- How do I read SNOTEL data tables to determine SNOWPACK patterns?
- How do water managers apply math to plan for, store, treat, test, transport, maintain, and pay for the water that we all take for granted?
- How do I read my family's water bill? Where does the fee we pay for clean, reliable water actually go?
- How do scientists apply math to calculate climate change patterns out into the future?
- Greenhouse gas emissions are measured in parts per million. What does that mean? How are these tiny changes driving major impacts in ecosystem integrity and public health?
- When I use a carbon footprint calculator to assess my GHG emissions, what mathematical assumptions and equations are built in? What about the mathematical assumptions in measuring my water footprint?
- If I make a change in my daily life to reduce my carbon or water footprint, and collect some data, and then extrapolate that data applied to every family in my school what would be our collective impact? What about every household in my city? How can I estimate these numbers using publicly available data sets?
- What mathematical thinking do we need to apply to engineer a home, school or commercial building for net zero water? Can we use our annual “rain budget” to store enough water through the winter to draw on this system through the summer? How much rain do we receive? What are the consumption needs within the building? How much storage will we need?

Food Systems

- What is the relationship between our local food system and our SNOWPACK?
- As the SNOWPACK shrinks, what are the expected impacts on our local food system?
- What are the local food justice issues related to the expected impact of climate change in our bioregion? See Got Green | Rainier Beach Action Coalition
- By reducing food waste in my home or in the school cafeteria, can I help slow down the shrinking of our SNOWPACK? What is the relationship here? See Food Too Good to Waste | Reduce Food Waste - Project Drawdown

- If California grows a large percentage of our fruits and vegetables, how are our consumption choices connected to SNOWPACK in the Sierra Nevada? Are we “eating” California’s water?