Northwest Regional Office

High school Curriculum: Sustainable Halibut Fisheries

Recruiting teachers, Overview, Pre-Visit, Teacher Evaluation and Vocabulary

Recruiting Teachers

NOAA's 9th-12th grade Sustainable Halibut Fisheries Curriculum

Science: Biology, Marine Biology, Environmental Studies

- Life Science (Evolution, Population dynamics and stock assessments)
- Inquiry (questioning, data analysis, formulating conclusions from evidence)
- Application (Science, technology, problem solving)

Social Studies and Classroom Based Assessment:

- History of Halibut Fishery on West Coast
- Geography (habitat and range)
- Management and Policy (Which laws regulate the fishing?)
- Economics (Stakeholders and how different levels of government regulate impacts)
- Government (local, state, federal, and international)
- Civics (rights and responsibility of citizens)

Aligns with **CBA: Causes of Conflict**

Curriculum Overview

Lesson	Topic	Activity	Length of Time	Materials Needed	Assessment
1	Life history, Adaptations, and Classification	Fisherman's Next Top Model	50 min. period	Sustainability Poster/website worksheet computer access for research	research worksheet and rubric
2	Ecosystem management, overfishing, bycatch, and habitat destruction, Timeline of Fishery	Longlining 3 Threats: scientific questions and experiments that drive ecosystem management	50 min. period	worksheet computer access for research	research worksheet
3	Policy, Regulations, and Economics	Scale model awards Research type of fishery	50 min. period	worksheet computer access for research	research worksheet
4	Government, Policy and Management	Quick write stakeholders Fisherman's Facehook page	50 min. period	Facehook page (1 per student) 4 posters (print off 10 of each per class) computer access for research	research worksheet
5	**NOAA representative:** Science, Management and Stewardship	Given stock assessment data, how do managers make allocations; stewardship	50 min. period	worksheet Stock assessment activity provided by NOAA Rep.	datasheet classroom participation

Classroom based assessment: Causes of Conflict
http://www.k12.wa.us/assessment/WASL/SocialStudies/BridgingDocuments/HighSch08/HSEcon-CausesofConflict-CBA.pdf

To arrange a NOAA guest speaker email: nwr.education@noaa.gov

Northwest Regional Office

NOAA's 9th-12th Grade Sustainable Halibut Fisheries Curriculum
Aligned for Social Studies CBA: "Humans and the Environment"

Pre-Visit Questionnaire

Your Name:	Teacher's Name:	
School/Groups Name:	Phone number:	
Periods: * * * * * *	Time: * * * * * *	Class size: * * * * * *
School location: Driving Directions:		
Presentation Date:	Check in at office? Yes ☐ No ☐ Room #:	
What is the best time to set up:	Resources that you brought: # Distributed:	

Content background knowledge

- What background do your students have in policy and marine conservation efforts?
- Are there any vocabulary words or topics that you would like me to specifically address or connect to prior knowledge or concepts?

Class dynamics

- Do you have any special needs students?
- How do you involve them in group discussion? (raising hands?)
- What techniques do you use to get their attention? (clap, turn off lights, etc.)

Equipment and Room Space

- Computer and LCD projector? Yes ☐ No ☐ Macintosh ☐ or PC ☐
- Recommendations? own laptop ☐ CD or flash drive ☐ TV/VCR Yes ☐ No ☐
  ☐ Make a pdf of your presentation to avoid inconsistencies in formatting/ font etc.
- Blackboard or dry erase board?
- Table if you have hands-on materials (baleen, salmon eggs, etc.)
- Open space if you are going to do an activity on the floor (sitting or able to move around)

Timing

- Will I have time to set up before you introduce me?
- What will they be doing before and after my presentation? (lunch or recess?)

⇦ **OVER** ⇨

Summarize your presentation for the teacher:
Notes and observations from your classroom visit:

Northwest Regional Office

NOAA's 9th-12th Grade Curriculum: Sustainable Halibut Fisheries

Teacher Feedback and Curriculum Evaluation

Classroom Background Information	
Teacher's Name: School: Grade level: Subject/class name:	NOAA representative: Visit Date:

Teacher Evaluation	Strongly disagree…….Strongly agree **1**	**2**	**3**	**4**	**5**
Lessons 1-5: Was there enough background information?	1	2	3	4	5
Was the information age-appropriate?	1	2	3	4	5
Was the purpose clear?	1	2	3	4	5
Were the instructions for the lessons easy to follow?	1	2	3	4	5
Were the worksheets appropriate?	1	2	3	4	5
Were students successful using the websites?	1	2	3	4	5
Was the time estimated for each lesson accurate?	1	2	3	4	5
Did students enjoy the curriculum?	1	2	3	4	5
Would you teach it again?	1	2	3	4	5
Anything else you would like to tell us?					
NOAA Representative:					
Was the guest timely in preparation, delivery, and cleaning up?	1	2	3	4	5
Was the guest easy to understand/follow?	1	2	3	4	5
Was the guest's time valuable to the success of the curriculum?	1	2	3	4	5
Anything else you would like to tell us?					

Please send to:
NOAA Fisheries, c/o Peggy Foreman, 7600 Sand Pointe Way NE,Bld.1, Seattle, WA 98115

9th-12th Grade Social Studies Vocabulary

Social Studies: History vocabulary			
history	involuntary servitude	scientific invention	internal conflict
ethnic groups	federal policy	technological invention	external conflict
racial groups	treaty	social life	diverse cultures
cultural influence	removal	economic life	17th Century 18th Century
social influence	reservation	modes of transportation	European explorers
conflict	allotment	economic prosperity	European settlements
war	contemporary	national unity	American Revolution
religious motive	interpret	exploration	Civil War
political motive	points of view	interaction	Reconstruction
economic motive	resistance	native people	American Indians
immigrant	assimilation	territorial expansion	Manifest Destiny
consequences			
Social Studies: Geography vocabulary			
maps	basin	suburban	annex
globes	elevation	rural	cession
graphs	tributary	metropolitan area	province
charts	climate	estuary	urbanization
databases	tundra	drought	physical environment
models	prairie	backcountry	political development
landforms	savanna	tidewater	economic development
piedmont	canal	earthworks	westward migration
plateau	urban		
Social Studies: Economics vocabulary			
economics	inflation	depression	interest
profit	commerce	boycott	trade-off
risk	supply	boom	opportunity cost
stock	demand	bust	entrepreneur
raw materials	natural resources	capital	free enterprise
professional trade	conservation	human resource	market economy
company	tariff	division of labor	deficit
export	taxation	consumer good	economic region
import	monopoly	stock market	diverse economy
debtor	barter	unemployment	interest rate
budget	embargo	rationing	middle class
Social Studies: Civics and Government vocabulary			
democracy	parliament	junta	colonialism
direct democracy	congress	civil disobedience	empire
democratic republic	dictatorship	revolution	emperor
representative democracy	state	independence	prime minister
monarchy	coup d' etat	legitimacy	president

Groundfish Fisheries

High School: Life History, Adaptations, and Classification
Lesson 1: Fisherman's Next Top Model Contest

HARVEST	**Subject Area(s):** life history and factors that influence population growth; adaptations and evidence of evolution; classification	**Duration:** one 50 minute period
	Key words: groundfish, rockfish, flatfish, roundfish, sharks/rays, scale, proportion, size, weight, counter shading, orientation, eye migration, swimming patterns, dichotomous key, recruitment, ontogenies, benthic, metamorphosis, morphological evolution	
Materials:	Worksheet Computers with internet access	
State Standards: WA, OR, and ID	WA: EALR 2, 9-12 INQH (citations for all ideas from research work) EALR 4, 9-12 LS3A (biological evolution) EALR 4, 9-12 LS3C (characteristics in classifying using a common ancestor) EALR 4, 9-12 LS3E (classification using similar and differences with physical characteristics) OR: H.2L.4 (explain how biological evolution is the consequence of the genetic variation) H.2L.5 (explain how multiple lines of scientific evidence supports biological evolution) ID: 9-10.B.1.1.1 (explain the scientific meaning of systematic order and organization) 9-10.B.1.2.2 (develop models to explain concepts or systems) 9-10.B.3.1.1 (use the theory of evolution to explain how species change over time)	
Focus Questions:	What are the four main groups of groundfish and how are they alike and different? What factors can influence the size of an animal, its abundance, and distribution? What evidence of evolution and natural selection are seen in flatfish?	
Learning Objectives:	At the end of this lesson students will be able to: • identify the general body plan, natural history, and basic background on groundfish. • describe the adaptations of groundfish and evidence of evolution • Explain the factors that influence population growth and how scientists study this	
Engage and Encounter	Explore adaptations and evolution of halibut (eye migration, asymmetrical coloration, and 90° rotation)	
Explore and Investigate	Students will compare and contrast different orders of fish, classify and study the life history from a population growth perspective.	
Reflect and Explain	Students will construct a scale model of their groundfish, research the life history of that fish and find interesting facts related to fisheries	
Apply and Extend	Compare halibut to other species (Atlantic halibut or California halibut) Quiz themselves on other types of fish using interactive NOAA website	
Background for teacher	Pacific halibut are large flatfish found on the continental shelf from California to the Bering Sea. Halibut have diamond-shaped bodies, can weigh up to 600-700 pounds, and can grow to nine feet long. The left eye migrates to the right hand side of the animal and there are approximately 80 dorsal soft rays. Halibut is low in saturated fat and sodium and is a very good source of protein, niacin, phosphorus, and selenium. Your students can make a model of the largest caught halibut, average male/female, or whatever category they choose, but encourage them to get multiple resources to verify their facts and be explicit of the size they focused on. A frequently asked question: How old is a 40 pound halibut? Actually, there is no simple answer to this question. It all depends on the sex of the fish and from which regulatory area it came. Female halibut tend to grow faster, so a 40 pound female would be younger than a 40 pound male. Also, halibut seem to grow faster the farther north (west) you go: a 40 lb fish off the coast of WA State is likely to be a lot older than a 40 lb fish off of Kodiak Island, AK.	
Contact NOAA	For a NOAA guest speaker in lesson 5 email: **nwr.education@noaa.gov**	

Lesson 1 Procedures

Fisherman's Next Top Model Contest: life history, adaptations, classification

I. Anticipatory Set: (15 minutes)

A. **Halibut Adaptations and Evolution**: Share the halibut life history with students and ask them what evidence of evolution and natural selection can explain the eye migration, asymmetrical pigmentation, and 90° rotation in position. Tell them that this unit covers the life history of groundfish and halibut is one species from this category. Encourage them in their research to think like a fisheries biologist, ask questions like: What can flatfish ontogenies tell us about benthic lifestyles.

B. Ask students to get into 4 equal teams and get ready to introduce the Fisherman's Next Top Model Contest.

II. Direct Instruction: (35 minutes)

A. **Fisherman's Next Top Model Contest:** The four teams represent the main types of groundfish: rockfish, flatfish, roundfish, and sharks/skates. Share how they will work in a group to compare and contrast their species and group; then explain the scale model and life history information card.

B. Ask the students to turn to their neighbor and describe what a scale model is. Probe them to explain how to create a scale model. Highlight that they are smaller versions of real things that are in correct proportion. Emphasize that there is a mathematical relationship between the model and the object that exists in real life.

C. Hand each student the worksheet/rubric and walk through the example of using ratios/fractions to determine scale. Emphasize materials should be recycled to even the playing field and brainstorm ways to include weight in their model. Reinforce the due date (Assign on a Friday or Monday and make due on Tuesday or Wednesday works best; you will need it done for the 3rd lesson or least the information card).

III. Assessment:

A. Group work on classification characteristics (Order/suborder and dichotomous key, or graphing catch data), groundfish scale model, and information card worth 50 points total, see rubric.

IV. Apply and extend:

A. You could have students look at different species of halibut (California Halibut, Atlantic Halibut, or even arrowtooth flounder to compare and contrast to the Pacific halibut)

B. Have students test their knowledge of species I.D. using this website http://www.nmfs.noaa.gov/speciesid/Sustainability.html

Fisherman's Next Top Model Groundfish Contest

Names:

Species:

	Grading Criteria:	Value	Your Points
1. **Group work:** Your group will be assigned one of the four main types of groundfish. Your job will be to compare and contrast your species and share how these animals are classified. **Make time to work on this together. (10 pts)	Quality of: **Comparison:**What order or suborder does your fish belong to? Explain characteristics. **Contrast:** Make a dichotomous key based on appearance or anatomy OR use the fishery data sheet (Excel file) to graph catch data either for your state or compare states.	5 pts 5 pts	
2. **Scale model:** Each member of your team will make a scale model of one of the species from (rockfish, flatfish, roundfish, or sharks/rays). Please do not go out and spend money on fancy materials; try your very best to used recycled products from school or home. (20 pts total)	**Accuracy and scale** Size/ Proportions Shape Weight Coloration is realistic, detailed and neat	 5 pts 5 pts 5 pts 5 pts	
3. **Information card:** Investigate its life history and write this either on a large index card or half piece of card stock. This will be used in lesson 3, so please make sure your name is on both the model and this card. Here are some websites that might be useful in your research: http://www.pcouncil.org/facts/groundfish.pdf http://www.pcouncil.org/groundfish/gfprimer.html#fish http://www.nmfs.noaa.gov/speciesid/Sustainability.html http://www.afsc.noaa.gov/Rockfish-Game/gamemenu.htm (20 points: 10 point for key characteristics and 10 points for adaptations and evidence of evolution)	**Content accuracy:** Size (length and weight) Coloration Counter shading Eye migration Orientation (right or left sided?) Compressed (laterally or dorsal/ventrally?) Swimming patterns Habitat Life cycle Adaptations and evidence of evolution Cite your sources	 10 pts 10 pts	

Comments:

TOTAL:

/50

Determining Scale:

Real car		Model/match car	
length:	17 ft.	length:	2.5 inches
width:	5 ft.	width:	1.5 inches
weight:	3,200 lbs	weight:	20 grams

Real fish	Model fish
length:	length:
width:	width:
weight*:	weight*:

***Note:** you might want to use two ratios; one for size (length and width) and one for weight.

**Don't forget to site your sources on your information card.

Step 1: Convert the units of the real item to the units you will use in the model. (Change 17 feet into inches, like your model. How many inches in a foot? So the real car is 204 inches)

Step 2: Set up a ratio where the numerator is the model item and the denominator is the real life item. Your goal is to get the numerator to 1. So divide the top and bottom by the numerator and that will give you the scale or ratio.

$$\frac{2.5 \text{ inches}}{204 \text{ inches}} \div \frac{2.5 \text{ inches}}{2.5 \text{ inches}} = \frac{1}{81.6} \text{ or } \frac{1}{82}$$

Step 3: Interpret: for every inch of your model it represents 82 inches in real life.

****Hint**: If the whole class uses the same scale, then easy to compare

Species list: Put a star next to your species

Rockfish (64 target species)	**Flatfish** (12 target species)	**Roundfish**	**Sharks/Rays** (6 target species)
Black rockfish	Pacific halibut	Lingcod	Leopard shark
Canary rockfish	Starry flounder	Pacific cod	Soupfin shark
Darkblotched rockfish	Arrowtooth flounder	Pacific whiting (hake)	Spiny dogfish shark
Widow rockfish	Turbot	Sablefish	Big skate
Yelloweye rockfish	Sanddab or Pac. flounder	Chinook salmon	California skate
Yellowtail rockfish	Dover sole	Sockeye salmon	Longnose skate
Shortspine thornyhead	English sole	Coho salmon	
	Petrale sole	Pink salmon	
	Rex sole	Chum salmon	
	Rock sole	White sturgeon	
	Sand sole		

Groundfish Fisheries

High school: How do scientific questions/experiments drive ecosystem management?
Lesson 2: Sustainable Practices and History of Halibut Fishery

	Subject Area(s): Sustainable fishing practices, environmental or human impacts on an environment (overfishing, bycatch, and habitat destruction)	**Duration:** one 50 minute period
	Key words: sustainable, exploitation, tragedy of the commons, overfishing, bycatch, habitat destruction, International Pacific Halibut Commission, ecosystem management, landing data	
Materials:	Worksheet Species landings data strips (pounds and dollar value) **cut up prior to class! Excel spreadsheet (tabs at bottom for Alaska, Washington, Oregon, and California landing data) Computers with internet access	
State Standards: WA, OR, and ID	WA: EALR 2, 9-12 INQA (generate questions and evaluate a question) EALR 3, 9-12 APPA (scientific ideas influenced society) EALR 3, 9-12 APPB (technological design, defining problem in terms of criteria) EALR 3, 9-12 APPC (choose best solution involves comparing alternatives) OR: SS.HS.HS.01.01 (reconstruct the chronological order of significant events related to history) H.2L.2 (explain how ecosystems change in response to disturbances) H.3S.5 (explain how technology problems and advances create a demand) ID: 9-10.B.1.6.1 (Identify questions and concepts that guide scientific investigations) 9-10.B.5.2.1 (explain how science advances technology) 9-10.B.5.2.2 (explain how technology advances science)	
Focus Questions:	How does science drive the management and policy of an ecosystem? How do policy and management ensure sustainability within a fishery? How does knowledge of past events influence present and future science, management and policy?	
Learning Objectives:	At the end of this lesson students will be able to: • Explain what a sustainable fishery is and how the biota, ecosystem, and people are all considered • Give 5 examples of questions/testable experiments scientists are doing to better understand a fishery • Describe the brief history of the halibut fishery in our country.	
Engage and Encounter	Longlining activity: hand students a type of fish, landing data by weight and dollar amount for 2008.	
Explore and Investigate	Students will explore what questions/testable experiments that scientists would apply to better understand ecosystem management in regards to issues.	
Reflect and Explain	Research the timeline of events that shaped the history of the Pacific Halibut Fishery. Technology challenge: address one of the threats and attempt to solve one of the issues.	
Apply and Extend	Plan a fieldtrip to the closest fishing community and tour a vessel or Interview a fisherman or elder who might be familiar with the issues	
Background for teacher	Native Americans have fished halibut both on the East and West coast for many centuries. The groundfish fishery however first started on the East coast and started around 1888 on the West Coast. The groundfish managed under the Pacific coast groundfish Fishery Management Plan (FMP) include more than 90 different species that, with a few exceptions, live on or near the bottom of the ocean. Students will investigate when certain events happened in history to shape this industry (technology advancement in nets, vessels, and navigational equipment) and emphasize the cause and effect relationships. Exploring these cause and effect relationships will help students think logically and draw conclusions based on evidence. By exploring how change has occurred over time in this fishing industry, students will see firsthand the trial and error of methods; which is key to the scientific method.	
Contact NOAA	For a NOAA guest speaker in lesson 5 email: **nwr.education@noaa.gov**	

Groundfish Fisheries

Lesson 2: Sustainable Practices and History of Halibut Fishery

I. Whole Class: Anticipatory Set (10 minutes)

A. **Longlining Activity**: Hand out the landings data/ statistic strip according to the species they chose in lesson 1. Tell students that this is a non-verbal activity. They will align themselves from largest to smallest according to the category:

1. Pounds of fish caught in a certain year for your state. Have them remember the top 3 and where Halibut are in the order. Emphasize the different types of groundfish (rockfish, flatfish, roundfish, and sharks/skates).
2. Next, try again in order of Dollars earned from that year's fishery from your state. Again reinforce the price per pound and how lucrative a fishery might be in comparison to other species. What do they have in common? How was this line up different than the first one? Top three? Halibut? Etc.
3. Share with students that this exercise was to emphasize the economic value of fisheries in your region. Remind students that this information came from a 2008 database from their state and if their group decides to use graphs for their Model Project, tell them where to find the Excel sheet.

II. Direct Instruction: (40 minutes)

A. Ask students to think like a fisherman, your target species is halibut among all of the groundfish; how do you catch just halibut? Brainstorm how the conservation of resources, like halibut, is necessary to maintain a healthy and productive environment for future generations.

1. Define and discuss what a sustainable fishery means. What might this mean for fishermen, scientists/managers, and the fish? A sustainable fishery means a fishery capable of being continued with minimal long-term effect on the biota, environment, and people. To fisherman, it is job security; to scientists/managers it means populations are not in jeopardy; and sustainability to fish means a future in our oceans.
2. How do local, state, federal, and international governments work to accomplish the same goals? Policy and management need to be inclusive, international, and have equal representation from all stakeholders.

B. Hand each student the worksheet and start on the sustainable fisheries side. As a class intentionally go through each one to distinguish the difference between the science and managers. You could also be generating a list of questions that could be addressed with the NOAA representative in lesson 5.

C. Next ask them how have the technology, science, and policy/management influenced or played a role in sustainability? To help them with these questions, have them work on the History of Halibut Fishery Timeline in partners or on their own. Use the following websites to help guide them. http://www.iphc.washington.edu/halcom/fishery.htm and http://www.pcouncil.org/facts/groundfish.pdf.

III. Assessment:

A. Finish the worksheet and have them investigate the above websites to learn more about groundfish beyond the species they chose for their scale model.

IV. Apply and extend:

A. Look into a fieldtrip where students could go to their closest fishing community and get a tour of a vessel, meet a fisherman, and inquire more.
B. Have students interview an elder of any sort and ask them what they think of fishing practices today. How has the fishing industry changed over time?

What is a sustainable fishery?

Define Sustainable=

What is ecosystem management? How is it different than let's say Halibut management?

	If you were a fisheries biologist…	**If you were a fisheries manager…**
What would you want to know about overfishing: What testable experiments could scientists do to help better understand overfishing:		
What would you want to know about bycatch: What testable experiments could scientists do to help better understand bycatch:		
What would you want to know about habitat destruction: What testable experiments could scientists do to help better understand habitat destruction:		

Technology Challenge: Work in partners or on your own to address one of the threats above by changing the technology to improve fishing techniques or scientific research. Create a prototype and 1 page summary of your idea. Make sure you include estimated cost, materials, how it works, and what issue it addresses. How does your technology improve sustainability?

History of Halibut Fishery: Timeline

Visit the following website to help you: http://www.iphc.washington.edu/halcom/fishery.htm (click on history tab)

Time	Events	Cause	Effect
>400ya			
17th century			
18th century			
19th century			
20th century			
21st century			

Groundfish Fisheries

High school: Fishing Regulations and Economics
Lesson 3: Halibut Derby

	Subject Area(s): Fishing regulations and economics of catch sharing plan	**Duration:** one 50 minute period
	Key words: allocation, Catch sharing plan, exploitable biomass, revenue, regulatory areas, closures, regulations, fishing periods/openings, fishing limits, gear restrictions, recreational bag limits, size limits (fish/boats), exclusive economic zones	
Materials:	Research sheet Computers with internet access **For the most current data do your own query and put into Excel at http://www.oar.noaa.gov/k12/	
State Standards: WA, OR, and ID	WA: EALR 2, 9-12 INQC (explain or draw conclusions supported by evidence) EALR 2, 9-12 INQD (communicate clearly) EALR 3, 9-12 APPD (solve problems with math, computers, probes, or data) OR: H.2E.4 (evaluate the impact of human activities on environmental quality) H.4D.6 (evaluate ways how ethics, public opinion, and government policy influence the work of engineers and scientists) ID: SS.9-12.E.3.2.2 (explain and illustrate the impact of economic policies and decisions made by governments, businesses, and individuals)	
Focus Questions:	Why are there different fishing areas in our oceans? Who manages this resource? How do federal, state, local, and tribal governments manage one resource? How do policy and management ensure sustainability within a fishery?	
Learning Objectives:	At the end of this lesson students will be able to: • Explain the differences in the five fisheries in the 2A region • List at least five ways a fishery is managed • Explain how regulations promote sustainable fisheries for future generations. • Identify how economics, environment, and society influence sustainable practices.	
Engage and Encounter	Fisherman's next top model AWARDS	
Explore and Investigate	Students will learn how the halibut fishery in the NE Pacific is managed through closures, fishing periods, limits, gear restrictions; size limits (fish and vessels).	
Reflect and Explain	Students will research how managers divide up the quota in the 2A region.	
Apply and Extend	Fishing derby activity (data collection and analysis) SONAR lesson plan using graphing calculators and veneer probe	
Background for teacher	Pacific halibut is managed by the United States and Canada in a bilateral commission known as the International Pacific Halibut Commission. Each year, the Commission sets total allowable catch levels for halibut that will be caught in the U.S. and Canadian exclusive economic zones in the northeastern Pacific Ocean. The International Pacific Halibut Commission refers to U.S. waters off the states of Washington, Oregon and California collectively as "Area 2A." Regulations for Area 2A are set by NOAA Fisheries Service's Northwest Regional Office in Seattle. Halibut in Area 2A is divided between tribal and non-tribal fisheries, between commercial and recreational fisheries, and between recreational fisheries in different states (Washington, Oregon, and California). There is also another group known as the Pacific Fisheries Management Council that each year writes a catch-sharing plan describing these allocations.	
Contact NOAA	For a NOAA guest speaker in lesson 5 email: **nwr.education@noaa.gov**	

Lesson 3 Procedures

Halibut Derby: Fishing Regulations and Economics

I. Anticipatory Set: (20 minutes)

A. **Fisherman's next top model awards**: Reserve a place outside, in your gym, or hallway where students can place their most glamorous models for the whole class to see.

1. Start with compare and contrast of 4 different groups and species.
2. Hand out awards according to your own criteria, could be overall or each of these categories per fish type.
    a. Largest fish (this might be largest model or it could be by the ratio)
    b. Heaviest fish
    c. Prettiest fish
    d. Most realistic fish
    e. Most accurate fish

II. Direct Instruction: (30 minutes)

A. Next have them sit down and emphasize that money is only one factor that influences the fishery. Now challenge them to think how they can catch a target species like halibut when all of these groundfish live in similar areas of the ocean and avoid unwanted species or non-target species (bycatch). How would they do it?

B. **Halibut Derby:** Show the students the map of regulatory areas, especially the 2A region on poster. Have students brainstorm what the advantages of dividing the regulatory areas into these regions. Pacific halibut are distributed throughout the continental shelf regions of the Bering Sea and the northern Pacific Ocean, from northern California, through Canadian waters, along the coast of Alaska, and into Russian territorial waters. For management purposes, the IPHC divided the range into smaller units known as statistical areas. These areas were used as convenient analytical units for tabulating and analyzing halibut catch data, biological and biometric data, and migration data from tagging experiments.

C. Share with them that off the coast of Washington, Oregon, and California there are 5 different halibut fisheries. Assign each group one of the following:

1. Tribal fisheries;
2. Sport fishery in Washington
3. Sports fisheries in Oregon and California
4. Halibut commercial fishery;
5. Salmon commercial troll fishery with incidental halibut retention;
6. Sablefish commercial longline fishery with incidental halibut retention

Have them answer the first five question of worksheet before you hand it out.
http://www.nwr.noaa.gov/Groundfish-Halibut/Pacific-Halibut/upload/AR080887-_____7.pdf

III. Assessment:

A. Allocations worksheet to be finished either individually or in teams.

IV. Apply and extend:

A. Fishing derby activity from middle school lesson (data collection activity)

B. Lesson plan on SONAR and how to find the fish:
http://oceanservice.noaa.gov/education/classroom/lessons/23_hydrosurvey_see.pdf

Halibut Fishing Research

Looking at the map, what are the advantages of dividing the regulatory areas into these regions?

Now that you know what regulatory region you would fish in, how would you know where to fish in that area?

-
-

How would you find the fish?

What gear would you use?

Research: Choose one of the five types of halibut fisheries in the 2A region and investigate the following: http://www.nwr.noaa.gov/Groundfish-Halibut/Pacific-Halibut/upload/CSP_2008.pdf and http://www.iphc.washington.edu/staff/stevek/basic2.htm#GearTypes

Fishery type: tribal, sport, commercial or incidental catch in the sablefish longline fishery or salmon troll fishery.

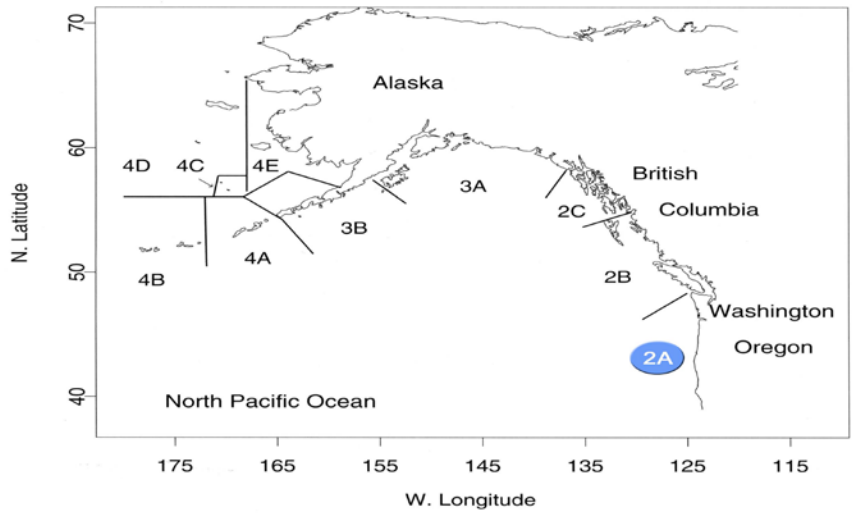
Area allowed to fish:

Season:

Who manages:

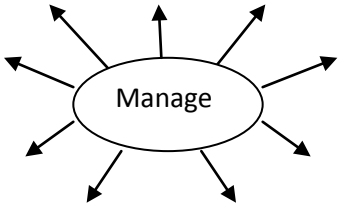
Gear used? Pros and cons

What are you curious about?



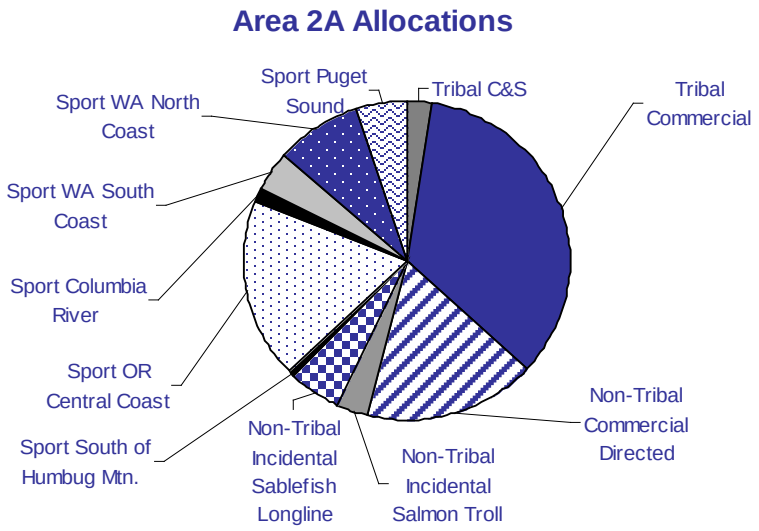
IPHC Regulatory Areas

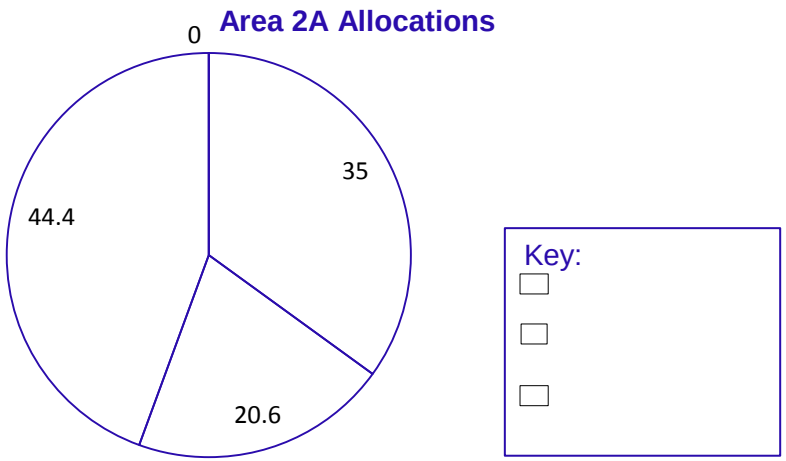
Policy and Regulations: What are all the ways the fishery is managed to ensure sustainability? http://www.pcouncil.org/facts/groundfish.pdf



Who gets how much?

Using the pie chart on the left, simplify that graph by clumping them into three groups. Color and fill in the key accordingly. For extra help, check out this website http://www.nwr.noaa.gov/Groundfish- Halibut/Pacific-Halibut/Index.cfm.





Looking at both graphs above, can you estimate the percents for all of the categories? Are they equal? Why? How do suppose managers detmine these allocations?

Tribal Fisheries:	Non-tribal commercial fisheries	Non-tribal sport fisheries:

What do you notice:

Groundfish Fisheries

High school: Government, Policy, and Management
Lesson 4: Fisherman's Facebook stakeholder's profile

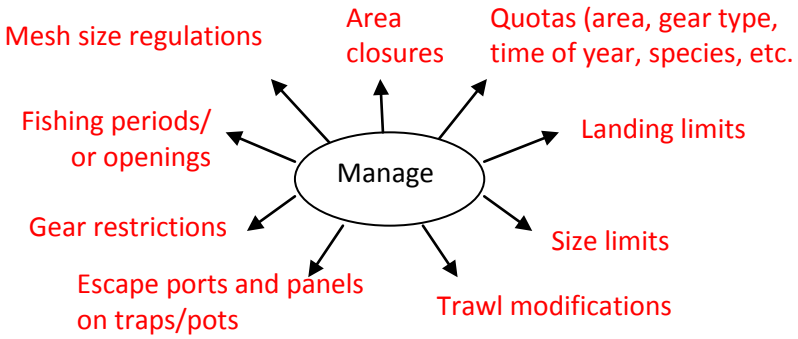
HARVEST	**Subject Area(s):** Government, Policy, and Management	**Duration:** one- two 50 minute periods
	Key words: Department of Fisheries and Ocean (DFO), National Marine Fisheries Service (NMFS) also known as NOAA Fisheries, International Pacific Halibut Commission (IPHC), Pacific Fisheries Management Council (PFMC), conflict resolution, checks and balances, testimonies	
Materials:	Worksheet Computers with internet access	
State Standards: WA, OR, and ID	WA: EALR 4, 9-11 LS2C (population growth limited by resources, size of environment, competition/predators) Social Studies EALR 1.2.3 (evaluates impacts of various forms of gov't on people) Social Studies EALR 3.2.1 (evaluates human impacts on the environment) Social Studies EALR 5.11 (analyzes consequences of an issue) OR: SS.HS.SA.04 (analyze an event, issue, problem from varied or opposed perspectives) ID: SS.9-12.E.3.2.1 (define scarcity and explain its implications in decision making)	
Focus Questions:	How do two countries manage a fish that lives in an environment that has no boundaries? How do federal, state, local, and tribal governments work together to achieve a common goal? How does the Pacific Fisheries Management Council represent all constituents?	
Learning Objectives:	At the end of this lesson students will be able to: • Describe the international management of halibut in the Pacific Northwest. • Explain the representations of different governments on the Pacific Fisheries Management Council and how they work together to create a sustainable fishery. • Explain the checks and balance in the management of the halibut fishery.	
Engage and Encounter	Review ways to manage a fishery Quick write on who the stakeholders are	
Explore and Investigate	Students will learn how the halibut fishery in the NE Pacific is managed on international, federal, state, and local levels.	
Reflect and Explain	Students will also understand how agencies, non-governmental organizations, and workplaces actually work on problems.	
Apply and Extend	Hold a mock meeting as the stakeholders addressing one or all three threats Write a testimony (template provided)	
Background for teacher	In 1923 the U.S. and Canada signed a convention on halibut, leading to the eventual creation of the International Pacific Halibut Commission (IPHC). This international management example explores an ecosystem approach to management. Understanding who makes the decisions and how one gets involved is vital to establishing interconnections between humans and the environment. Resource Management issues regarding how fisheries promote sustainable practices and problem solving with diverse constituent groups can be difficult for students if they don't research what factors influence their beliefs and values. Allowing students to familiarize themselves with the different types of fisheries, the closures and other regulations, will help them analyze and evaluate the different stakeholders in this lesson. Emphasize to the students that sustainable practices today define future opportunities for generations to come.	
Contact NOAA	For a NOAA guest speaker in lesson 5 email: **nwr.education@noaa.gov**	

Lesson 4 Procedures

Fisherman's Facehook stakeholder's profile: Government, Policy, Management

I. Anticipatory Set (15 minutes)

A. **Review:** Have students take out their worksheet from yesterday and review the lower right hand box from page 1 that asks the students what are the ways to manage the fishery.



B. **Quick write:** Have the students do a brainstorming strategy known as a quick write to generate **"Who is at the table? Or Who are the stakeholders involved in Halibut Fisheries? "** This might be done in a notebook or on scratch paper; a quick write challenges students to write down their ideas that first pop into their minds. Have them generate details, topics, or tap into past experiences and not focus on spelling, punctuation, or grammar. Give the students 1.5 minutes only. Topics: fishermen, marinas, boat captains, biologists, managers, Federal, State, International representatives, anyone who profits from the season influx of fishermen into their community (like hotels, restaurants, etc.)

C. Once done, ask the students to share their lists with a neighbor. Encourage them to develop their list (add new ones, add specificity, etc.) Share one or two groups with the whole class and write this brainstorm list on the board.

II. Research on computers time: (35 minutes)

A. Tell the students that you want to get all of the stakeholders together to discuss the three main threats (overfishing, bycatch, and habitat destruction). Ask them to imagine what that would be like? Who would lead? What is the hierarchy in the management system and who would be present? Split the class into four groups:

1. Pacific Fisheries Management Council 10 people
2. International Pacific Halibut Commission 6 people
3. Fishermen/Gear by region 10 people
4. Science and Management team 6 or remainder

B. Research a stakeholder and their role in that group, then fill in a "mock" Facehook page focusing on what that person does and their opinion on the three threats.

C. Share with the class either at the end of the period, or the next day.

III. Assessment:

A. Worksheet provided: Have students finish their research and be prepared to share with the class the next time they meet.

IV. Apply/Extend:

A. Research one of the issues and submit a testimony to the Council, see attached example and template.

Group 3: Fishermen/Gear by Region

Visit the following website to help you, http://www.nmfs.noaa.gov/fishwatch/fishinggears.htm and http://www.montereybayaquarium.org/cr/cr_seafoodwatch/sfw_gear.aspx

National Marine Fisheries Service

International Pacific Halibut Commission

Department of Fisheries and Oceans

U.S. approves IPHC regulations; NMFS implements
a) IPHC Regulations,
b) NMFS regulations, and
c) Catch Sharing Plan for the U.S.

Public comment

Catch Sharing Plan

Public comment

IPHC sets quota, approves regulatory changes, and reviews Catch Sharing Plan changes.

Treaty tribes

Public

Coastal States

Recreational Fishers: *proposals*

Public comment

Public comment

Commercial Fishers: *proposals*

Group 3: Fishermen/Gear by Region

Visit the following website to help you, http://www.nmfs.noaa.gov/fishwatch/fishinggears.htm and http://www.montereybayaquarium.org/cr/cr_seafoodwatch/sfw_gear.aspx or http://www.nwr.noaa.gov/Groundfish-Halibut/Pacific-Halibut/upload/AR080887-7.pdf

Stakeholder List: have students choose one and write it down on their Facehook page	Student's Name:
Tribal ceremonial and subsistence fisherman with hook and line	
Tribal commercial halibut fisherman with gill net	
Washington sports fisherman with hook and line	
Oregon sports fisherman with harpoon	
California sports fisherman with traps and pots	
British Columbia halibut commercial fisherman using dredging	
Washington halibut commercial fisherman using purse seine	
Oregon halibut commercial fisherman using trawl or dragging	
California halibut commercial fisherman using longline	
Salmon commercial troll fisherman off Columbia River for incidental halibut	
Sablefish commercial troll fisherman off Oregon for incidental halibut	
Describe the checks and balances:	

Group 1: International Pacific Halibut Commission (IPHC)

Visit the following website to help you, http://www.iphc.washington.edu/halcom/about.htm.

National Marine Fisheries Service

International Pacific Halibut Commission

Department of Fisheries and Oceans

U.S. approves IPHC regulations; NMFS implements
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The Pacific halibut fishery is managed by the International Pacific Halibut Commission (IPHC) with implementing regulations published by the federal governments of the United States and Canada. The IPHC conducts an extensive stock assessment and makes recommendations to the two governments on total removals of Pacific halibut in all management areas off the U.S. and Canada. Allocative responsibility and consequent management measures are the responsibility of the individual federal governments. **Research one of roles below in the IPHC:**

Stakeholder List: have students choose one and write it down on their Facehook page	Student's Name:
Commissioners:	
Director:	
Staff: describe their job titles and where they work.	
Port samplers:	
Scan samplers:	
Sea samplers:	
Describe the checks and balances:	

Group 1: International Pacific Halibut Commission (IPHC) KEY

Visit the following website to help you, http://www.iphc.washington.edu/halcom/about.htm.

National Marine Fisheries Service

International Pacific Halibut Commission

Department of Fisheries and Oceans

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Commissioners: 6 total 3 Canadian and 3 U.S.	Canadian: Garry Robinson (2005-) Laura Richards (2005-) Larry Johnson (2009-) United States Ralph Hoard (1993-) James Balsiger (2000-) Phillip Lestenkof (2003-)
Director: 1 person	Bruce M. Leaman (There have been a total of 6 directors since 1923)
Staff: describe their job titles and where they work. ~30 staff members	Biologists/research scientists: 10 people Quantitative science/data transcription: 6 people Survey/survey manager: 3 Computers/programmers: 4 Administrator/Executive director: 4 Vessel operator: 1
Port samplers: 12 people (8 in Alaska, 3 in BC, and 1 WA (Bellingham))	To collect detailed accurate fishing records from commercial fishers; obtain biological data from commercial deliveries; collect random halibut otoliths; and gather biological or statistical data; and serve as the commission's liaison to the public.
Scan samplers: AK: hires 8 seasonal employees BC: contracts with Archipelago Marine Research (AMR). Area 2A, IPHC staff, tribal biologists, and contract employees. 2A sport catch: biologists from the Washington and Oregon Departments of Fish and Wildlife.	The commission implements an extensive coast-wide halibut tagging program using PIT tags (passive integrated transponder). 1st goal is to provide a direct estimate of abundance that is independent of the current stock assessment model. 2nd goal is to provide exploitation rates in areas where no analytical assessment exists. 3rd goal is to provide estimates of the movement rates among management areas. • Goal is to scan 25% of all halibut landed from each regulation area in the fishery.
Sea samplers: 25-36 people on 12-15 vessels	These people are the data collectors who are independent of commercial catch records. Quantitative scientists use their independent data in conjunction with data collected from commercial halibut fishing logs to determine total allowable catch for the upcoming season. They collect catch per unit effort (CPUE) data.
Describe the checks and balances:	Equal representation between states and BC province; representatives from commercial, tribal, sport fisheries as well as including public comment which allows all voices to be heard and attempt to reduce biases.

Group 4: Science, Management, and Others Team

Visit the following website to help you, http://www.nmfs.noaa.gov/fishwatch/profiles.htm

National Marine Fisheries Service

International Pacific Halibut Commission

Department of Fisheries and Oceans

U.S. approves IPHC regulations; NMFS implements
a) IPHC Regulations,
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Group 4: Science, Management, and Others Team

Visit the following website to help you, http://www.nmfs.noaa.gov/fishwatch/profiles.htm

NOAA fisheries biologist	Studying:
NOAA fisheries habitat specialist	Studying:
Washington Department of Fish and Wildlife biologist	Studying:
Oregon Department of Fish and Wildlife	Studying:
Idaho Fish and Game biologist	Studying:
NOAA fisheries observer	Monitoring what:
NOAA fisheries manager	Focused on:
Seafood Chef	
Non-government organization NGO	
Conservation group that removes derelict fishing gear	
other	
Describe the checks and balances:	

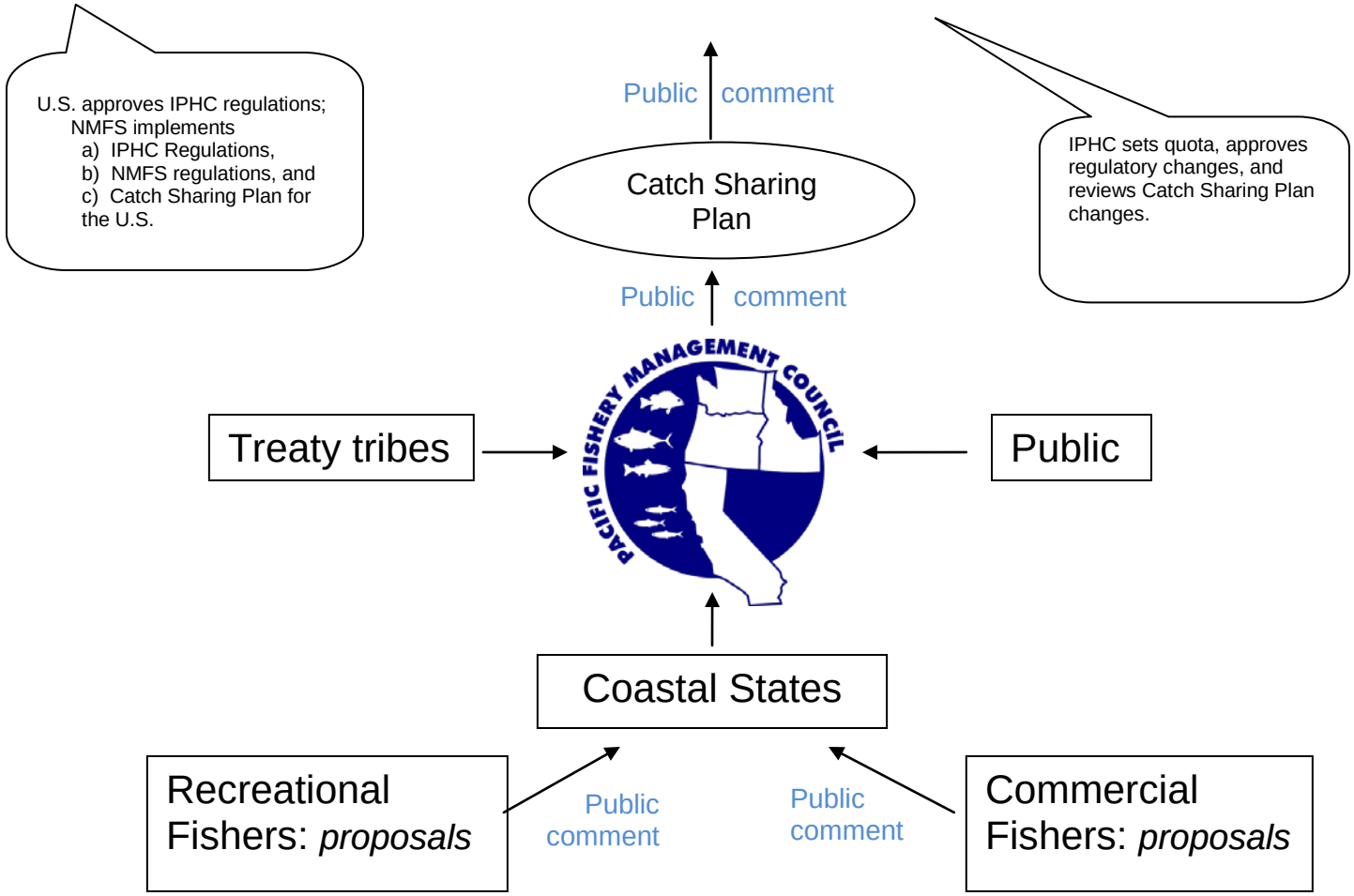
Group 2: Pacific Fisheries Management Council (PFMC)

Visit the following website to help you, http://www.pcouncil.org/guide/Guide-intropage.html. Check out their fact sheets too.

National Marine Fisheries Service

International Pacific Halibut Commission

Department of Fisheries and Oceans



Group 2: Pacific Fisheries Management Council (PFMC)

Visit the following website to help you, http://www.pcouncil.org/guide/Guide-intropage.html. Check out their fact sheets too.

Research one of the roles below from the PFMC:	
Council Members	
Council Staff	
Advisory Bodies	
Public Comments What are the processes?	
What other fisheries do they manage?	
Describe the checks and balances:	

Fisherman's Facehook

Home | Profile | Friends | Inbox

Stakeholder's Profile

Information

My Name: _____

Location: _____

My occupation: _____

What % of my income relies on groundfish? _____

_____

_____

_____

_____

Friends

My Wall

6 facts about my role in Groundfish Fisheries (gear. type of boat, season, etc.)

What can I do to help protect this fishery?

Sustainable Halibut Fisheries

High school: Science, Policy & Management, and the Fishery
Lesson 5: Invite a NOAA Representative to your classroom

	Subject Area(s): Ecosystem management, fishery dependent and independent research, stock assessments and stewardship	**Duration:** one 50 minute period
	Key words: stock assessments, catch sharing plan, stewardship, marine debris, derelict fishing gear, NOAA's fish watch program, PIT tags (passive integrated transponders), stock assessments	
Materials:	worksheet Stock Assessment goodies	
State Standards: WA, OR, and ID	WA: EALR 1, 9-12 SYSD (systems can be changing or in equilibrium) *math connection *b A1-8B (select and apply strategies to solve problem) EALR 4, 9-11 LS2F (sustainable development) EALR 2, 9-12 INQC (explain or draw conclusions supported by evidence) OR: H.2E.4 (evaluate the impact of human activities on environmental quality) SS.HS.GE.06.01 (evaluate the consequences of economic, cultural, and environmental changes on a given population) ID: 9-10.B.1.6.2 (utilize the components of scientific problem solving to design an investigation) 9-12.G.5.1.2 (discuss the mutual impacts of ideas, issues, and policies among nations)	
Focus Questions:	How do we know the quantity of fish in our oceans? How does one measure that? What are some safe guards that can ensure that fishermen don't overfish on the first day? How can we make a difference for halibut, our oceans, or our community?	
Learning Objectives:	At the end of this lesson students will be able to: • Construct understanding of fishery dependent and independent research • Explain how policy or rules are needed to ensure viable, reproductive and sustainable populations • Understand the importance of civic involvement and how citizens can influence government actions • Share how derelict fishing gear and marine debris impact our oceans	
Engage and Encounter	A NOAA scientist or manager will introduce themselves and explain their role in Groundfish Fisheries	
Explore and Investigate	Allocations Activity: Determining who gets how much fish. Reinforce how ecosystem management relies on the expertise from the science, and the fishery (biota, habitat, and stakeholders/community)	
Reflect and Explain	Students will role play what to do once they know the stock assessment number for a certain year. They will evaluate the 2 years prior to determine allocations.	
Apply and Extend	Regime shifts article Learn more about marine debris Have students look on the back of the worksheet and post the deadlines for some of the summer job opportunities, internships, and scholarships	
Background for teacher	The oceans and humans are inextricably interconnected; humans affect the ocean in a variety of ways. Laws, regulations, and resource management affect what is taken out and put into the ocean. This lesson is intended to empower the community to participate in the decision making process and having a voice is vital to the success of conservation and recovery of endangered and threatened species. We believe that people of any age and in any geographic region can make a positive impact on the marine environment. We hope to strengthen the link between scientific knowledge, resource management and being active stewards in their environment.	
Contact NOAA	For a NOAA guest speaker in lesson 5 email: **nwr.education@noaa.gov**	

Lesson 5 Procedures:

NOAA Guest Speaker: Science, Management, and Stewardship

I. Anticipatory Set (5 minutes)
   A. Have the NOAA representative introduce themselves and share what role they play in the sustainable groundfish fishery.
   B. Ask the students: How do we know how many fish are in the ocean? How does one study a population of fish? Think back to your first lesson when you were first studying about all the different types of groundfish, how do scientists know the range and life history of these animals?

II. NOAA Representative: (45 minutes)
   A. Allocations Activity:
   B. Answer any questions they might have come across in this unit
   C. If there is any time left, show them the "Sustainability: It's in our hands" Poster
      1. Discuss regime shifts and a changing world
      2. What you can do to make a difference and Opportunities for them

III. Assessment:
   A. Worksheet provided

IV. Apply/Extend:
   A. Great document that you could have students dissect and discuss regime shifts, climate change, or other topics such as competition, like the flatfish invasion? http://www.iphc.washington.edu/Staff/hare/html/decadal/halibut/foprop.html
   B. Have students apply their knowledge of marine debris to their service learning requirements, if apply.
   C. Have students look on the back of the worksheet and post the deadlines for some of the summer job opportunities, internships, and scholarships

Stewardship: You can make a difference!
Ocean Literacy Principle: The oceans and humans are inextricably interconnected

1. Learn more about marine debris: derelict fishing gear -plastics (larval stages/invasive species) file:///D:/oceanservice.noaa.gov/education/yos/resource/101mdfacts.pdf

2. Be a responsible consumer; know sustainable fish to buy either at a restaurant or grocery store. Check out NOAA's Fishwatch or Seafood watch http://www.nmfs.noaa.gov/fishwatch/

3. If you were to make a top 10 list of actions you could do at home, school, or in your community what would it be?

Opportunities

NOAA Science Camp: needs instructors/counselors in the summer contact http://www.wsg.washington.edu/education/events/noaa.html

ORCA Bowl
http://www.wsg.washington.edu/education/events/orca.html

NOAA Earth Week Fair at the NWFSC

Ocean Career Day at the Seattle Aquarium

OPM Summer Student Employment
http://www.opm.gov/employ/students/intro.aspThe Student Educational Employment Program provides Federal employment opportunities to students who are enrolled or accepted for enrollment as degree seeking students taking at least a half-time academic, technical, or vocational course load in an accredited high school, technical, vocational, 2 or 4 year college or university, graduate or professional school.

Internships/Scholarships

NOAA interns for Sophmores, Jr. and Sr. American Fisheries Society Hutton Intern Program ($3,000 scholarship)
http://www.fisheries.org/beta/hutton.html

Science.gov
http://www.science.gov/internships/index.html This section is intended for use by students, teachers, and professors who are looking for internships or fellowships in science, technology, engineering, or mathematics (STEM). The lists have been compiled by members of FICE, the Federal Interagency Committee on Education.

ENTRY POINT!
http://ehrweb.aaas.org/entrypoint/ ENTRY POINT! is a program of the American Association for the Advancement of Science (AAAS) offering Outstanding Internship Opportunities for Students with Disabilities in Science, Engineering, Mathematics, Computer Science, and some fields of Business.
NOAA observer program

Pacific Fisheries Management Council: Testimony Template

Teacher Key/Guide

Time limit:	5 minutes or 10 minutes for group representatives
Greeting:	This is the greeting traditionally used to address the Council. If the Chair is female, use "Madam Chairwoman" or "Madam Chairperson." Or Mr. Chairman and members of the Council,
Name or organization:	My name is Mary Thomas. I represent the Bay Area Giant Squid Supporters (BAGSS), a nonprofit organization with 8,000 members.
State your Concern	Refer to the fishery management plan or rule that you are commenting on. We would like to express our concern that giant squid are not being considered in the Council's proposed Sea Creature Fishery Management Plan.
Desired outcome	State your desire clearly. Make sure that you are asking for something that falls within the Council's mandate. We urge the Council to include consideration of giant squid in the SCFMP.
Background on your expertise and background	My father spent his life fishing for giant squid, and from an early age I was impressed by these animals. As a founder of BAGSS, I have made the study of giant squid my life's work. In 2007 I conducted a comprehensive assessment of giant squid in northern California for the National Giant Squid Association. Don't be afraid to show a little passion and poetry, but don't go overboard, either. Control any anger you might feel.
Connect the issue to other important issues facing the Council.	The assessment clearly showed that these mysterious and beautiful creatures play an important role in California's coastal ecosystem, particularly in regard to their symbiotic relationship with yellowtail rockfish.
If you sent them supplemental information 2wks prior. Then include:	Agenda Item B.7 in your briefing book gives a brief summary of the assessment.
Provide a short history of your involvement with this issue.	In May 2008, I sent a letter to the National Marine Fisheries Service on behalf of BAGSS expressing our concern that NMFS was ignoring giant squid.
Demonstrate knowledge of other factors that are influencing the issue.	The letter echoed many of the concerns presented in the lawsuit filed by the Squid Supporters of Hawaii (SQUISH). The decision in the SQUISH lawsuit is scheduled for November 2009 and is likely to bring giant squid to the foreground of fisheries management issues.
Connect your concern to the National Standards of the Magnuson-Stevens Act.	National Standard 2 of the Magnuson-Stevens Act states that "(2) Conservation and management measures shall be based upon the best scientific information available." We at BAGSS strongly believe that the 2007 assessment of giant squid represents the best scientific information available on these animals, and should be considered in the SCFMP.
Re-state your argument at the end—with more detail, if desired. Suggest a constructive step for the Council to take. Volunteer your services, if possible and relevant.	In closing, BAGSS would like to respectfully recommend that the Council immediately create a committee to consider including giant squid in the FMP. I would be happy to serve upon such a committee and make my knowledge of giant squid available to the Council.
Close respectfully.	Thank you for the opportunity to comment.

If you want to provide supplemental information and if it is relevant, send it two weeks or more before the Council meeting, so it can be included in the briefing book..However, remember to keep it brief.

Pacific Fisheries Management Council: Testimony Template
Your turn

Time limit:

Greeting:	
Name or organization:	
State your Concern	
Desired outcome	
Background on your expertise and background	
Connect the issue to other important issues facing the Council.	
If you sent them supplemental information 2wks prior. Then include:	
Provide a short history of your involvement with this issue.	
Demonstrate knowledge of other factors that are influencing the issue.	
Connect your concern to the National Standards of the Magnuson-Stevens Act.	
Re-state your argument at the end—with more detail, if desired. Suggest a constructive step for the Council to take. Volunteer your services, if possible and relevant.	
Close respectfully.	

If you want to provide supplemental information and if it is relevant, send it two weeks or more before the Council meeting, so it can be included in the briefing book..However, remember to keep it brief.

2008 Oregon data from: http://www.oar.noaa.gov/k12/

AFS Species name	Pounds	Dollars	Price_Pound
Anchovy, Northern	571,029	56,674	0.10
Cabezon	54,494	189,109	3.47
Cod, Pacific	14,368	7,725	0.54
Flounder, Arrowtooth	4,698,925	474,266	0.10
Flounder, Pacific, Sanddab	138,137	58,568	0.42
Flounder, Starry	6,258	2,414	0.39
Greenling, Kelp	48,193	236,578	4.91
Hake, Pacific (Whiting)	55,510,987	6,829,815	0.12
Halibut, Pacific	242,364	905,115	3.73
Lingcod	269,675	338,795	1.26
Rockfish, Black	219,584	383,992	1.75
Rockfish, Blue	3,710	4,234	1.14
Rockfish, Canary	4,746	2,384	0.50
Rockfish, Darkblotched	162,036	77,380	0.48
Rockfish, Widow	77,115	34,531	0.45
Rockfish, Yelloweye	2,119	1,962	0.93
Rockfish, Yellowtail	29,934	18,319	0.61
Rockfishes	1,244,964	615,282	0.49
Sablefish	6,514,367	13,737,024	2.11
Salmon, Chinook	1,280,290	3,460,385	2.70
Salmon, Chum	177	138	0.78
Salmon, Coho	558,941	729,697	1.31
Shark, Spiny dogfish	89,646	33,056	0.37
Skates	2,198,094	615,500	0.28
Sole, Dover	15,491,205	5,876,103	0.38
Sole, English	325,773	102,720	0.32
Sole, Petrale	2,449,707	2,371,109	0.97
Sole, Rex	692,314	247,105	0.36
Sole, Rock	458	161	0.35
Sole, Sand	35,990	28,313	0.79
Sturgeon, White	183,256	390,252	2.13

2008 Oregon data: Queried for Pounds largest to smallest

AFS Species name	Pounds	Dollars
Hake, Pacific (Whiting)	55,510,987	6,829,815
Sole, Dover	15,491,205	5,876,103
Crab, Dungeness	13,872,405	29,163,671
Sablefish	6,514,367	13,737,024
Flounder, Arrowtooth	4,698,925	474,266
Sole, Petrale	2,449,707	2,371,109
Skates	2,198,094	615,500
Thornyhead, Shortspine	1,909,562	1,286,973
Salmon, Chinook	1,280,290	3,460,385
Rockfishes	1,244,964	615,282
Sole, Rex	692,314	247,105
Anchovy, Northern	571,029	56,674
Salmon, Coho	558,941	729,697
Sole, English	325,773	102,720
Squids	303,454	21,548
Lingcod	269,675	338,795
Halibut, Pacific	242,364	905,115
Rockfish, Black	219,584	383,992
Sturgeon, White	183,256	390,252
Rockfish, Darkblotched	162,036	77,380
Flounder, Pacific, Sanddab	138,137	58,568
Shark, Spiny dogfish	89,646	33,056
Rockfish, Widow	77,115	34,531
Cabezon	54,494	189,109
Greenling, Kelp	48,193	236,578
Sole, Sand	35,990	28,313
Rockfish, Yellowtail	29,934	18,319
Cod, Pacific	14,368	7,725
Clams, Pacific Razor	7,900	42,536
Clams, Butter	7,467	8,589
Flounder, Starry	6,258	2,414

Thornyhead, Shortspine	1,909,562	1,286,973	0.67
Clams, Butter	7,467	8,589	1.15
Clams, Pacific Razor	7,900	42,536	5.38
Clam, Pacific, Gaper	1,327	2,636	1.99
Crab, Dungeness	13,872,405	29,163,671	2.10
Octopus	3,039	4,021	1.32
Squids	303,454	21,548	0.07

Rockfish, Canary	4,746	2,384
Rockfish, Blue	3,710	4,234
Octopus	3,039	4,021
Rockfish, Yelloweye	2,119	1,962
Clam, Pacific, Gaper	1,327	2,636
Sole, Rock	458	161
Salmon, Chum	177	138

Price_Pound
0.12
0.38
2.10
2.11
0.10
0.97
0.28
0.67
2.70
0.49
0.36
0.10
1.31
0.32
0.07
1.26
3.73
1.75
2.13
0.48
0.42
0.37
0.45
3.47
4.91
0.79
0.61
0.54
5.38
1.15
0.39

2008 Oregon data: Queried for Dollars largest to smallest

AFS Species name	Pounds	Dollars	Price_Pound
Crab, Dungeness	13,872,405	29,163,671	2.10
Sablefish	6,514,367	13,737,024	2.11
Hake, Pacific (Whiting)	55,510,987	6,829,815	0.12
Sole, Dover	15,491,205	5,876,103	0.38
Salmon, Chinook	1,280,290	3,460,385	2.70
Sole, Petrale	2,449,707	2,371,109	0.97
Thornyhead, Shortspine	1,909,562	1,286,973	0.67
Halibut, Pacific	242,364	905,115	3.73
Salmon, Coho	558,941	729,697	1.31
Skates	2,198,094	615,500	0.28
Rockfishes	1,244,964	615,282	0.49
Flounder, Arrowtooth	4,698,925	474,266	0.10
Sturgeon, White	183,256	390,252	2.13
Rockfish, Black	219,584	383,992	1.75
Lingcod	269,675	338,795	1.26
Sole, Rex	692,314	247,105	0.36
Greenling, Kelp	48,193	236,578	4.91
Cabezon	54,494	189,109	3.47
Sole, English	325,773	102,720	0.32
Rockfish, Darkblotched	162,036	77,380	0.48
Flounder, Pacific, Sanddab	138,137	58,568	0.42
Anchovy, Northern	571,029	56,674	0.10
Clams, Pacific Razor	7,900	42,536	5.38
Rockfish, Widow	77,115	34,531	0.45
Shark, Spiny dogfish	89,646	33,056	0.37
Sole, Sand	35,990	28,313	0.79
Squids	303,454	21,548	0.07
Rockfish, Yellowtail	29,934	18,319	0.61
Clams, Butter	7,467	8,589	1.15
Cod, Pacific	14,368	7,725	0.54
Rockfish, Blue	3,710	4,234	1.14

0.50	Octopus	3,039	4,021	1.32
1.14	Clam, Pacific, Gaper	1,327	2,636	1.99
1.32	Flounder, Starry	6,258	2,414	0.39
0.93	Rockfish, Canary	4,746	2,384	0.50
1.99	Rockfish, Yelloweye	2,119	1,962	0.93
0.35	Sole, Rock	458	161	0.35
0.78	Salmon, Chum	177	138	0.78