



**PROBLEM BASED
LEARNING
EDUCATING *for*
SUSTAINABILITY**

Mapping My Watershed Address

Grade Level: Middle School or High School
Subject: Human Geography, Science, Civics

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PROBLEM STATEMENT

If I knew my watershed address as well as I know my street address, what systemic improvements would I design for my community?

SUMMARY

Everyone knows their street address. That’s how we find our way home. But almost nobody, including adults, knows their **watershed address**, the neighborhood-scale, sub basin stream system within the larger watershed landscape on which our cities and school districts have been built

Indigenous People who thrived in this region for thousands of years prior to colonization absolutely knew their watershed address. They knew the stream-based ecosystem boundaries, the natural habitats and seasonal patterns for salmon, berries, roots, deer, and furs. This is still their practice. But today, salmon habitat is so degraded due to urbanization, Northwest Tribes argue that [treaty rights are at risk](#).

To build a sustainable future based on a much stronger understanding of our watershed address, it’s critical to honor the wisdom of **Indigenous peoples**. We need to remember our own sense of **belonging**, build **geographic literacy**, and **practice stewardship** of our land and water resources.

In this lesson series, students draw a “**mental geography**” map of their neighborhood, local commute trips, and any landmarks they commonly use including both human-made and natural elements.

The mental geography map serves as a personal reference point for what we know and what we don’t know about the watershed habitats we inhabit. **Students from immigrant experiences** are invited to draw a similar neighborhood map of their previous home community, city, or watershed, and to compare their level of familiarity with their home geography with their new community.

Next, students respond to a number of inquiries as they work in teams to identify features they might recognize on a large map of their watershed with nothing but streams, rivers and water bodies to guide them. No roads. No city boundaries. No buildings or shopping centers.

Students enhance their geographic literacy by exploring [My Watershed Address](#), a community impact mapping website built by Mapseed and Sustainability Ambassadors that includes interactive GIS map layers, [Print Maps](#), and great collections of additional [Maps We Love](#). Students can use the [Swipe](#) feature to slide back and forth between any two map layers to see what new stories are revealed.

Students use [My Watershed Address](#) to investigate **equity indicators, salmon habitat conditions, historical aerial photos**, and the strange jumble of **overlapping boundaries** that define our cities, school districts, and stream basins. What if all these different jurisdictions shared the same boundaries as those that defined a watershed address? Would policy making that respects the landscape be more effective?

Students explore examples of student-produced [Map Stories](#) that can be extended through the [Neighborhood Sustainability Inventory](#) leading to deeper research inquiries and opportunities for [Impact Project Design](#). High quality student impact projects can also be [posted](#) on the map to help visualize collective impact across the landscape. See the “**projects**” map layer and click on one of the little green dots to learn what’s happening near you. Sustainability Ambassadors is working with our partners to identify and post project sites that serve as case studies for unpacking science and engineering solutions. This is an expanding collection!

A fascinating lesson in **Asset Based Community Development (ABCD)** empowers students to identify community improvements based on community assets (as opposed to what’s wrong with our community) and to design **Impact Projects** that align academic standards with watershed community policies, plans, and performance measures.

Learning Objectives

1. I can interpret information on a range of maps related to my watershed and tell stories about the systemic relationships between my street address and my watershed address.
 2. I can apply systems thinking to understand the issues and opportunities related to the sustainability of my watershed / community, balancing environmental, economic and equity outcomes.
 3. I know how to take personal action to measurably improve the sustainability of my watershed / community.
3. Draft a personal Map Storypath using map layers and Maps We Love from [My Watershed Address](#).
 4. Draft a mind map plus a street map of positive community assets using ABCD principles ([Asset Based Community Development](#)).
 5. Make a list of possible watershed / community improvements
 6. Write a draft impact project plan following the [IP3 Strategy](#).


Formative Assessment

Menu of possibilities...

1. An initial personal sketch of my neighborhood assessing “mental geography” of place. Option: An initial personal sketch of “my Immigrant story map” from there to here.
 2. Research notes from selected map inquiries from past and present and from different perspectives or geographic lenses.
1. Develop an individual or team presentation on watershed / community assets and recommended improvements.
 2. Follow the [IP3 Strategy](#) to design and implement a watershed / community impact project that demonstrates a clear connection between personal action and one or more policy frameworks or performance measures from your city or county government.
 3. Produce a personal reflection, mind map, or video-self-interview on your growth as a learner including your reflections on the nature-based wisdom of Indigenous People.

Summative Assessment

Photo: Tom Reese

A photograph showing a group of people in a boat on a body of water. The water is shimmering with sunlight. In the background, there are several large industrial cranes or structures, possibly at a port or construction site. The sky is clear and blue.

ACADEMIC STANDARDS

NGSS #HS-ESS3-1 - Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. Examples of key natural resources include access to fresh water, fertile soils, and fossil fuels. Examples of natural hazards can be from things like volcanic eruptions and earthquakes, tsunamis and soil erosion, and severe weather. Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation.

K-12 Environmental and Sustainability Education (ESE) Learning Standards

Standard 1: Ecological, Social, and Economic Systems Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate an understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, tribal, and global levels.

Standard 2: The Natural and Built Environment Students engage in inquiry and systems thinking and use information gained through learning experiences in, about, and for the environment to understand the structure, components, and processes of natural and human-built environments.

Standard 3: Sustainability and Civic Responsibility Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability.

K-12 Social Studies Learning Standards, Middle School and High School

G1 Understands the physical characteristics, cultural characteristics, and location of places, regions, and spatial patterns on the Earth's surface.

G2 Understands human interaction with the environment.

H3 Understands that there are multiple perspectives and interpretations of historical events.

H4 Understands how historical events inform analysis of contemporary issues and events.

BIG PICTURE

[NGSS Global Climate Change](#)

[NGSS Human Sustainability Standards](#)

[OSPI Environmental Sustainability Standards](#)

[OSPI Social Studies Standards](#)

[College, Career, and Civic Life \(C3\)](#)

[Common Core State Standards](#)

Since Time Immemorial



[Image Source](#)

Middle School Outcomes

By the time Washington State students leave middle school, they will understand:

That according to the US Constitution, treaties are “the supreme law of the land” consequently treaty rights supersede most state laws

That Tribal sovereignty has cultural, political, and economic bases

That Tribes are subject to federal law and taxes, as well as some state regulations

That Tribal sovereignty is ever-evolving and therefore levels of sovereignty and status vary from Tribe to Tribe

That there were and are frequent and continued threats to Tribal sovereignty that are mostly addressed through the courts.

High School Outcomes

By the time Washington State students leave high school, they will:

Recognize landmark court decisions and legislation that affected and continue to affect Tribal sovereignty

Understand that Tribal sovereignty protects Tribes’ ways of life and the development of their nations

Understand that Tribal, state, and federal agencies often work together toward the same goal

Explain the governmental structure of at least one Tribe in their community

Distinguish between federally and non-federally recognized Tribes.



COMMUNITY CONTEXT

My family's sustainable practices

My Neighborhood Association

Nonprofits focused on this issue

Nonprofits focused on equity

My School's Green Team goals

My School's Sustainability Policies

My City and County Sustainability,
Equity, and Land Use Policies

My Watershed Salmon Recovery Plan

Puget Sound Regional Council

Puget Sound Ecosystem - Vital Signs

Washington Department of Ecology

Tribal Treaty Rights

Tahoma School
Cedar River Middle School
Shadow Lake Elementary
Tahoma Senior High
Lake Wilderness Elementary
Rock Creek Elementary
Tahoma Junior High
Glacier Park Elementary

Breaking Down the Problem Statement

If I knew my watershed address... as well as I know my street address... what systemic improvements... would I design for my community?

If I knew my watershed address....

- What is the nearest stream or water body to the place where I live?
- When it rains in my neighborhood, which way does the water flow?
- What percentage of this water flows in ditches or down storm drains?
- If there were suddenly no houses, buildings, grocery stores, malls, roads, or parking lots in my neighborhood, where would I go to drink fresh water each day?
- Where would I fish for salmon?
- Gather berries?

as well as I know my street address...

- When did you first memorize your street address?
- What are your most frequent travel patterns to get to places you need or enjoy? What is the pathway to school? To the grocery store? To the transit center? To the mall? To your friend's place? To the park?
- To travel beyond your extended neighborhood, what are the major roads, bus lines, light rail, or freeways you depend on?
- Where do these highways and train tracks cross over your river?
- Can you access a stream or river from where you live? What is the pathway?
- What is the placement of storm drains in your neighborhood? When it rains a lot and water rushes along the curb and down these storm drains, where does it go?

- Do you ever notice flooding where you live? Why does this happen?

what systemic improvements...

- What is a system? What do we mean by systemic?
- Can I improve human health?
- Can I play a role in improving salmon health?
- What is the relationship between human health and salmon health?
- What is the relationship between salmon and the health of Puget Sound Orca?
- What is the point of view of Indigenous Peoples on these same questions?
- What treaty rights are guaranteed to local tribes?
- What are the systemic benefits of increasing the tree canopy in my city?
- How do my daily habits contribute to my carbon footprint?
- How does my carbon footprint relate to the shrinking snowpack in the Cascade Mountains?
- How does shrinking snowpack relate to the health of my watershed address, to Salmon and Orca?

would I design for my community?

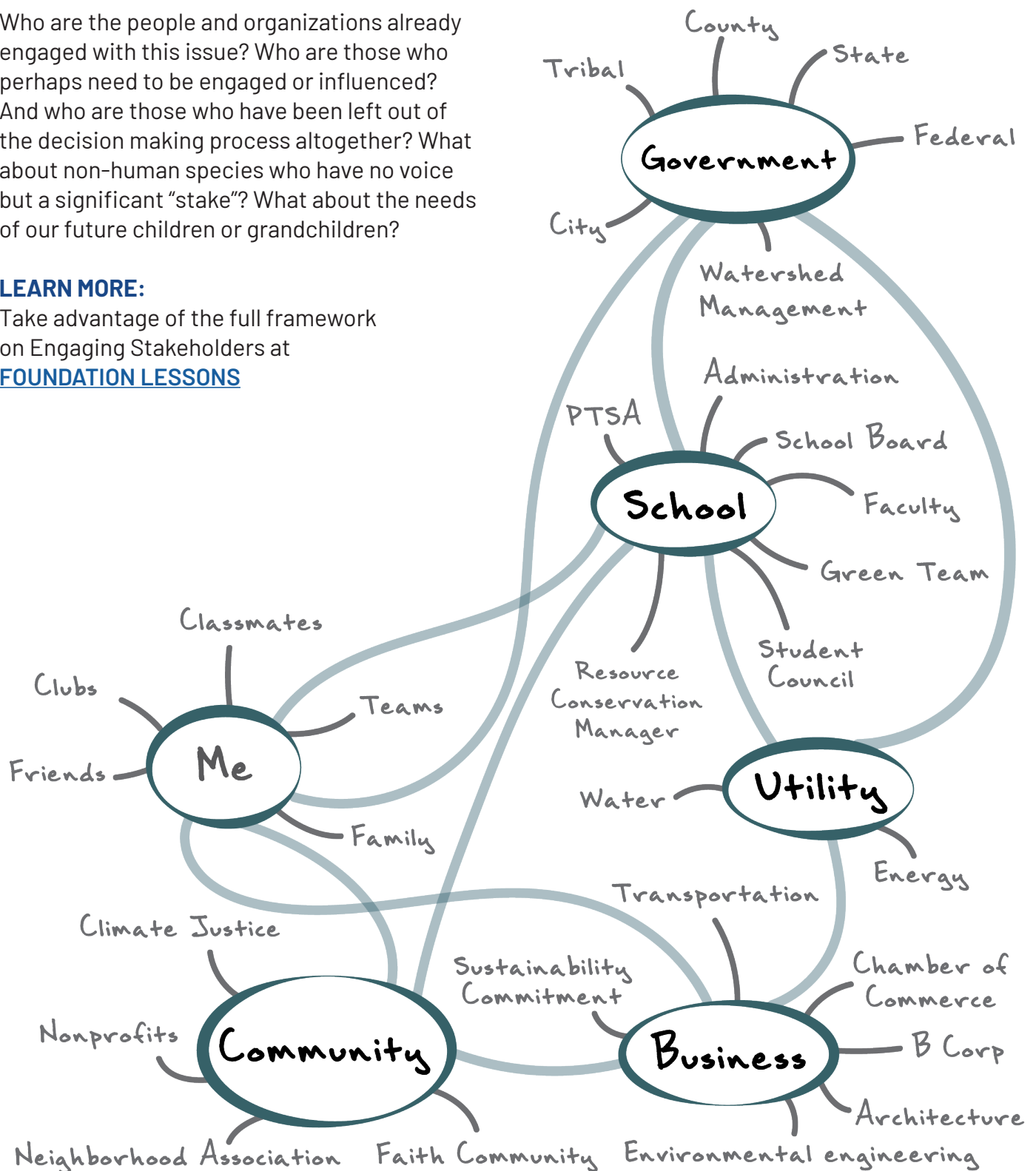
- What social, cultural, and natural assets does my community already have?
- Who is already working on some of these solutions? How can I help?
- How can I apply my knowledge of civics to support the watershed / community goals of my city?
- How can I apply science concepts to understand the systemic connections between climate change, watershed ecosystem health, and human well-being?
- How can I apply the engineering design process to improve watershed / community conditions?

Stakeholder Brainstorming

Who are the people and organizations already engaged with this issue? Who are those who perhaps need to be engaged or influenced? And who are those who have been left out of the decision making process altogether? What about non-human species who have no voice but a significant "stake"? What about the needs of our future children or grandchildren?

LEARN MORE:

Take advantage of the full framework on Engaging Stakeholders at [FOUNDATION LESSONS](#)

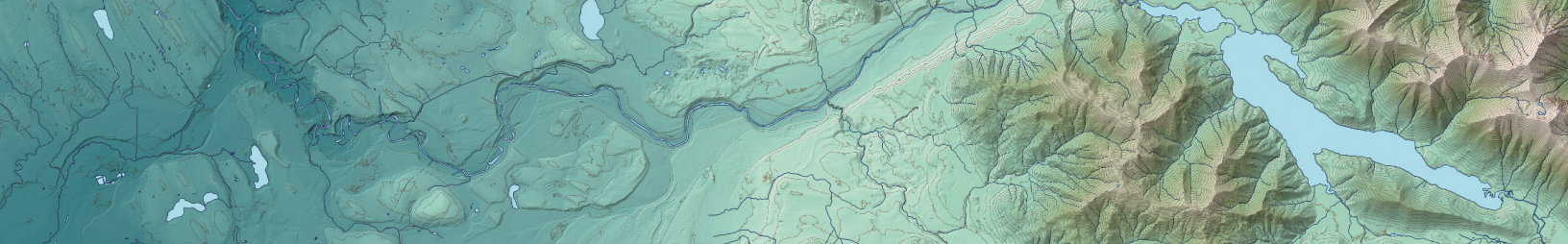


Stakeholder Perspectives

As students identify specific stakeholders relevant to this topic, they will want to consider each point of view with integrity. This practice provides a critical opportunity to develop social-emotional learning skills and cultural competency by building an awareness of our own internalized biases and expanding our capacity for empathizing with stakeholder perspectives different than our own. See sample stakeholder [paragraph descriptions](#).

EXAMPLE: Stakeholder Engagement Table

STAKEHOLDERS	INTERESTS	GOALS	APPROACH
Name of stakeholder group	What motivates them? What do they care about? What are they responsible for?	Do they have specific action plans, goals, or projects they are pursuing?	What is the best message and timing to engage with this group?
My family	Access to the watershed, open space, healthy salmon runs, water conservation.	Stormwater best management practices, Consistent access to drinking water.	Informal conversation and information sharing.
Natural Resource Managers: Watershed, Forest, Farmland	Health and productivity of the environment for human and nonhuman communities.	Protecting and conserving natural resources for the future.	Public engagement sessions, opportunities for public comment on policy making.
Tribal Governments	Access to healthy fishing grounds for salmon, shellfish, plants, as guaranteed by treaty rights.	Maintain natural resources for current and future livelihoods as well as cultural connections.	Connect with Tribal Governments as partners in natural resource management and conservation.
Environmental Justice Organizations	Improving the health and wellbeing of communities historically burdened by environmental damage.	Equitable access to the environment, healthy watersheds, and opportunity to inform decision making.	Participate in projects, volunteer time, actively promote the messages shared by the organization.
City and County Land Use Planners	Balancing the needs of communities and the environment through local planning and legislation (zoning, infrastructure, transportation).	Economic development, housing, roads, water, sewer, energy infrastructure, public safety.	Planning commission meetings, public forums, and public engagement sessions. City Council meetings.



Background- Gapless Explanation

What is a Watershed?

A watershed is a drainage area defined by its ridgelines, fed by multiple smaller streams flowing downhill through its mainstem river and opening to Puget Sound through its estuary. A watershed is not a river. It's the entire drainage system.

The water cycle lifts moisture up out of Puget Sound and from the greater ocean beyond, back up over the landscape, it rains, it snows, the snow melts, and it all flows downhill again. Some **precipitation** gets held in the tree canopy, some is taken up by the roots of trees and plants, most of it **percolates** into the **groundwater**, and whatever is left over **runs off as surface water** into streams, rivers and lakes. So, our watershed includes understanding the water cycle in our region, ground water geology, and the dynamics of surface water runoff.

At least this is how it works in the **natural environment**.

If you plop a city on top of the natural drainage pattern of a watershed landscape, you interrupt the percolation element of the system, and a much higher percentage of rainwater flows off all the hard, **impervious** surfaces like roof tops, sidewalks, streets, and parking lots. This **runoff** now carries pollutants with it. And, instead of a slow release of water into streams, you get a wallop of water slamming into the system every time there is a major rain event. Our engineered stormwater system keeps our streets from flooding, but all that polluted runoff is now the **number one source of pollution** entering Puget Sound. Learn more here: [Pollution in Our Waterways](#)

What's my Watershed Address?

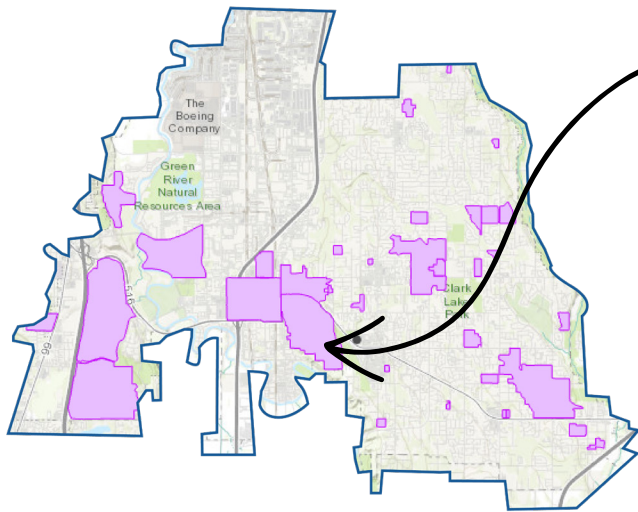
Your **watershed address** is the smaller sub basin, or stream of the larger watershed where you live. The stream network in your sub basin might be an actual stream, but it also might be flowing through a series of ditches, or buried underground in a bunch of stormwater pipes. However it travels, it does flow, and the direction of this flow is always from higher elevations downhill toward sea level.

The sub basin where you live or where the school campus is situated, can be seen by looking at a **contour map** and understanding the downhill flow of water from the ridgelines that separate one sub basin stream from another. On [mywater.world](#) you can find a **contour map layer** as well as a map layer that shows **sub basins boundaries** in your area.

Overlapping Boundaries

It is interesting to consider the relationship between the sub basin in which we live, our watershed address, and the school district service area boundaries that determine which kids go to which school. These boundaries may be quite different than the neighborhood boundaries officially designated by your city for zoning, planning, infrastructure, and services. This strange jumble of **overlapping boundaries** adds a lot of complexity to natural resource decision making.

What if my school service area and the official designation of my neighborhood shared the same boundaries as my watershed address?
Would we be able to make more efficient and sustainable decisions?



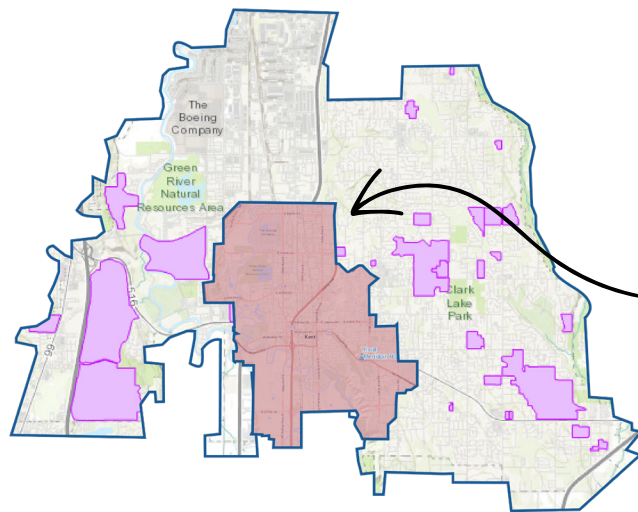
City of Kent Neighborhood

How did these neighborhoods get designated?

Why just these neighborhoods?

Which communities got left out?

Is there political power in being designated as a neighborhood?



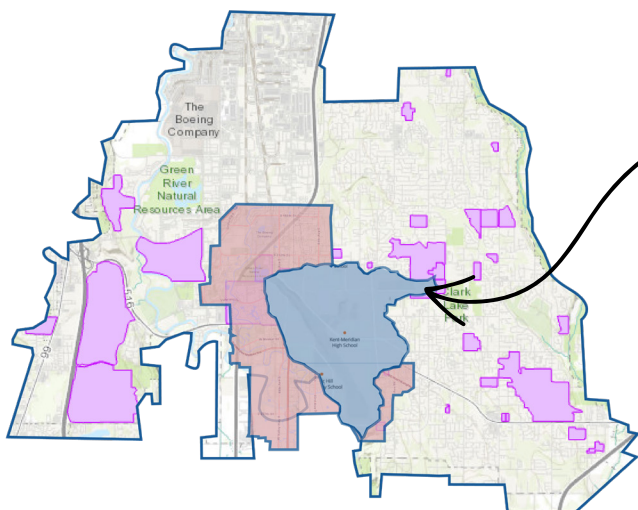
Kent Meridian High School Service Area

What determines a school service area?

How did these decisions get made?

Do all the people identify with the high school?

Which neighborhoods are included?



Mill Creek Sub Basin

Is there a stream here or just pipes and ditches?

Which way does the water flow?

How polluted is it? What's the temp?

Who is responsible for its stewardship?

Indigenous People

Water Systems Information

Indigenous People who thrived in this region for thousands of years prior to colonization, some say since time immemorial, absolutely knew their watershed address. They knew the stream-based ecosystem boundaries, the natural habitats and seasonal patterns for salmon, berries, roots, deer, and furs. This is still their practice.

Treaties signed in 1854-1856 were intended to guarantee access to these resources, particularly salmon fishing. The arrival of Europeans, the creation of the United States, and rapid colonization of traditional tribal lands changed the lives of indigenous people forever. Treaties were broken, and yet a single powerful statement, written into each of the regional treaties, has held up in the courts as a guaranteed right.

“The right of taking fish at usual and accustomed grounds and stations is further secured to said Indians in common with all citizens of the Territory, and of erecting temporary houses for the purpose of curing, together with the privilege of hunting and gathering roots and berries on open and unclaimed lands. Provided, however, that they shall not take shell-fish from any beds staked or cultivated by citizens.”

– Treaty of Point Elliott, 1855

This right was guaranteed in writing, but it took the “Fish Wars” of the 1970’s to guarantee it in the courts. However, with ongoing urbanization and the relentless impacts from our industrial economy, habitat for salmon has continued to decline. The tribes argue today that treaty rights are at risk because what good is the right to fish if the habitat has become so degraded that there are not enough fish to catch?



Photo: Tom Reese



How Imperialism and Colonialism Influenced Mapping

Today, maps show up on cell phones, computers, in cars, and street signs. We all carry around a mental map of the landmarks and pathways that are useful to us, but what are the underlying assumptions related to land use designations over time? To help students inspect their perceptions of maps it will help them to explore how imperialism and colonialism shaped the world as we know it currently. By making the definitions of imperialism and colonialism clear, map making as a tool for oppression becomes clear as well.

Imperialism

Exerting political and economic control over people in an area

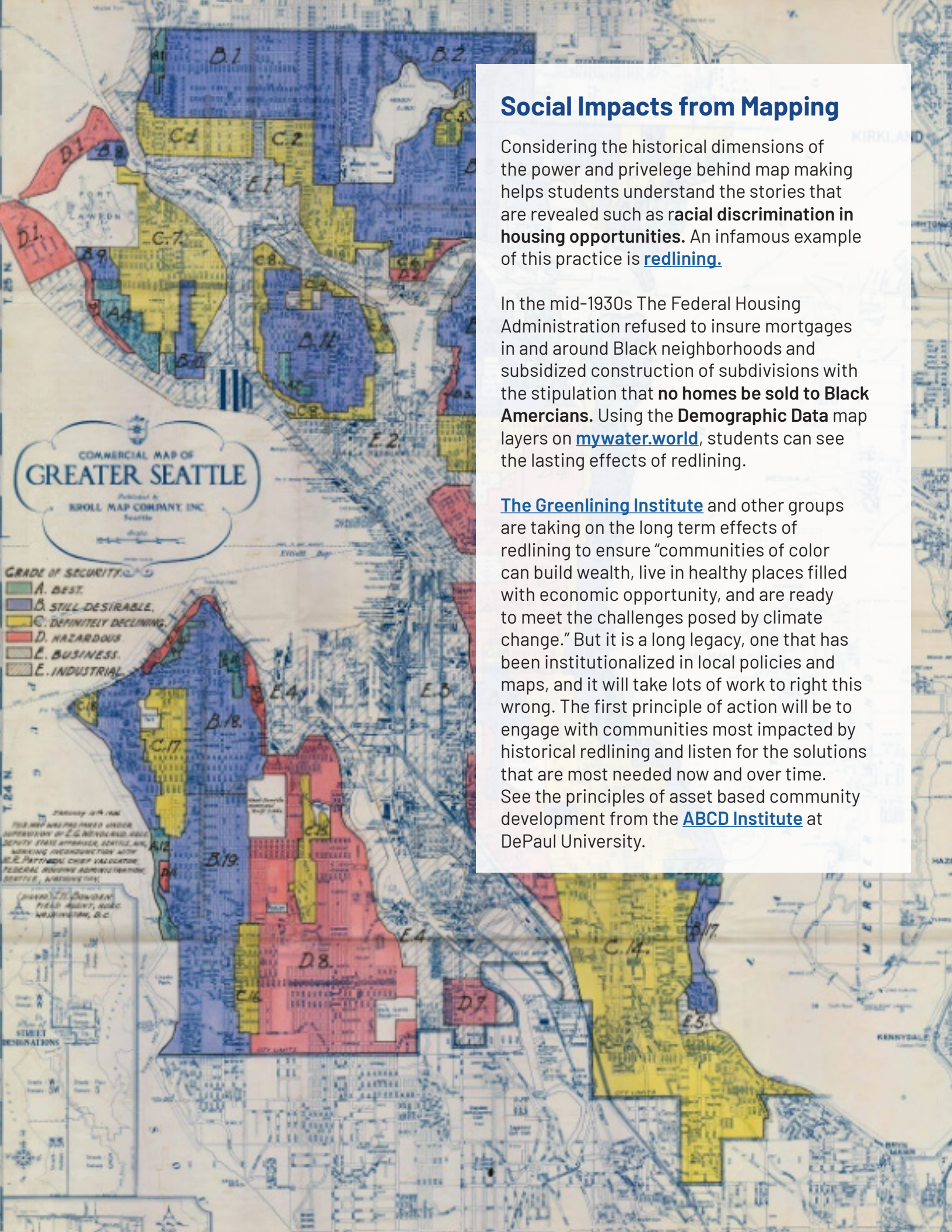
Colonialism

Displacing, moving onto land, and exerting control over people in an area

As more places were colonized or forced into an imperialist government, maps began to show the world through the eyes of the map makers. The **practice of map making (cartography)** focused on the stories of conquerors. Opposite ideas emerged and they were, and sometimes still are, reinforced by maps. Ideas such as east and west, claimed and unclaimed, known and unknown, civilized and savage, inhabited and frontier, exotic and familiar.

One goal of imperialism was to bring the world into **one system of thought**. Naming, classifying, ordering, and mapping in a systematized way **served "conquering" countries** and left many other populations of people off maps entirely.

Ultimately, imperialism and colonialism placed a high value on knowledge of place as defined by conquerors rather than Indigenous people. Maps made it easy to erase entire cultures and impose a singular world view. [Source: Learning to Divide the World: Education at Empire's End by John Willinsky](#)



Social Impacts from Mapping

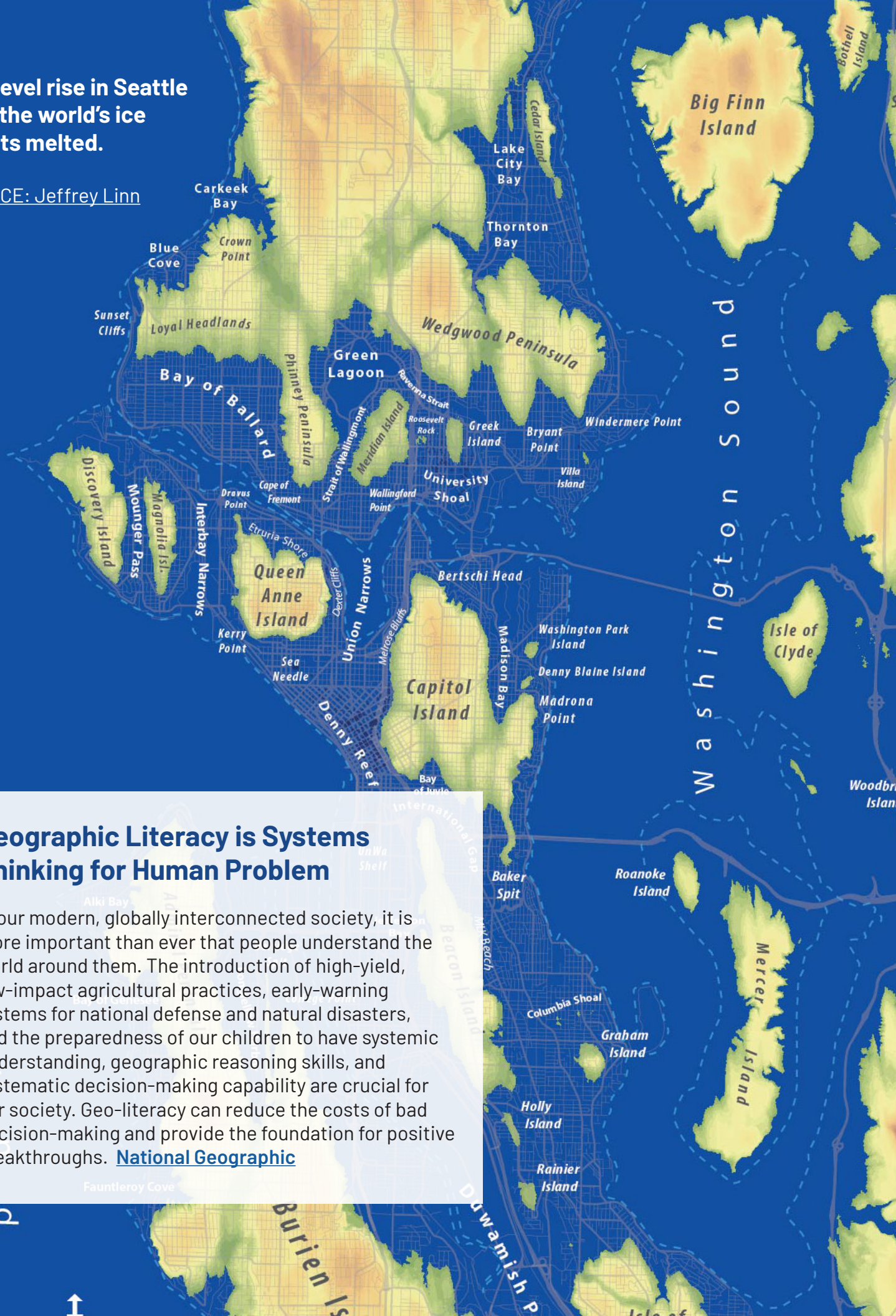
Considering the historical dimensions of the power and privilege behind map making helps students understand the stories that are revealed such as **racial discrimination in housing opportunities**. An infamous example of this practice is [redlining](#).

In the mid-1930s The Federal Housing Administration refused to insure mortgages in and around Black neighborhoods and subsidized construction of subdivisions with the stipulation that **no homes be sold to Black Americans**. Using the **Demographic Data** map layers on [mywater.world](#), students can see the lasting effects of redlining.

[The Greenlining Institute](#) and other groups are taking on the long term effects of redlining to ensure “communities of color can build wealth, live in healthy places filled with economic opportunity, and are ready to meet the challenges posed by climate change.” But it is a long legacy, one that has been institutionalized in local policies and maps, and it will take lots of work to right this wrong. The first principle of action will be to engage with communities most impacted by historical redlining and listen for the solutions that are most needed now and over time. See the principles of asset based community development from the [ABCD Institute](#) at DePaul University.

Sea level rise in Seattle
if all the world's ice
sheets melted.

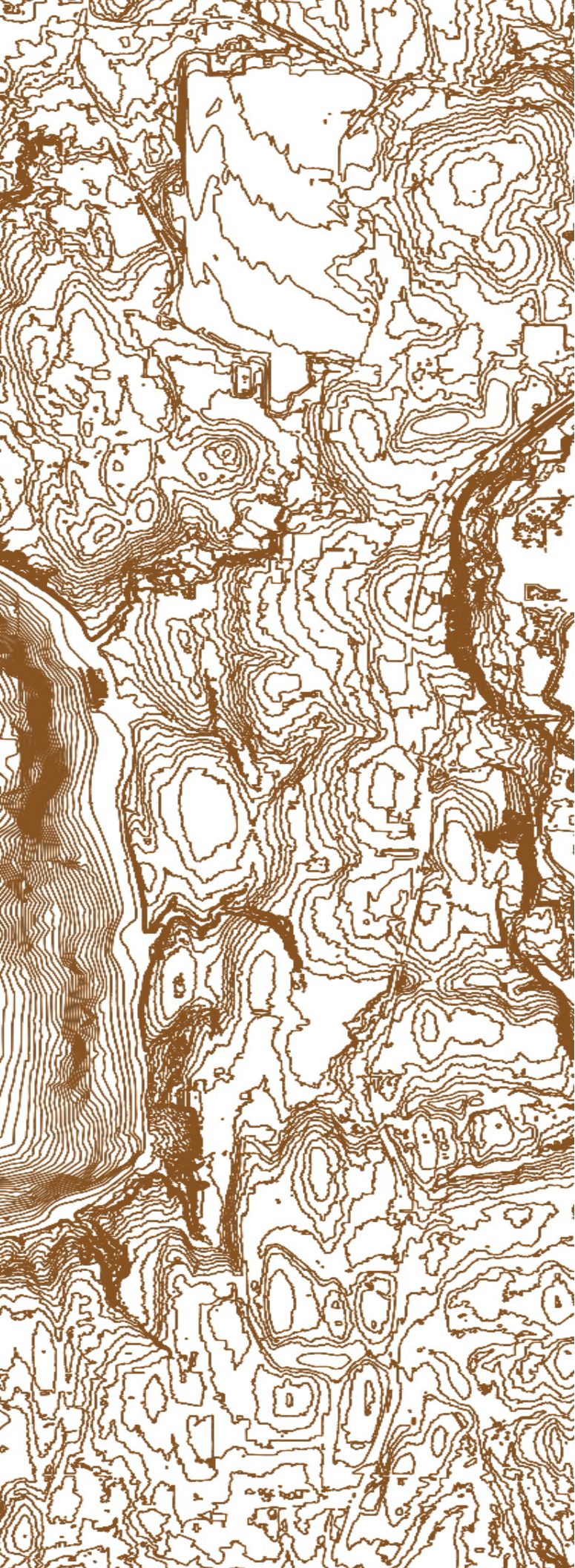
SOURCE: Jeffrey Linn



Geographic Literacy is Systems Thinking for Human Problem

In our modern, globally interconnected society, it is more important than ever that people understand the world around them. The introduction of high-yield, low-impact agricultural practices, early-warning systems for national defense and natural disasters, and the preparedness of our children to have systemic understanding, geographic reasoning skills, and systematic decision-making capability are crucial for our society. Geo-literacy can reduce the costs of bad decision-making and provide the foundation for positive breakthroughs. [National Geographic](#)

Fauntleroy Cove



LESSON OUTLINE

Materials Needed:

Internet access to view and explore mywater.world

Download and print hard copies at mywater.world/page/print

More cool "[Maps we Love](#)"

Time Needed:

Each of the lesson ideas in this collection may take 1-3 class periods.

VOCAB AND KEY SEARCH WORDS

Watershed / Sub Basin / Confluence

Groundwater

Water Cycle

Climate Change Impacts

Indigenous wisdom

Redlining / Greenlining

Gentrification

Urban planning

Comprehensive Plan

Land Use / Zoning

Map making

Scale, zoom level, orientation)

Demographics

Bioregionalism

Asset Based Community Development (ABCD)

Precipitation Patterns

Water Supply / Water Quality

Reservoir

Green Stormwater Infrastructure

Stormwater Management Plan

Point Source Pollution

Nonpoint Source Pollution

Integrated Water Management

Resolution / Ordinance

Water Equity / Water Justice

ENTRY EVENT

Invite students to reflect on how they hold a map of their community in their head. This is an initial sketch of the neighborhood assessing students "mental geography," a sense of their personal identity with the places they frequent and the pathways that connect them. If we were to draw this out from scratch, what would be the prominent features? Students can work in several different ways: (1) individuals on an 11x17 piece of paper, (2) teams on a 2'x3' piece of butcher paper taped to a group table, or (3) pairs of students on the white board with dry erase markers.

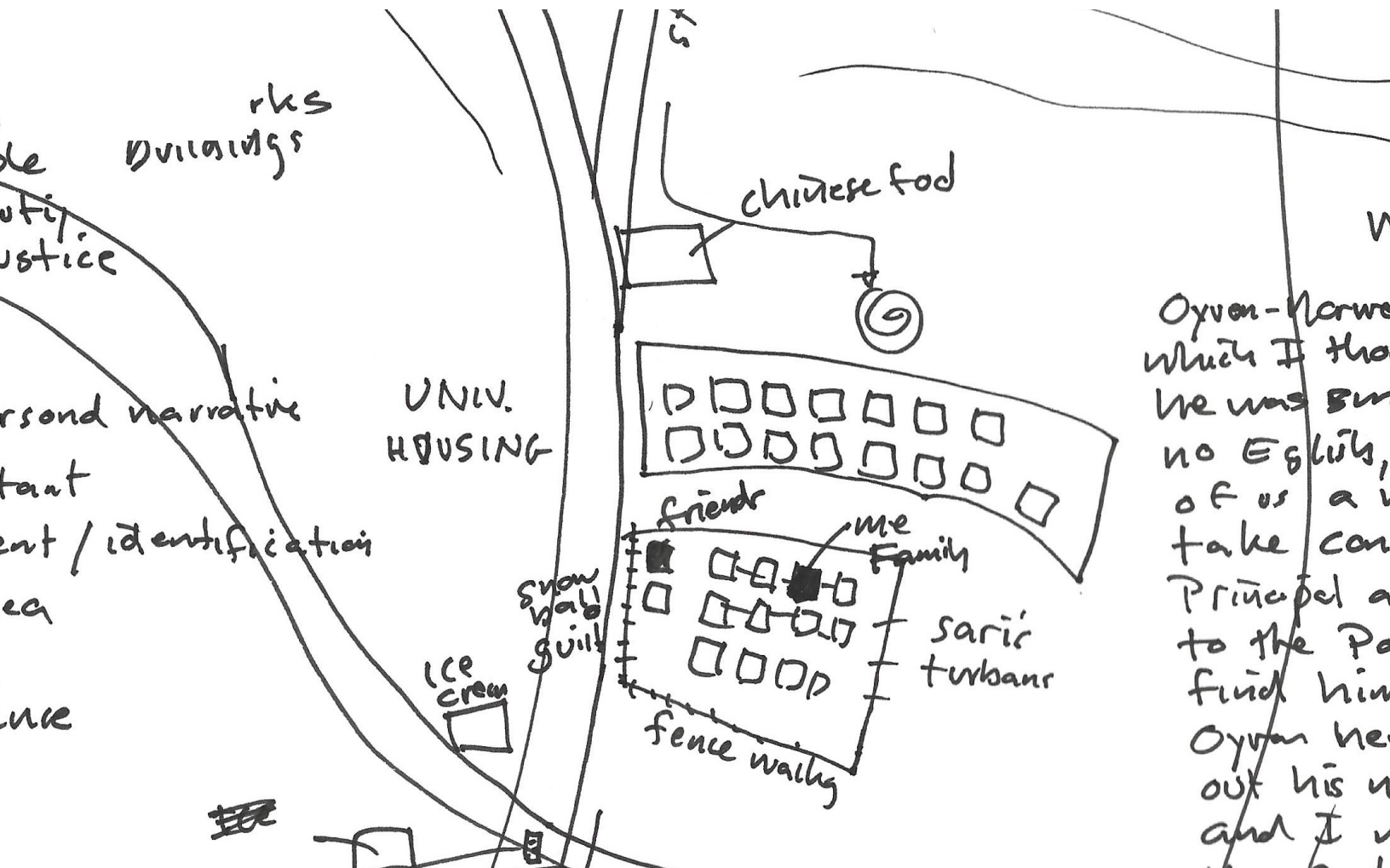
A few prompts for mental geography:

- What is your starting point? Home? School? Stadium? Park?
- How would you like to orient your map? Where is north?
- Draw in major roads, parks, landmarks, streams, lakes, shopping centers

- Where do you get your food?
- What is your school bus route?
- Add 3-4 places you typically hang out.
- Where do your best friends live?
- Do your relatives live in the area?
- If your relatives are out of the area, how do you travel to them?
- Where do you go to the doctor or dentist?
- Where do you go to see sporting events?
- Where do you see concerts or movies?
- Where do you go hiking, camping, biking?

Option: For students who may be recent immigrants, this same sketch might be made of the community they recently came from to recognize what may already be a strong sense of place.

From this foundation they can begin to shape a similar sense of belonging to the new place where they now reside.



ACTIVITY 1

What is My Watershed Address

Students respond to a number of inquiries as they work in teams to identify features they might recognize on a large map of their watershed. This map **only features streams, rivers and water bodies**, no roads or city boundaries, no buildings, parks, or shopping centers to orient them. It's a fun, visual puzzle to get to know your watershed address without human-built infrastructure to guide us.

Use this excellent [collection of inquiries](#) to challenge and expand students' understanding of their watershed from the natural landscape up. The questions are organized into sections and may be explored in jigsaw teams or in smaller lessons over time as the curriculum best aligns with the topics.

Watershed Fundamentals

Think Like a Salmon

Watershed Wisdom of Indigenous People

My Personal Watershed Address

Download and print hard copies at [mywater.world/page/print](#). Students may work independently or in small teams using print copies or digital versions of these watershed maps.

The 2'x3' Blueline maps can be laminated and used with wet-erase markers by student teams.

The 11x17 photocopy maps are great for individual use with colored pencils or pens.

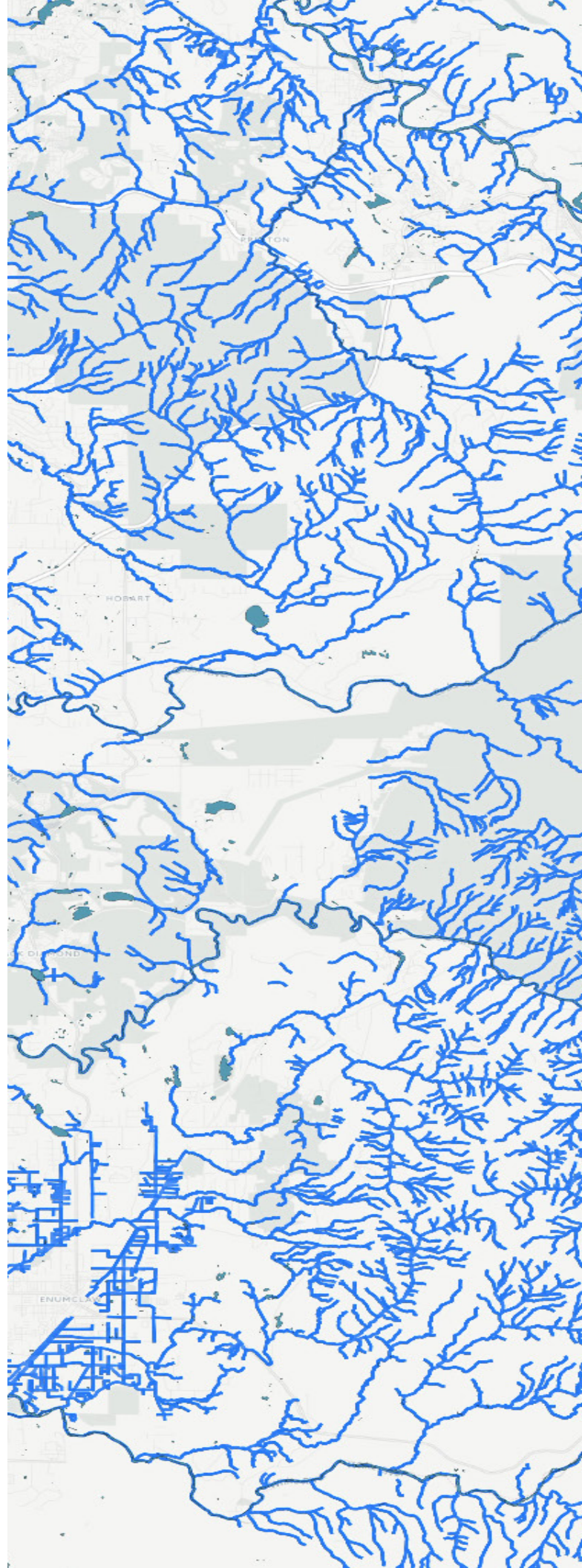
WRIA 7 - Snoqualmie-Snohomish Watershed

WRIA 8 - Cedar River-Lake Washington Watershed

WRIA 9 - Green Duwamish Watershed Maps

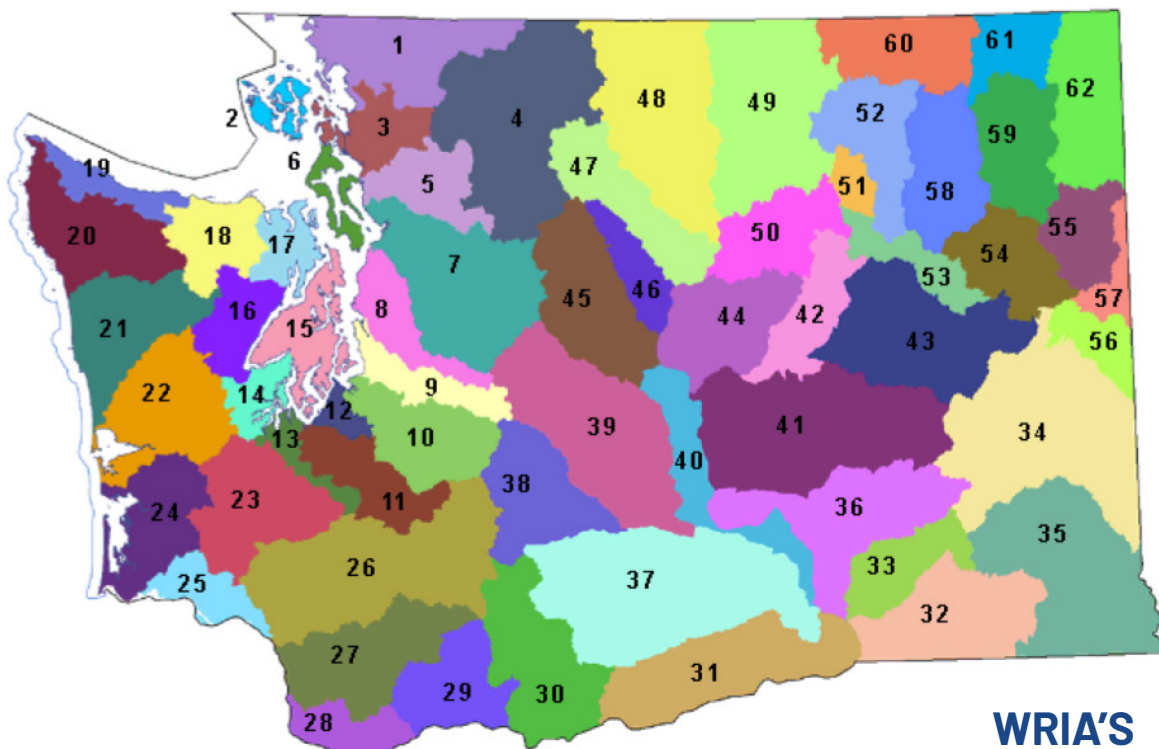
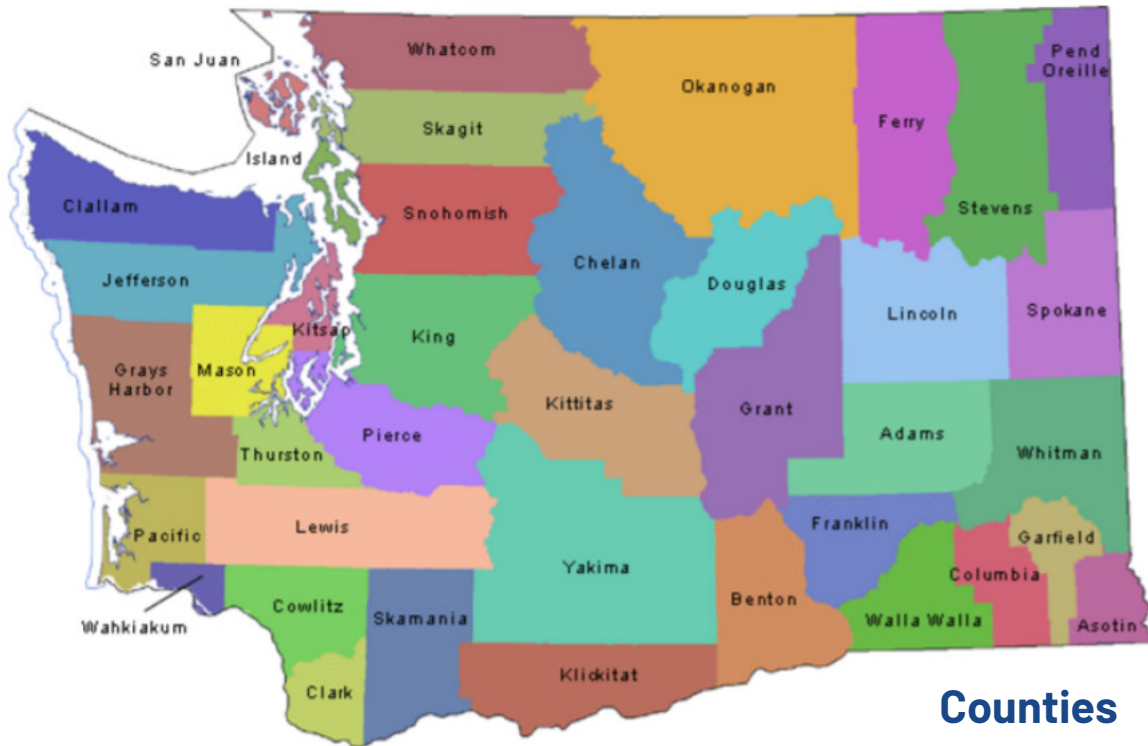
WRIA 10 - Puyallup Watershed

WRIA 11 - Nisqually Watershed



What's a WRIA?

WRIA stands for Water Resource Inventory Area. Each WRIA is a geographic area used by the Department of Ecology to manage, regulate, and protect the watersheds of our state. WRIAs engage multiple jurisdictions in shared decision making around salmon recovery, forests, floodplains, and farms.



ACTIVITY 2

Exploring mywater.world

We worked with Mapseed to produce [mywater.world](#), a community impact mapping website that can be used to enhance geographic literacy through a number of different curriculum applications.

Webquest

A great way to introduce this resource is through student-led discovery of how the website is set up and what each map layer reveals. There are multiple tabs across the top of the page.

What do they support?

Adding or removing **map layers** in combination with different **base maps** is a great first step. Students can explore hundreds of combinations to gain perspective on their watershed.

Using the [Swipe](#) function, students can show two map layers simultaneously, dragging the “swiper” back and forth to analyze landscape changes from two perspectives.

The [Love](#) tab has a huge collection of tagged **“Maps We Love.”** We don’t have digitally integrated map layers for these maps, but we thought they were just too cool not to feature. Plus, they add social, political, and ecological detail to the fundamental watershed story.

Students can conduct their webquest on this site and analyze its content in small groups. As a team, they can answer any or all of the following inquiries, or invent more questions to challenge another team.

Suggested inquires

Why do you think this website is called “My Watershed Address?”

Can you find your home? Your school? Landmarks in your neighborhood?

*Why does the landing page feature a map of rivers and streams as opposed to roads and cities?
What’s the philosophy behind this decision?*

How do the basemaps work in combination with the map layers? Zoom in and out and scroll around. What new features or map details are revealed?

What do the green dots on the map represent? Could our class add additional green dots that we think deserve to be on the map?

How does the “Swipe” feature work and what are the most intriguing maps to compare. Which maps under “Love” interests you the most?

Using both the map layers and “Maps We Love,” what kinds of stories might we tell? Did you check out some of the student-created map stores already posted under “Stories?”

What insights can we gain from the set of map layers listed under the section “Demographic Data?”

When you click on the map layer “Longhouse Village Sites” what can you infer about daily or seasonal life for teenagers, people your age, before colonization?

How has the Duwamish river changed through history? Click on the “Historical Duwamish River” map player. What do you think are some of the intended and unintended consequences of straightening the natural meanders and broad floodplain of the Duwamish estuary into a straight channel for industrial efficiency?

Turn on the “1936 Aerial View” basemap. What was daily life like for teenagers living in 1936 in some of the same areas where a longhouse village once stood? What about in your neighborhood?

Students can share their findings with the class in mini tutorials. Small groups or pairs share a tutorial on what they think are the most useful features of the [mywater.world](#) website and how they responded to selected inquiries using the maps and map layers.



Photo: Tom Reese

ACTIVITY 3

Indigenous Peoples' Perspective

Salmon and Water

"From a tribal legend, we learn that when the Creator was preparing to bring forth people onto the earth, He called a grand council of all creation. From them, He asked for a gift for these new creatures—a gift to help the people survive, since they would be quite helpless and require much assistance from them all. The very first to come forward was **Salmon**, who offered his body to feed the people. The second to come forward was **Water**, who promised to be the home to the salmon. In turn, everyone else gathered at the council gave the coming humans a gift, but it is significant that the very first two were Salmon and Water. In accordance with their sacrifice, these two receive a place of honor at traditional feasts throughout the Columbia Basin. These ceremonies always begin with a blessing on and the drinking of water, followed by a prayer of thanksgiving on and the serving of wy-kan-ush, the salmon. This ceremony reinforces the central role that salmon and water play in the health of Indian people and their culture." **SOURCE: We are all Salmon People, Columbia River Intertribal Fish Commission**

Jigsaw

Engage students in a jigsaw selected from some or all of the resources below with the goal of answering the question:

"Since time immemorial, Indigenous People in the Pacific Northwest have had a close relation to Salmon and the watersheds that support them. What are the factors, elements or principles of this relationship? What has changed over time that threatens this relationship?"

[Tribal Salmon Culture of Northwest Tribes](#)

This website is a great foundation for understanding how Salmon are an integral part of tribal religion, culture, and physical sustenance.

[Understanding Tribal Treaty Rights in Western Washington](#)

This short overview provides an excellent introduction to the legal ramifications of treaties signed between northwest Tribes and the US Government and how these rights are at risk due to the continued loss of salmon habitat.

[Tulalip Tribes - Climate Change Webpages](#)

Explore this excellent website to find out what the Tulalip Tribes are doing to take climate action, continue our community's resilience in light of extreme weather events and harmful environmental trends, and the strategies we are taking to continue our stewardship of treaty resources.

[Indigenous Knowledge is Critical to Understanding Climate Change](#)

This is an opinion essay from the Seattle Times written in a personal and wise voice by Timothy J. Greene Sr. who is a former chairman of the Makah Tribal Council and a trustee for The Nature Conservancy in Washington.

See more annotated links for NW Tribes at the [Living Textbook.](#)

If I lived in this longhouse

Explore the **Longhouse Village Sites** map layer on mywater.world and consider some of the following inquiries. Notice that each longhouse icon on the map represents a village that may have been home for 200-500 people.

Why are there clusters of longhouse villages located in some locations and none in others?

It took a lot of work to harvest and shape the great cedar timbers and planks. And once built, a longhouse might last for a couple hundred years. So you need to pick a great location. What additional geographic features influence the choices people make to build a longhouse village in a particular site?

Is your home or school near the historical site of a longhouse village? Click on the map layer "Schools and Colleges."

Return to [this collection](#) for additional inquiries.

To build a sustainable future, it is critical for each of us to honor the wisdom of **Indigenous People** that has been built over thousands of years. At its foundation indigenous wisdom respects the watershed and the many species it supports, including human beings.

Indigenous: (adjective) Describes any group of people native to a specific region. In other words, it refers to people who lived here before colonists or settlers arrived, defined new borders, and began to occupy the land.

"I don't believe in magic. I believe in the sun and stars, the water, the tides, the floods, the owls, the hawks flying, the river running, the wind talking. They're measurements. They tell us how healthy things are."

"Salmon-based ecosystems weave together the spiritual, mental, social, cultural, physical, and economic health of Indigenous communities and their self-governance. Diverse Indigenous cultures flourish alongside abundant salmon populations, building on **respect, reciprocity, and interconnectedness** to sustain environmental health and the well-being of human-salmon communities. Respectful relationships with salmon and salmon ecosystems are **passed to future generations** through traditions, practices, and Indigenous science, to ensure that community health and wealth are sustained in perpetuity. These belief systems and practices reinforce an appreciation for salmon as more than a resource; Indigenous Peoples see **salmon as family** and relations gifted by the Creator." **SOURCE:** The Sociocultural Significance of Pacific Salmon to Tribes and First Nations



Photo: Tom Reese

ACTIVITY 4

How do maps shape our daily lives and who uses maps to make decisions?

Begin by setting aside time for students to work through an individual reflection on how maps show up in their daily lives. They can write or draw about their ideas and perceptions of maps. Invite them to specifically think about how GPS or the Global Positioning System, is used in their lives. What is it? How does it work? How and when was it developed?

GPS is Everywhere!

Students think-pair-share about their reflections and continue by considering the following questions about GPS specifically:

Who uses GPS?
How do you think it works?
When did it come into our day-to-day lives?
Who invented it and when?

Since our society relies on satellites and GPS for much of our navigation, what other advances might happen with this technology? What perspectives or ideas have scientists not yet been able to explore using our current mapping technologies?

What if this happened...

GPS goes out on your phone and you're seriously lost.

GPS fails to identify where to ship the package you just ordered online.

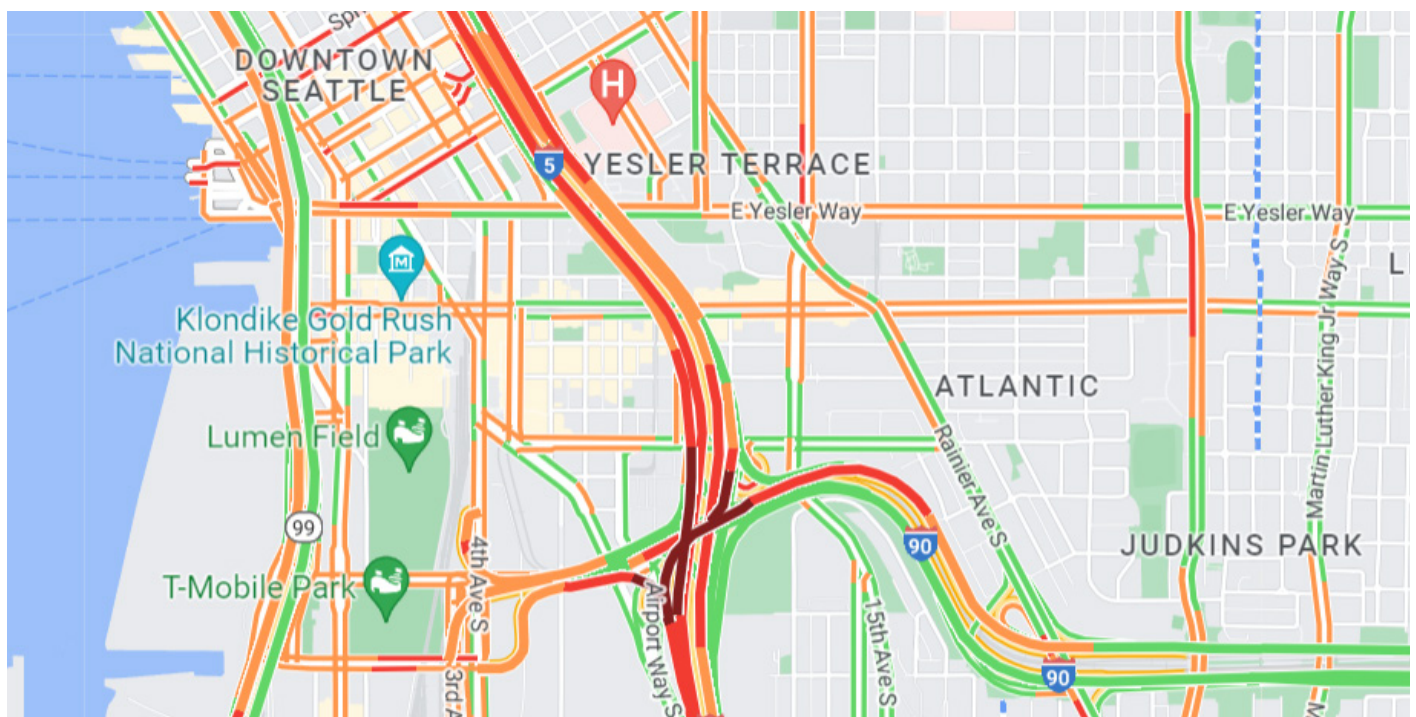
You are at a soccer tournament and you can't find your team's hotel.

Investigating who uses maps

Students use this [worksheet](#) to **match the job titles** with the ways that people use maps to make decisions using the idea bank

Or, for more of a challenge, students can use this [worksheet](#) to fill in the blank spots on how different people in government, business, school or nonprofit sectors use maps to make decisions.

And here is a [blank table](#) where student teams can challenge each other with inventing even more types of jobs that people have and how they use maps to make decisions.





Gladys West: the hidden figure who helped invent GPS

[Ahmna Modin, The Guardian](#)

The Global Positioning System (GPS) is the foundation of what most of us know as maps today. The Space Race of 1960s propelled this satellite-based technology forward and initially supported navigation for military use only. This technology became available for [public use by the 1980s](#). Satellites used for GPS circle the Earth twice a day moving at about 7,000 miles per hour. The GPS receivers on Earth measure the distance to each satellite by the amount of time it takes to receive the transmitted signal ([Garmin](#)).

An important contributor to the creation of GPS is **Gladys West**. West was crucial in generating a geodetic (having to do with the shape and area of the earth) model of the Earth and her work on the [Seasat](#) project set the stage for further satellite modeling of the planet (Katherine, [A Mighty Girl](#)).

ACTIVITY 5

What stories get told on maps?

Warm up

Below are three maps and five questions to work through as a warm up for analyzing what kinds of stories get told on maps and who tells them. Each of the maps offers a different level of analysis from easy to challenging.

Three Maps

Easy Analysis: [Google Traffic Live](#)

Moderate Analysis: [Median Household Income in King County](#)

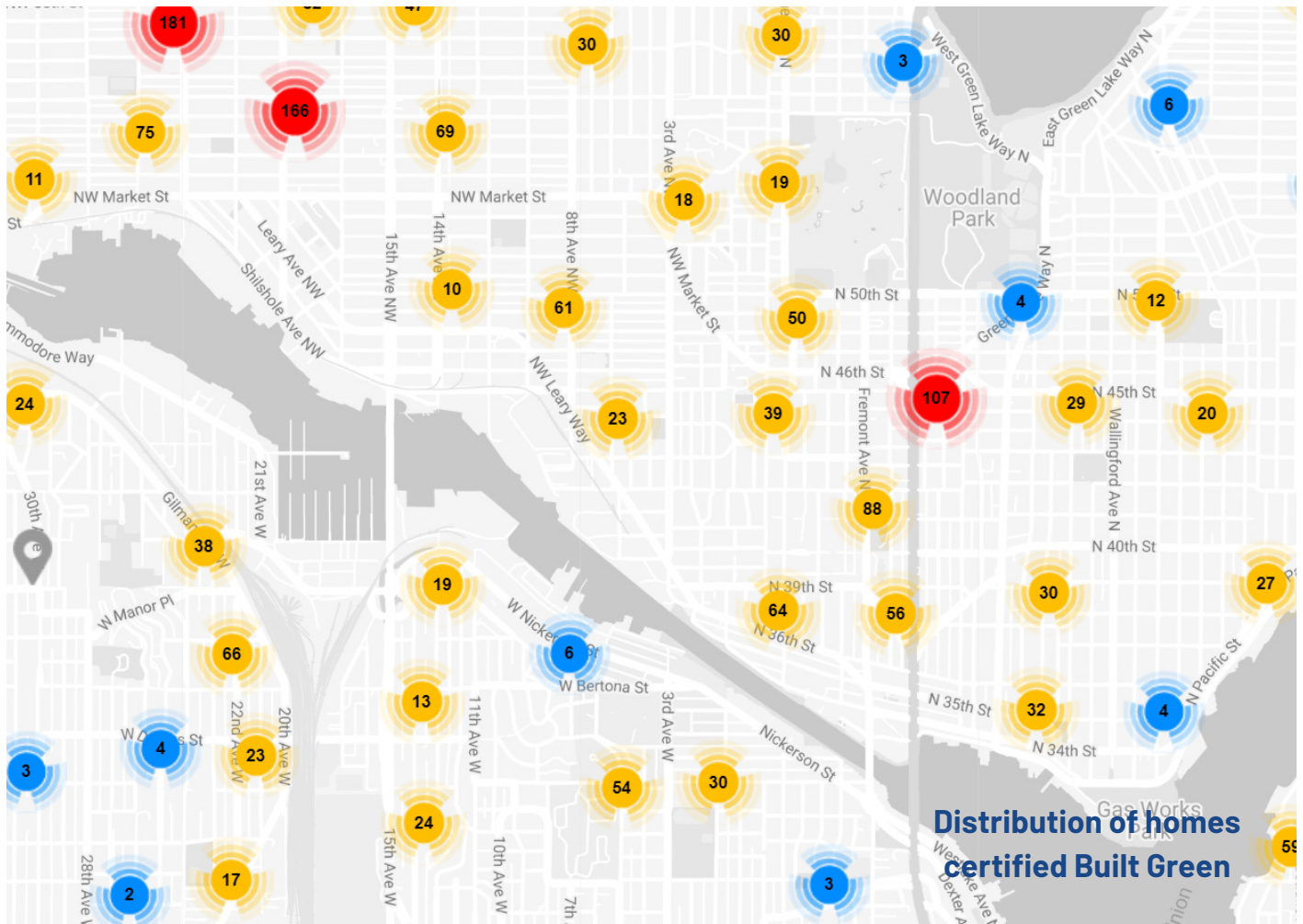
Challenging Analysis: [Built Green Certified Homes](#)

Five Questions

1. What is the purpose of this map?
2. Who made this map?
3. Who benefits from this map?
4. Who or what is left off the map?
5. Who uses this map to make decisions?

Jigsaw- Thinking about the use of maps

After the warm up above, students can challenge themselves by exploring some combination of a map, an article, and a video while working through the suggested inquiries. (See thumbnails on next page.) This is a place where students may begin to unravel the systems of oppression written into maps, from changes in salmon runs as a result of dam construction to the connection between Black people and land.

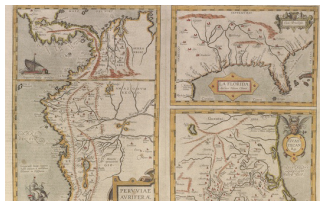


Map Resources to Explore

Choose 4-5 that are best suited for your subject area



[VIDEO: Housing Segregation and Redlining in America | NPR](#)



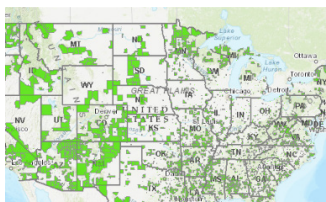
[ARTICLE: How Cartography Helped Make Colonial Empires](#)



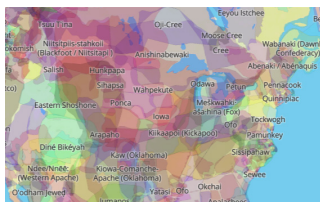
[VIDEO: The Black/Land Project](#)



[ARTICLE: Northwest Food Deserts](#)



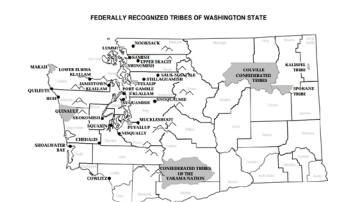
[MAP: USDA Food Access Research Atlas](#)



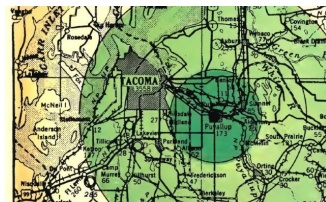
[MAP: Native-land.ca](#)



[MAP: WA State Tribal Reservations and Draft Treaty Ceded Areas](#)



[MAP: Federally Recognized Tribes of Washington State](#)



[MAP/ ARTICLE: National Japanese American Historical Society](#)



[INTERACTIVE MAP: Salmon Tribal Maps | GOIAgration: A story that connects us all](#)



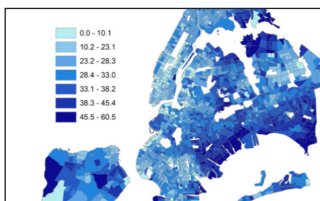
[MAP: Salish Sea Institute - Salish Sea Atlas](#)



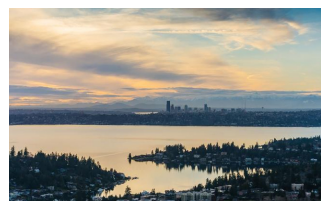
[ARTICLE: Emergence Magazine - Wave Patterns](#)



[STORY MAP: Seeking Softer Shorelines](#)



[STORY MAP: Mapping Justice 2021](#)



[STORY MAP: WRIA 8 - Restoring a Place Where Salmon and People Thrive](#)

...Continued from Page 28

Students can select a single line of inquiry as organized below and work through each question within that category. Or they may choose one or two questions from each line of inquiry if they are interested in several topics. The inquiries are meant to draw on the concepts they explored in the previous activities and to strengthen their geographic literacy.

Visual Observation Inquiries

How do text and images support the main idea?

Are photos or graphics embedded in the map? To what effect?

How is color used to influence your understanding of the map?

Do you see borders and boundaries? How do they tell a story or support the main idea?

How does the choice of scale focus the purpose of the map?

If you could improve this map visually, what artistic adjustments would you make?

Equity-focused Inquiries

Is there a social or environmental justice story being told on this map? What is it?

Does this map demonstrate unequal access to resources?

Does this map incorporate an Indigenous person or tribe's point of view?

How does this map explain an environmental justice topic?

Does this map inform public health decisions?

Is there an idea, point of view, or group of people left out of this map?

Ecological-focused Inquiries

What watershed is represented in this map?

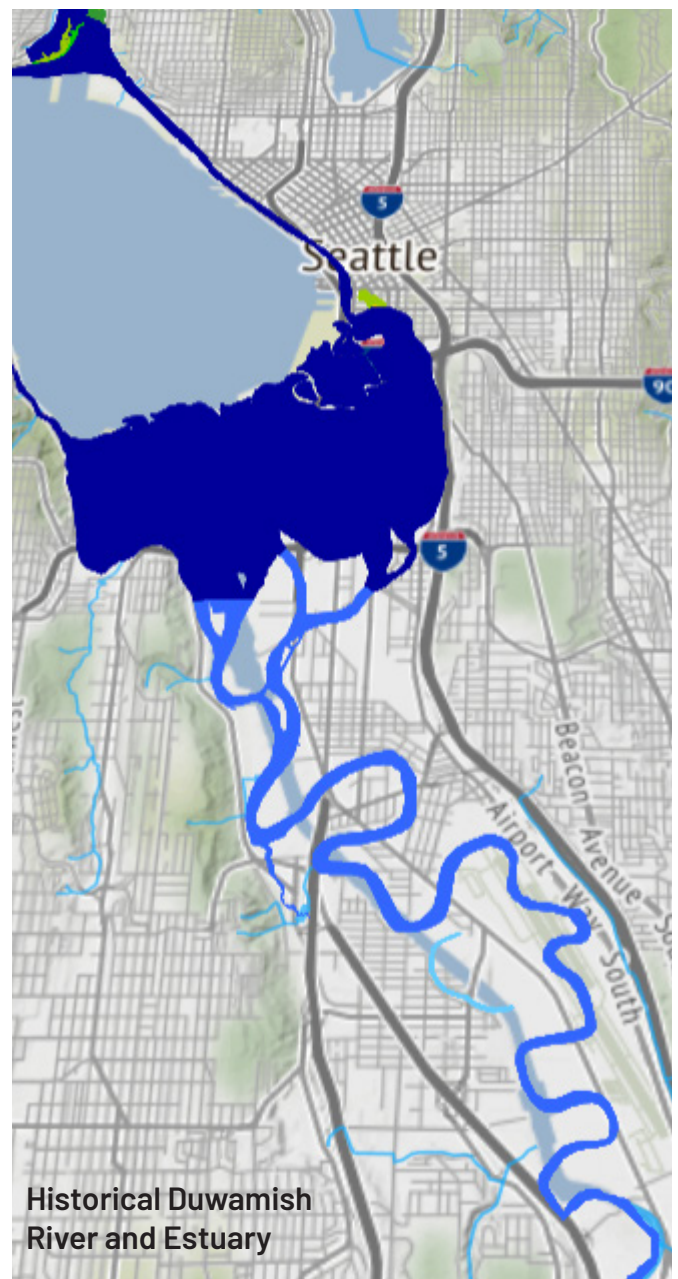
What are the primary land use features shown in this map?

What plants and/or animal species are represented in the map?

Does this map point to an ecological problem or its solution?

How does the map demonstrate a connection between people and the ecosystem?

Does this map showcase a particular time frame, past, present or future?



ACTIVITY 6

Creating Your Own Map Story

In this activity, students follow their curiosity about where they live to generate a compelling story using multiple maps and a guiding question of their choice. The stories are presented as voice over video recordings. See some of the student-generated examples at mywater.world.

Developing a Question

Students think about how the map layers found on mywater.world might help them answer a question they are curious about. The Maps We Love section may also be useful for gaining a deeper understanding of the question.

Discovery

Students might ask...

What watershed do I live in and where does it drain?

In what direction does surface water drain where I live?

Where does my drinking water come from?

How is climate change impacting the place where I live?

Storytelling

Students might ask...

Which maps tell a story I am excited about or interested in?

How do people use maps to tell stories?

What other images, audio, or graphics do I want to use to tell my Map Story?

Action

Students might ask...

Who is taking action on (a given problem) where I live?

How can I get involved in a given solution) where I live?

How can I use maps to visualize or support an important effort?

How can my Map Story influence local decision-making?

Outline the Map Story

Students can outline their ideas using this [storyboard template](#) and then record their Map Stories as a voiceover video. Here are some helpful, student-generated resources:

1. [Posted map story examples](#)
2. [C'mon... Let's Storyboard Your Map Story!](#)
3. [How to Record a Map Story](#)
4. [Tips for Recording a Map Story](#)

Peer Review

In small groups, students can share their Map Story and interview each other. Some possible interview questions include:

Did this activity spark interest in taking further action on your topic or central question?

What is something that surprised you about the map layers you used to tell your story?

What map layers do you wish you had access to?



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About Sustainability Ambassadors

Sustainability Ambassadors is a professional development program for student leaders, teacher leaders and community leaders committed to rapidly advance a sustainable future by aligning classroom rigor with community relevance for real world impact.

We support a year-round training program for over 60 highly motivated youth, a paid Equity Advocacy Internship, a Green Jobs Youth Pathways Portal, and a Teacher Fellows Program, working with hundreds of educators to design new models of problem-based, place-based learning around a shared vision of **educating for sustainability**.

We focus on middle school and high school youth, the teachers and school districts that guide their learning, and the community stakeholders, local government and business leaders who are relying on the next generation to be engaged voters, informed taxpayers, conscious consumers, and employees who can create and lead sustainability initiatives.

Visit: <https://www.sustainabilityambassadors.org/>

