VIDEO VIEWING GUIDE
SALMON AND STORMWATER

Youth-Voiced Expert Topics

About this Collection: Our student team of Sustainability Ambassadors has researched, voiced, and edited these short, informational videos, and developed a set of handy viewing guides, to help teachers facilitate classroom inquiry. In each video, we identify curious stopping points and pose possible inquiries to help students build connections to key concepts and needed actions. You are welcome to adapt these guides to fit into your own curriculum.

VIDEO 1: Stormwater 101

This is a viewing guide for our Youth-Voiced Expert Topic video on general information regarding stormwater and pollution.

VIDEO 2: Isolating Chemicals in Stormwater

This is a viewing guide for our Youth-Voiced Expert Topic video series on chemical contaminants in our stormwater.

VIDEO 3: Toxic Tire Dust

This is a viewing guide for our Youth-Voiced Expert Topic video on chemicals in tire dust affecting salmon.

VIDEO 4: 6-PPD Quinone and Salmon

This is a viewing guide for our Youth-Voiced Expert Topic video on toxic chemicals from roadway runoff killing salmon.

VIDEO 5: Copper Brake Pad Pollution

This is a viewing guide for our Youth-Voiced Expert Topic video on copper contamination and the effects on salmon.

Sustainability TALKS

About this Collection: Sustainability Ambassadors has produced this series of short, technical videos, most of which were presented by experts in front of a live student audience in a high school auditorium. We developed companion sets of handy viewing guides to help

teachers facilitate classroom inquiry. In each video, we identify curious stopping points and pose possible inquiries to help students build connections to key concepts and needed actions. You are welcome to adapt these guides to fit into your own curriculum.

VIDEO 6: Toxics in Stormwater Pollution

This is a viewing guide about stormwater contaminant exposure in salmon, featuring aquatic ecotoxicologist, Dr. Jenifer McIntyre from Washington State University.

VIDEO 7: Why are Salmon dying before they can spawn?

This is a viewing guide about pre-spawn mortality in salmon in Longfellow Creek, featuring Kathryn Davis, the Stewardship Manager for Puget Soundkeeper.

VIDEO 8: Stormwater Pollution in Pacific Herring

This is a viewing guide on oil pollution in herring from stormwater, featuring biologist and environmental toxicologist, Dr. Louisa Harding from Washington State University.

VIDEO 9: Bioaccumulations of toxins in Orca

This is a viewing guide about toxin effects in Orcas, featuring Lynne Barre, Recovery Coordinator for our endangered Southern Resident Orcas.

VIDEO 10: Reducing stream temperature for Salmon - Newaukum Creek

This is a viewing guide examining the effects of temperature on salmon, featuring Josh Kahan, the Middle Green/White River Basin Steward for King County Department of Natural Resources and Parks.

VIDEO 11: Nearshore Ecosystems for Salmon

This is a viewing guide about the importance of nearshore habitat for spawning, featuring Kollin Higgins, senior ecologist with King County Department of Natural Resources.

VIDEO 12: What do our Chinook Salmon need?

This is a viewing guide on critical habitat for salmon success in the Green River, featuring returning speaker, Kollin Higgins, senior ecologist with King County Department of Natural Resources.

VIDEO 13: Microplastics and Me

This is a viewing guide on microscopic plastics in our water, featuring Hillary Sanders, Volunteer Coordinator for 21 Acres Center for Local Food and Sustainable Living.

VIDEO 14: Acidification Impacts in the Puget Sound

This is a viewing guide to explore how acidification could impact our waters, featuring Dr. Jan Newton, Senior Principal Oceanographer with the University of Washington.

VIDEO 15: Economic Impacts of Acidification on the Shellfish Industry

This is a viewing guide on how acidification has already caused problems for us, featuring Bill Dewey, Director of Public Affairs for Taylor Shellfish Farms.

VIDEO 16: Roadside Rain Garden for Barton Basin CSO Control

This is a viewing guide to introduce a case study on stormwater engineering with civil engineer Patty Buchanan.

VIDEO 17: Duwamish Superfund Site: Toxic History, Engineering Solutions

This is a viewing guide to explore the cleanup plan to toxins from the Lower Duwamish, featuring EPA Duwamish CleanUp Project Manager, Rebecca Chu.

VIDEO 18: Engineering Strategies - Duwamish Superfund Cleanup

This is a viewing guide to explain the engineering behind the cleanup of the Lower Duwamish, featuring our very own Cesar Lopez. Available in English and Spanish.

VIDEO 19: Understanding Stormwater Management Fees

This is a viewing guide for understanding how stormwater management works at the city level, featuring our very own Annalisa Mueller-Eberstein.

VIDEO 20: Sponge Cities in China

This is a viewing guide to explore the innovative, water-conserving, “sponge cities,” featuring our very own Basant Apurva.

VIDEO 1
Stormwater 101 Watch Video [11:36]

First Stop: 1:16 [*"...except."*]

What does stormwater look like in your neighborhood? Do the roads flood? Does your yard? Do you know where your storm drains are?
Predict what you think could make stormwater a problem in the Seattle area?

Second Stop: 2:19 [*"..stop and think."*]

Have you seen an oil leak recently? Where do you think that oil went?
What other pollutants do you think could be in stormwater? Brainstorm.

Third Stop: 6:08 ["...*stormwater runoff.*"]

How do impervious surfaces interrupt the water cycle? Do they? Explain why or why not.
Do you think stormwater is still an issue for smaller communities with less impervious surfaces? Why or why not?

Fourth Stop: 11:36 [*END*]

Brainstorm ideas on solutions to mitigate runoff pollution. Devise a plan to improve our current stormwater system.
If our landscape was not impervious, where would our pollutants go? Do you think we would still have a problem? Explain why or why not.

LEARN MORE

Here is some great information on stormwater and stormwater management in Washington from the Department of Ecology.
This is a great article from the Environmental Protection Agency (EPA) on stormwater pollution, featuring some examples of green infrastructure solutions!
Another article from the EPA examines the link between urbanization, impervious surfaces, runoff pollution, and features some great figures.
King County has a detailed series of articles on their website about stormwater issues; this one in particular has a great infographic illustrating the issue.
An informative study by researchers at Cochin University in 2015 looked at the environmental impacts of impervious surfaces and explored changes in the watershed.

VIDEO 2
Isolating Chemicals in Stormwater Watch Video [6:56]

First Stop: 1:43 ["***...this is called urbanization.***"]

Brainstorm ways that urbanization can create problems with stormwater.
In what ways, outside of stormwater issues, does urbanization impact the surrounding environment?

Second Stop: 3:21 ["***...and vehicle exhaust.***"]

What are PAHs? Brainstorm in what ways PAHs could harm wildlife?
Will a decline in Pacific herring lead to a decline in salmon? Why or why not? Explain your reasoning.
What other pollutants do you think are in stormwater runoff? Create a list of potential pollutants.

Third Stop: 6:16 ["***...can drastically affect their swimming performance.***"]

If herring are more sensitive to PAHs than salmon and exhibit slower swimming when exposed, could this change the salmon population? Do you think it could cause an increase or decrease in salmon populations? Why or why not.
What factors might make salmon less sensitive to PAH exposure than herring?

Fourth Stop: 6:56 [*END*]

Discuss the danger of ecosystem collapse from PAH pollution.
Do you think other pollutants should be focused on as primary threats, or is PAH the most pressing pollutant? Explain your reasoning.
What do you think the solutions to our PAH problem could be? Brainstorm and discuss with a partner.

LEARN MORE

Here is the study mentioned in the video, if you are interested in exploring their research.
For more general information on PAHs, check out these studies:

- Polycyclic aromatic hydrocarbons in stormwater runoff from sealcoated pavements
- A Review of PAHs

In the Lower Columbia Estuary there has been focused research into PAH contamination, this serves as an interesting case study on this topic.
And here is another study into how PAHs could affect juvenile salmon directly, outside of a dwindling food supply.

VIDEO 3
Toxic Tire Dust Watch Video [6:28]

First Stop: 3:59 ["...*all roads lead to puget sound*."]

Predict the effects of pollution in stormwater runoff on aquatic species in the PNW. Think about keystone and endangered species.
What are some examples of stormwater pollution you have seen in your neighborhood, around school campus, or out shopping?
What other things do you think could be in stormwater runoff (think chemicals, garbage, etc.)?

Second Stop: 5:31 ["*...it hits them like a fist.*"]

Hypothesize how salmon are affected by pollution during the first rain.
Are salmon more at risk of exposure during this time, or are they in equal danger all year?

Third stop: 6:28 [*END*]

Review the 12 principles of green chemistry, what compound could replace 6PPD? Are there any downsides to this chemical, will be as effective a 6PPD for limiting tire degradation.
Why do we care about salmon? Think about the ecological importance, cultural value, or other aspects.

LEARN MORE

This is a wonderful presentation [27:57] from a lead researcher on the effects of tire chemicals on salmon, and a link to the research paper she is covering.
There was another great study about tire chemicals and salmon mortality in 2020; a more condensed version of this study is also featured in The Guardian.
A blog post from the Washington Department of Ecology describes issues with tire chemicals and possible solutions.
Two more recent research papers, one from 2021 and one from 2022, delve into effects on other species or other chemicals, respectively.
Here is an interesting article about the current petition from the Port Gamble S'Klallam, Puyallup, and Yurok tribes to the EPA to ban 6PPD.
This is a recent article detailing a fascinating project in Ohop Creek to filter stormwater and keep 6PPD out of the creek.

VIDEO 4
6-PPD Quinone and Salmon Watch Video [8:20]

First Stop: 1:50 ["***...a ratio called hematocrit.***"]

Why would a fish gasp for air when in distress? Brainstorm some possible reasons that this would be their reaction.
Why do you think salmon's blood is affected by runoff?

Second Stop: 3:15 ["***...cannot be explained by just stress alone.***"]

What is blood plasma?
Hypothesis what a loss in blood plasma would mean for an organism. How would this affect their survival?

Third Stop: 4:50 ["***...does the blood brain barrier weaken?***"]

Generate a hypothesis to answer the experimental question. Explain your reasoning.
How would you design an experiment to test this in salmon?

Fourth Stop: 6:27 ["***...microvessels of the salmon.***"]

Why does it matter if the blood brain barrier is broken? What do you think the effects of this would be?

Fifth Stop: 8:20 [***END***]

Imagine you are a scientist tasked with solving this issue. What would you do?
How would you convince lawmakers and the community to accept your solution?

LEARN MORE

This is the study mentioned in the video if you would like to read more about their research.
Here is a detailed article about 6PPD pollution along the West Coast, featuring the recording of the issue hearing from the U.S. House Committee of Natural Resources.
Research into 6PPD alternatives has been a hot topic in conservation; here is a list of alternatives being researched from the WA Department of Ecology, and research into one form University of California Berkeley.
Other species are also affected by this deadly chemical; there has been research into the fate of other salmon and unrelated aquatic species

VIDEO 5
Copper Brake Pad Pollution Watch Video [5:25]

First Stop: 2:07 ["***...some will reach young coho salmon.***"]

Why do we care if copper reaches young salmon? Brainstorm how you think copper could affect young salmon.

Second Stop: 2:55 ["***...their sense of smell.***"]

Now that you know how copper affects salmon, what do you think this means for other organisms in the Puget Sound?
How would life be more difficult for you without your olfactory sense? Now, picture how you would be affected if you were a salmon?

Third Stop: 4:36 ["***...from brake pad pollution.***"]

Do you think adult salmon are affected the same as juvenile salmon when exposed to copper?
Why might copper pollution decrease survivorship of juveniles more than adult fish?

Fourth Stop: 6:23 [***END***]

How could we speed up the process of removing contaminants through legislation? Do you think it could be faster? Explain why or why not.
What chemicals can you think of now that we can identify as pollutants? How would you propose we go about removing this pollutant?

LEARN MORE

This is a blog post from the Washington Department of Ecology detailing copper pollution and how to select new low-copper brake pads!
Here is an interesting study conducted on the effects of copper on the olfactory systems in both salmon and steelhead.
These two studies examine the effects of copper on increasing predation in adult and juvenile salmon.

VIDEO 6
Toxins in Stormwater Pollution Watch Video [11:01]

First Stop: 1:25 [***..."in some kind of way."***]

With your background knowledge, answer the research questions McIntyre has proposed: **What** is urban runoff? **How** toxic is urban runoff? **Can** we prevent toxicity?

Second Stop: 4:10 [***..."bad hearts."***]

Do you think the "sublethal" effects caused by exposure to stormwater runoff will result in eventual mortality? Choose two effects and explain why.

If PAHs cause cardio-toxic effects in humans, why do we still produce them? Brainstorm reasons why.

Zebrafish are used as the test organism for this research, do you think other fish exposed to these conditions would respond similarly?

Third Stop: 6:28 [..."***have bad hearts***."]

Describe how genes are expressed, and what the presence of CYP1-a in fish means?

Why do you think organisms have these genes? What do the two genes in the video do? Predict how these genes could have evolved in fish.

Fourth Stop: 11:01 [***END***]

Do bioretention methods work? Explain how you know using one of the three lines of evidence in the video (mortality, sublethal, molecular).

Think about your own neighborhood. Where would you put one of the bioretention methods mentioned in the video?

LEARN MORE

This is the research McIntyre presented in the video on Zebrafish developmental effects when exposed to stormwater.
Here is a recent Forbes interview with McIntyre on the effects of 6PPD-Quinone, a main pollutant in runoff.
Most recent research from McIntyre centers around understanding bioretention measures.

VIDEO 7
Why are Salmon dying before they can spawn? Watch Video [7:41]

First Stop: 0:53 [***..."these small freshwater streams."***]

Predict why you think salmon are dying upon re-entering streams.

Second Stop:

Would you expect a decrease in stormwater if cities were less impervious? What effects would this result in?

Have you heard of these contaminants before?

Do you expect them to have the same effects on salmon that they do on us?

Why do you think the salmon are reacting like this? Brainstorm possible biological or chemical effects that could result in this.

Third Stop: 7:41 [***END***]

What does pre-spawn mortality mean for the longevity of the coho population?

Brainstorm possible solutions to the pre-spawning mortality problem. Think about some of the stormwater solutions we have previously discussed, or explore an avenue we have not yet.

LEARN MORE

If you're interested in learning more about this research or volunteering to participate in a salmon survey visit the Puget Soundkeeper.
Explore the actions being taken to control stormwater pollution, and the specific information about stormwater in King County.
Here is a great article detailing the pre-spawn mortality phenomenon Davis spoke about in the video.

VIDEO 8

Stormwater Pollution in Pacific Herring

Watch Video [9:50]

First Stop: 2:26 [...*"toxic chemicals."*]

What do oil tankers and herring have to do with polluted stormwater in the Puget Sound? Predict the possible connections being made in the video.

Why do we care about herring?

Second Stop: 4:53 [..*"in seawater."*]

Do you think the oil in stormwater has the same effects as large oil spills on marine organisms?

Predict the effects of stormwater exposure on the herring hatchlings.

Third Stop: 8:46 [..*"themselves."*]

Do you think that other pollutants in stormwater exacerbate the effects on herring larvae, or do you think oil is the only factor? Explain why.

What will the effects of heart defects be on juvenile herring?

Fourth Stop: 9:50 [*END*]

If herring are easier to catch, wouldn't this be good for their predators? Explain.

What would you propose as a way to reduce the oil input into the Sound from stormwater?

LEARN MORE

This is the research Harding discussed within the video.
Here is an article detailing the Exxon Valdez spill Harding mentioned as background in the video.
Explore the project to recover herring populations to support salmon in the Sound, this has great details on the importance of herring to salmon health.

VIDEO 9
Bioaccumulation of Toxins in Orca Watch Video

[7:00]

First Stop: 2:20 [..."***in their systems.***"]

Define biomagnification. How do you think this phenomenon will impact top predators like Orcas?

Do you know what PCBs are? What other contaminants could you expect to find in Orcas in the Puget Sound?

Why do we care about high contaminant concentrations in Orcas?

Who do you think is affected the worst by contaminants, small animals like phytoplankton or big organisms like Orca?

Second Stop: 5:16 [..."***health impacts***."]

Could addressing the contaminant problem also result in positive prey abundance for Orcas? Explain why or why not.

What do tissue or fecal samples tell us about Orcas? Why and how do we collect these?

Why might pollutants from the past still be present in Orcas?

What are the effects of contaminant accumulation? Are these connected to decreased population size? Explain why or why not.

Third Stop: 5:42 [..."***can help do.***"]

Look at the action agenda mentioned in the video. Do you think these goals were reached in 2020? Why or why not?

If you were a researcher working to reduce contamination in Orcas, how would you present your ideas to the government?

Fourth Stop: 7:00 [***END***]

Which of the strategies mentioned would you employ to protect Orcas from contamination?

LEARN MORE

This is the link to the 2021 State of the Sound to explore the progress of the action agenda mentioned in the video.
Explore this article from NOAA detailing the actions to protect Orcas.

VIDEO 10
Reducing Stream Temperature for Salmon - Newaukum Creek Watch Video [8:48]

First Stop: 3:32 [.."***near that stream.***"]

What other environmental effects do you think could raise the temperature?

Why does colder water hold more oxygen? You may need to review some chemical principles for this question.

How do agricultural practices degrade streams? Give two reasons mentioned in the video.

Second Stop: 5:08 [..."***low oxygen.***"]

What do you think fish do to avoid these lethal areas in the streams? Can they?

What other effects will high temperature have on salmon beyond depleted oxygen content in the water?

Third Stop: 6:45 {.."***for fish.***"]

How are habitats being restored in the acquired land?

When do you expect to see the effects of this restoration (now, in the near future, farther out)?

What does near shore vegetation provide salmon, beyond just shade?

Fourth Stop: 8:48 [***END***]

As you can see from this video, this took many moving parts and people to pull off. How would you organize a similar project in a degraded stream near you?

LEARN MORE

Explore this article for more information and updates on the Lower Newaukum Creek Restoration.
Here is the link to a similar successful project in restoring salmon habitat in Big Spring Creek.

VIDEO 11
Nearshore Ecosystems for Salmon Watch Video [9:38]

First Stop: 2:56 [..."***really good food.***"]

What is a nearshore ecosystem?

Why are they important?

What makes the nearshore ecosystems around the Sound unique?

Second Stop: 5:32 [..."***spawning habitat.***"]

Why are forage fish important to other organisms in the ecosystem?

What is a bulkhead, how do these disrupt spawning habitat?

Do you think bulkheads built with other materials, besides rock, can contaminate the surrounding water? Explain using an example in the video.

Third Stop: 9:38 [***END***]

What are the other negative effects of armored beaches? Why does this matter?

How could we protect near-shore communities without compromising safety or disrupting forage fish habitat?

LEARN MORE

Here is a great article from the Puget Sound Institute detailing the bulkhead removal project; they met their 2020 removal goal!
Check out this research into the effects of shoreline alterations on salmon.
This is a similar project completed in 2020, this has great information on the details of these kinds of restoration projects.

VIDEO 12

What do our Chinook Salmon need? Watch Video

[10:32]

First Stop: 3:19 [..."***juvenile salmon.***."]

What is the purpose of collecting data from smolt traps, what is it used for?

Second Stop: 3:57 [.."***the Duwamish***."]

Why do we need more juvenile salmon habitat?

What is the difference between adult and juvenile salmon habitat?

Third Stop: 7:19 [..."***too dirty to eat.***"]

How has the Howard Hanson Dam disrupted salmon habitat?

What have we done to alter the Green River, how has this impacted salmon habitat? Explain using examples mentioned in the video.

What is a superfund site? How does this impact salmon?

Fourth Stop: 10:32 [***END***]

What can salmon otoliths tell us about a salmon's life?

Predict what is happening to fry when they leave the watershed that causes them not to come back.

What does this mean for the size of the salmon population?

LEARN MORE

Here is the link to explore more about the otolith research Higgins mentioned in the video.
This is more recent research into juvenile salmon habitat modeling from King County along the Green and Duwamish Watershed.
This is an article explaining the current plans to make the Howard Hanson Dam passable for salmon.

VIDEO 13
Microplastics and Me Watch Video [7:27]

First Stop: 1:19 [...*"watersheds."*]

Have you heard of microplastics before? How do you think they get into the environment?

Why are microplastics a big problem? Predict the possible effects of these pollutants in the marine environment.

Second Stop: 5:10 [...*"or the mouth."*]

Why is the distribution of microplastics important to consider in the environment?

What are the effects of microplastics on large organisms? Do you think they are as severe as they are on small organisms?

Third Stop: 7:27 [*END*]

Think about your clothes, beauty, and hygiene products, how many of these do you think contain or could produce microplastics?

How would you change your routine to reduce your microplastic contribution?

LEARN MORE

Here is the link to volunteer to clean up plastic around the Puget Sound, this site also has more great information on microplastic pollution.
This is another great article on microplastics from NOAA.
Here is an article detailing research around the microplastics on the beaches around the Puget Sound.

VIDEO 14
Acidification Impacts in the Puget Sound

Watch Video [8:57]

First Stop: 2:44 [...*"the consequences of that."*]

What is ocean acidification, and what does it change about the ocean?

Predict the chemical mechanism behind the reduction of carbonate as pH decreases? (How does this work?)

How have humans contributed to ocean acidification?

Second Stop: 7:15 [...*"is causing this all."*]

What does carbonate do? Why is it important in the ocean?

How could ocean acidification affect us and our economy?

How did we study ocean acidification and what did we find? Predict what this could mean for our ocean ecosystems in the Puget Sound.

Third Stop: 8:57 [*END*]

Why are scientists studying crab and krill?

If ocean acidification is a global issue, why are we seeing differences in localized effects?

LEARN MORE

Here is a great explanation of the chemistry behind ocean acidification from NOAA; it's also just a good general background on OA impacts.
This is a scholarly review of the literature around ocean acidification from UH Manoa; and another review from NOAA.
Explore this comprehensive article from the WA Department of Ecology on acidification in the Puget Sound.

VIDEO 15
Economic Impacts of Acidification on the Shellfish Industry Watch Video [9:22]

First Stop: 3:06 [...*"pick it up as well."*]

Shellfish are filter feeders. Predict how the presence of pollutants and toxins could affect them.

Why are shellfish important to the ecosystem? Why are they important to us?

Second Stop: 5:10 [...*"raise oysters."*]

How does our carbon dioxide production affect shellfish?

Why does a lack of carbonate kill shellfish larvae?

Third Stop: 9:22 [*END*]

How would a collapse of the shellfish industry affect us? Think about the economics of our state, of small rural areas, and individuals.

Are the strategies implemented by the shellfish industry permanent solutions? What else (if at all) is needed to ensure productive farms?

LEARN MORE

This is an article discussing the shellfish collapse that Dewey mentioned.

Here is another article from NASA on the impacts of CO_2 production; as well as a video embedded in the article explaining how this ends up in the ocean.

A different effect of ocean acidification is explored by researchers in this research paper.

VIDEO 16
Roadside Rain Garden for Barton Basin CSO Control Watch Video [8:48]

First Stop: 2:56 [...*"we put it."*]

What is Barton Basin? What is a CSO? What is a rain garden?

What makes Barton Basin a good place for a rain garden? Explain using the building strategies mentioned in the video.

Second Stop: 6:01 [...*"roadside rain gardens."*]

Why is the location of a rain garden important?

What factors need to be considered before building a rain garden? List some.

Third Stop: 8:48 [*END*]

Why is a bypass necessary for rain garden drainage? What would happen without it?

How are rain gardens built? Provide a simple step by step explanation.

LEARN MORE

From King County, here is the information about the Barton Basin CS, including a short video explaining the CSO projects.

This is the GSI (green stormwater infrastructure) overview from the City of Seattle to explore other stormwater control techniques.

VIDEO 17
Duwamish Superfund Site: Toxic History, Engineering Solutions Watch Video [11:15]

First Stop: 3:26 [...*"entire ecosystem."*]

How have we altered the Duwamish?

How do contaminants spread throughout the ecosystem?

Second Stop: 9:12 [...*"overall cleanup objectives."*]

What does Chu mean by "unacceptable risks," explain using the examples in the video.

What are the cleanup strategies mentioned in the video? What are the advantages and disadvantages of these strategies?

Why does cleanup take so long? Explain using the factors mentioned under Steps 2 and 3 in the video.

Third Stop: 11:15 [*END*]

How does cleaning up the Superfund site affect the ecosystem? Are the problems in the Duwamish all solved after cleanup is completed?

Think about you routine, in what ways could you decrease the pollution in your area?

LEARN MORE

Here is the Superfund listing and updated information for the Lower Duwamish from the EPA (Environmental Protection Agency).

There is a great map from the WA Department of Ecology showing the current, former, and planned cleanup areas.

VIDEO 18
Engineering Strategies
Duwamish Superfund Cleanup

Watch Video [ENG] | Watch Video [ESP] [6:03]

First Stop: 2:16 [...*"think like engineers."*]

How has the Lower Duwamish changed with time?

Why was it important for this industry to change the Duwamish?

Second Stop: 5:06 [...*"of our Duwamish River."*]

What are the four options? Which do you think is the best for recovery in the Duwamish?

What are the drawbacks of these strategies?

Third Stop: 6:03 [*END*]

How could cleanup efforts be thwarted by new contaminants? Where are these new ones coming from?

LEARN MORE

This is a page on the cleanup with current updates in the Duwamish from the Port of Seattle.
Here is the information regarding the health hazards associated with the Lower Duwamish.

VIDEO 19
Understanding Stormwater Management Fees Watch Video [6:04]

First Stop: 3:01 [...*"happy and balanced in this situation."*]

What is a SWM fee? Explain how these are calculated for King County.

How is the money acquired from these fees used? List some of the examples in the video.

Second Stop: 6:04 [...*"or the mouth."*]

How are SWM fees for cities different from SWM fees for the county?

Think about the questions brought up in the video; research your city's SWM fees and use this data to answer the questions.

LEARN MORE

Here is a resource from King County to determine the SWM fees they charge and what they are used.

VIDEO 20
Sponge Cities in China Watch Video [8:44]

First Stop: 3:49 [...*"can be a sponge city."*]

What are the impacts of unmanaged water in China?

What is a sponge city?

Second Stop: 8:44 [...*"or the mouth."*]

What are some of the strategies used to build China's sponge cities?

How do these make these cities resilient to changes in water availability?

Imagine implementing one of the strategies in your city; which would you pick and where would you put it? Explain.

LEARN MORE

Here is a good article explaining more about the sponge city concept and implementation.
This is an interesting article talking about the stormwater management and climate change strategies cities around the world are implementing.