

Balancing Act

Student Instructions

You are going to play a game that illustrates the way that people, fish populations, and laws interact and influence each other. In the game, you will represent some of the people—lawmaker, scientist, anglers, and commercial fishermen—who influence and are affected by fisheries regulations.

1. Preparing for the game

You will each get a Role card. Your Role card includes a record sheet for you to fill out during the game. Read your role description carefully and ask your teacher any questions you have. Explain your role to the other members of your group and listen as they explain their roles to you. Each group will have one lawmaker, one fisheries scientist, at least three commercial fishermen, and at least one angler.

2. Setting up the game

Collect the rest of the game's materials and distribute them among your group. Give the graduated cylinder to the fisheries scientist. Give each harvester (commercial and angler) a set of measuring spoons. Label one of your containers "Lake Michigan" and have the fisheries scientist put 400 ml of dried beans in this bowl. Cover your lake with a piece of cloth or paper so that the exact level of "beanfish" cannot be seen. Label the other container "Extra" and put the rest of your beans in this bowl.

3. Playing the game

Round 1

- Commercial fishermen may take up to three tablespoons of beanfish from the bay. Anglers may take up to two tablespoons. Each person should put his or her individual harvest in a small cup for counting later.
- After everyone has finished harvesting, fill in the data chart on your record sheet. Check your role card to find out what this involves.
- Once the beanfish have been counted, commercial fishermen and anglers pour their harvests back into the "Extra" bowl.

- Using the graduated cylinder, the fisheries scientist measures the remaining population in the lake and calculates how much the fish reproduce. For every one ml of beanfish remaining, the scientist transfers one ml of beans from the "Extra" bowl to the lake. The fisheries scientist fills out his or her record sheet.
- The fisheries scientist, commercial fishermen, and anglers give recommendations to the lawmaker. Check your role cards for ideas.
- The lawmaker decides which regulations (if any) harvesters must follow during the next round.
- The lawmaker draws a Fishery Factor card and reads it to the group.

Round 2

- Your group will repeat the procedure from Round 1 following the new instructions from the Fishery Factor card and any new regulations (if there are any) from the lawmaker.
- The worth of the beanfish may change as the game goes on. If your class is including the impact of supply and demand in your game, the cost of beanfish will vary depending on how many are caught. If the total commercial catch is less than 150 fish, the cost per fish rises to \$110 due to scarcity. However, if the commercial catch is more than 210 fish, the cost per fish falls to \$90.

Every Round

- The commercial fishermen must make \$6,000 each round to make a living. If a commercial fisherman makes under this amount for a total of three rounds, he or she is out of business and becomes an angler. Surplus from good rounds can carry a commercial fisherman through times of shortage. This means that if a commercial fisherman makes \$6,500 in one round, \$500 can be used to make up for a bad catch in another round.
- Each angler in your group represents 25 people. For every one of those 25 people to catch a fish, the angler needs to catch 25 beanfish each round.

The most important thing to remember about this game is that you get to make most of the rules! You will need to come up with imaginative solutions as you encounter the challenges of fisheries management.

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Roles

Lawmaker

Your role

Your job is to make laws that determine how many beanfish commercial fishermen and anglers can take out of the lake each year. Your goal is to listen to everyone's point of view about how the fishery is doing and then make regulations that are fair and sensible. It is a tough job, but someone has to do it! Ultimately, you are striving to keep the fishing industry healthy throughout the entire game.

At the end of each round, you will get a recommendation from each interest group (fisheries scientists, commercial fishermen, and anglers). Although they may each recommend completely different actions, you need to use these recommendations to decide which regulations to make.

What does the lawmaker do?

As the lawmaker, you can regulate fishing in a number of ways. You can make everyone take fewer beanfish or allow everyone to take more. You can change the size of the equipment that commercial fishermen and anglers are allowed to use (they all have a set of spoon sizes you can choose from). You can also set different limits for the commercial fishermen than for the anglers. As a last resort, you can set a moratorium for

one round or more. A moratorium is a ban on all harvest of the species which allows the species to reproduce. You are also responsible for enforcing the regulations you set, when necessary.

Remember

As a lawmaker, your regulatory actions affect everyone who fishes. Commercial fishermen make a living by catching and selling beanfish. They cannot live on less than \$6,000 per round. They will go out of business permanently if they make less than this for a total of three rounds. This means that severe restrictions, or a moratorium, might put them out of business. On the other hand, commercial fishermen depend on catching beanfish, so overfishing might put them out of business in future rounds. Your goal is to find laws that will balance present and future needs.

Here are two examples of regulations that you could set:

- If the beanfish stock seems to be in wonderful shape, you can increase the amount that everyone can catch or allow for an unlimited catch, where everyone can take as much as he or she wants.
- If you are afraid that the beanfish stock is becoming too low, you can forbid the use of tablespoons to scoop up the beanfish. This means that commercial fishermen and anglers will have to use smaller spoons, which do not catch as many beanfish.

Lawmaker's Records

ROUND #	SCIENTIST'S SUGGESTIONS	COMMERCIAL FISHERMEN'S SUGGESTIONS	ANGLERS' SUGGESTIONS	FINAL DECISION FOR THE ROUND
ROUND 1				
ROUND 2				
ROUND 3				
ROUND 4				
ROUND 5				
ROUND 6				
ROUND 7				
ROUND 8				
ROUND 9				
ROUND 10				



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Roles

Fisheries Scientist

Your role

You are the person who studies and monitors Lake Michigan's fish populations. You provide hard facts to the lawmaker about how the beanfish population is doing. You investigate changes in the ecosystem like the arrival of invasive species or diseases, and you advise lawmakers on how to respond to these changes. In this game, you are also the person who measures the fish left after each round and calculates how many get put back into the pool through natural reproduction. This means that you are the only person who really knows how the beanfish are doing. Your goal in the game is to make sure enough beanfish are always left in the pool to replenish the stock after each round. In other words, you want to make sure there will be future bean fishing in the lake.

What does the Fisheries Scientist do?

To provide sound data to the lawmaker, you need to keep track of the number of beanfish in the lake before and after harvesting and beanfish reproduction. You will start the game by placing 200 ml of beanfish in the lake. After each round of harvesting, you will measure the number of fish left and calculate how successfully

the beanfish will reproduce that year. To do this, you will add one ml of beans to the lake for every one ml of beans left in the lake. For example, if 95 ml of beanfish are left in the lake at the end of Round 2, you will add 95 ml more beanfish before the next round begins. This will bring the total amount of beanfish in the lake up to 190 ml.

Based on what you know about the beanfish population after each round, you will need to verbally recommend to the lawmaker what you think should be done to maintain a healthy beanfish population.

Remember

Since you are the only member of your group who actually measures the beanfish population, you will need to explain to the others how the beanfish are doing. Most importantly, you will need to convince the lawmaker to make regulations that will keep the population healthy and not bring it down to low levels.

- If you can see that current regulations are allowing the beanfish population to become seriously low, you can recommend that the lawmaker limit commercial fishermen to one scoop each per round or that anglers use a smaller harvesting tool.
- If you think that the beanfish are doing well, you can recommend that the lawmaker allow them to harvest more beanfish.

Fisheries Scientist's Records

ROUND #	FISH IN LAKE AFTER HARVEST (IN ML)	FISH ADDED THROUGH REPRODUCTION (1 ML FOR EACH REMAINING ML)	TOTAL AFTER REPRODUCTION ADDED (IN ML)	FRACTION GAINED OR LOST FROM PREVIOUS ROUND
ROUND 1				
ROUND 2				
ROUND 3				
ROUND 4				
ROUND 5				
ROUND 6				
ROUND 7				
ROUND 8				
ROUND 9				
ROUND 10				

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Roles

Commercial Fisherman

Your role

You make your living by catching beanfish from the lake and selling them commercially. Your goal is to stay in business for the entire game while obeying laws and regulations set by the lawmaker.

What does a Commercial Fisherman do?

To stay in business, you need to catch enough beanfish to make \$6,000 each round (just to cover your expenses). For the first round, each bean is worth \$100, meaning that you have to catch 60 beans in the first round. The worth of each bean may change throughout the game.

If you make more than \$6,000 in any round, you may save your surplus in your savings account for tighter times. If you make less than this amount in any round, you must make up the difference with surplus from another time or count the round as a strike against you.

If you have a total of three strikes against you during the game, you go out of business and become an angler.

At the end of each round, you will need to tell the lawmaker how your business is doing and what you think should be done to keep you in business. Should you be allowed to use bigger and better gear or take more scoops? Should you or the anglers be taking less? Are you making enough money to make a living? Do you want to save money in case times get tight? To help make these recommendations, you need to keep track of your harvests using the chart on the back of this page.

Remember

- If there are no fish, you will have nothing to catch and no way to remain in business. On the other hand, if regulations are too strict, you may go out of business anyway. You may want to make recommendations with other commercial fishermen or anglers, or you may wish to be secretive about your business. It's your choice.

Commercial Fisherman's Records

ROUND #	AMOUNT HARVESTED (NUMBER OF FISH)	PRICE PER FISH THIS ROUND	TOTAL AMOUNT EARNED	AMOUNT EARNED ABOVE (+) OR BELOW (-) \$6,000	SAVNGS ACCOUNT (TOTAL SURPLUS)
ROUND 1					
ROUND 2					
ROUND 3					
ROUND 4					
ROUND 5					
ROUND 6					
ROUND 7					
ROUND 8					
ROUND 9					
ROUND 10					



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Roles

Angler

Your role

You do not make your living fishing, but it is still very important to you. You fish for fun, because you like to eat beanfish, and/or because you like to make a little extra money as a fishing guide. Even though each angler only catches a small number of beanfish, there are so many anglers that your harvest can make a significant impact on the beanfish population. For this reason, you must follow whatever laws are set by the lawmaker, just as commercial fishermen do.

What do the Anglers do?

Because there are actually many more anglers than commercial fishermen, you will represent 25 people.

This means that if you take a scoop of beans that has 25 beanfish in it, each person has caught one bean. However, if you catch only 10 beans, then only 10 people out of 25—or two fifths (40%)—of the people have caught a fish. When your harvests get below one fish per person, you should be worried. Anglers expect that when they buy a fishing license, there will actually be fish to catch!

At the end of each round, you will try to influence the lawmaker by verbally recommending how well the fishing is going and what you think should be done. Should anglers be allowed to catch more each round or use bigger and better fishing gear? Or are you worried that too much is being taken? If too much is being taken, should your catch, the commercial fishermen's or both of your catches be reduced? Keep track of the number of fish that you are catching with the chart on the back of this page.

Angler's Records

ROUND #	NUMBER OF BEANFISH CAUGHT, TOTAL	PERCENTAGE OF THE 25 PEOPLE YOU REPRESENT CATCHING 1 FISH (UP TO 100%)	PERCENTAGE OF THE 25 PEOPLE YOU REPRESENT WHO CAUGHT MORE THAN 1 FISH (UP TO 100%)	HOW CONTENT ARE YOUR 25 PEOPLE WITH THEIR CATCH?
ROUND 1				
ROUND 2				
ROUND 3				
ROUND 4				
ROUND 5				
ROUND 6				
ROUND 7				
ROUND 8				
ROUND 9				
ROUND 10				



Fishery Factor



Fishery Factor



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Fishery Factor



If commercial fishermen caught less than a combined total of 150 beanfish this round, not enough of the fish are making it to market to meet the demand for beanfish. Consumers are willing to pay more for this scarce fish and will now pay \$110 per fish. If commercial fishermen caught more than a total of 150 beanfish this round, there is a surplus of fish at the markets. Market owners are cutting their prices to get people to buy at their stores. Beanfish are selling for \$90 per fish. This card applies to every round.

I. Taking Stock

A series of torrential downpours and the floods that follow wash tons of sediment into the lake, smothering delicate beanfish eggs and killing submerged aquatic vegetation, the preferred food for beanfish. Reduce the beanfish population in the lake by 25%.

I. Taking Stock

The Wisconsin Legislature has called for a public vote (referendum) on whether or not to reduce the amount of beanfish anglers are allowed to catch by reducing their scoop size. Use a show of hands to determine whether or not anglers should use one size smaller scoop. Everyone may vote.

I. Taking Stock

Anglers have just been shown how to perform catch and release, a technique where fish are caught for recreation and then returned to the water unharmed. Anglers: start a new column for the number of fish, if any, you decide to release. Fish released may be put back into the lake before the fisheries scientist calculates reproduction.

I. Taking Stock

Each commercial fisherman has the option of buying bigger, more efficient equipment for \$2000 that can be used until laws prohibit the use of such equipment. If you choose to make the purchase, subtract \$2000 from your earnings this round or use any surplus you might have. In coming rounds, use one spoon size bigger than you used in the last round.

I. Taking Stock

The removal of a dam opens up prime beanfish spawning grounds and they reproduce in great numbers. Add 40 ml of beanfish to the lake. The dam also opens up new area for anglers who are now allowed an additional scoop each round unless regulations change.

I. Taking Stock

Everyone must move one seat to the left and take over the job and the data chart of the person whose seat he or she now occupies.

I. Taking Stock

Students create a forest and wetland between a large mall and a local waterway. This vegetation helps to reduce the amount of sediment, oil, and nutrient runoff washing from the mall into the waterway. As a result, fewer beanfish die population-related deaths, leaving more to reproduce. Increase your population by 10 ml.

I. Taking Stock

Wisconsin students have begun a project raising beanfish in the classroom. This week they released their fish into the lake in an effort to help restore the population. As a result of their project, the beanfish population in the lake grows by 20 ml.

I. Taking Stock

Suddenly, Canada starts shipping beanfish (which are just as good as yours) to your area. They are also cheaper than yours! This drives the market value of your beanfish down \$20 per fish for one round.

I. Taking Stock

A disease from the ocean is introduced to the lake through ballast water released from a large ship docked in Milwaukee. The disease is devastating to the beanfish population. Reduce your current beanfish population by one third.

I. Taking Stock

No changes this round.

I. Taking Stock