Chapter 3. Sample Lessons

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3.1 - Introduction

Sample Lessons

This chapter contains a few sample lessons, or tutorials, to learn more about the model behavior. Each sample lesson includes four sections: **Motivating Question**, **Analysis Approach**, **How To Do It**, and **Discussion Questions**. More lessons will be posted on the Columbia Basin Research web site:

http://www.cqs.washington.edu/crisp/model.html.

3.2 - Who Catches Who?

Motivating Question

Salmon are known for extensive migrations. What stocks are harvested by each fishery?

Analysis Approach

Use the Map Icons to determine which stocks are harvested by each fishery.

How To Do It

1. Launch and run the model.
2. Make sure the Fishery Circles and Stock Circles buttons on the tool bar are activated.
3. Click on a Fishery Icon. This will draw circles around all stocks harvested by that fishery (the name of the fishery will be displayed in the lower left corner of the map). The relative size of the circle indicates the approximate relative harvest rates on each stock.
4. Repeat step 3 for other fisheries of interest.
5. Click on the map background to clear the circles.
6. Click on a Stock Icon. This will draw circles around all fisheries that harvest that stock (the name of the stock will be displayed in the lower left corner of the map). Again, the relative size of the circle indicates the approximate relative harvest rates in each fishery.
7. Repeat step 6 for other stocks of interest.

Discussion Questions

1. Do you see any trends in the number of stocks harvested by different fisheries?
2. Which fisheries harvest the greatest number of stocks?
3. Which fisheries harvest the fewest number of stocks?
4. What American stocks are harvested in Canadian fisheries?
5. What Canadian stocks are harvested in American fisheries?

3.3 - Status Quo Catch Analysis

Motivating Question

The default long-term management strategy is to make some catch reductions during 1995-1997 and then beyond 1998 keep catches and harvest rates at about the average 1991-1994 level. How will this strategy impact fishery catches?

Analysis Approach

Run the model under the default long-term management strategy and record the catch trends for each fishery.

How To Do It

1. Create a table with three columns for recording the data. Column one is for the fishery name, column two is for the trend (increasing, decreasing, stable), and column three is for the approximate value in year 2017.
2. Launch and run the model.
3. Click the Fishery Menu.
4. Click Fishery Graphs.
5. Click Catches.
6. Click Total.
7. Resize the resulting Total Catch Graph so it fits in the upper right portion of the screen and lets you see the map icons.
8. Click the "wand" button at the top of the graph.
9. Move the mouse pointer over a fishery icon (boat icon) to show the catch trend for that fishery (the fishery name will be at the top of the graph window).
10. Record the trend of the catch during the simulation period.
11. Move the mouse pointer onto the graph window (be careful not to move the pointer over another fishery icon or it will change the graph) and determine the approximate catch in year 2017. Record the catch in the table.
12. Repeat steps 9-11 until data for all fisheries has been recorded.

Discussion Questions

1. How many fisheries have increasing, decreasing, or stable catch trends?
2. Is there any correlation between catch trends and fishery type (troll, net, sport)?
3. Why do some catch ceiling fisheries have perfectly stable catches while other ceiling fisheries have increasing or decreasing catches?

3.4 - Status Quo Escapement Analysis

Motivating Question

The default long-term management strategy is to make some catch reductions during 1995-1997 and then beyond 1998 keep catches and harvest rates at about the average 1991-1994 level. How will this strategy impact spawning escapements? (The term "escapement" refers to the fish that "escape" all fisheries and return to the spawning grounds.)

Analysis Approach

Run the model under the default long-term management strategy and record the escapement trends for each stock.

How To Do It

1. Create a table with three columns for recording the data. Column one is for the stock name, column two is for the trend (increasing, decreasing, stable), and column three is for the approximate value in year 2017.
2. Launch and run the model.
3. Click the Stock Menu.
4. Click Stock Graphs.
5. Click Escapements.
6. Resize the resulting Total Escapement Graph so it fits in the upper right portion of the screen and lets you see the map icons.
7. Click the "wand" button at the top of the graph.
8. Move the mouse pointer over a stock icon (fish icon) to show the escapement trend for that stock (the stock name will be at the top of the graph window).
9. Record the trend of the escapement during the simulation period.
10. Move the mouse pointer onto the graph window (be careful not to move the pointer over another fishery icon or it will change the graph) and determine the approximate escapement in year 2017. Record the escapement in the table.
11. Repeat steps 9-11 until data for all stocks has been recorded.

Discussion Questions

1. How many stocks have increasing, decreasing, or stable escapement trends?
2. What factors not in the model might affect escapement trends?

3.5 - Environmental Effects --Deterministic Mode

Motivating Question

Fishery biologists know that salmon survival during the first year of life is highly variable from year to year. This is called the "brood year survival rate" and is represented in model by the EV (Environmental Variability) Scalars. What happens to the model predictions if future survival rates don't match what the scientists predict?

Analysis Approach

Select a stock of interest and run the model in deterministic mode using different values for the future EV Scalars for each run of the model. In this case we will choose the Snake River Fall Chinook stock because it is listed under the Endangered Species Act.

How To Do It

1. Launch and run the model.
2. Set the Default Stock to Lyons Ferry.
3. Click the Stock Menu.
4. Click Stock Graphs.
5. Click Escapements.
6. Record the trend and value in year 2017.
7. Close the Escapement Graph.
8. Click the Stock/EV Scalars button.
9. Click the tab with year 2000.
10. Record the EV Scalar value used during the simulation period.
11. Click the "Y Box" at the top of the EV Scalar window.
12. Set the EV Scalar for year 2000 to 3.0 (note that this changes all the simulation years to 3.0, also).
13. Click apply and OK.
14. Close the EV Scalar window.
15. Click the run button on the tool bar.
16. Repeat steps 3 through 16 using EV Scalar values of 1.0 through 6.0.

Discussion Questions:

1. What EV Scalar value for the Lyons Ferry stock gives a stable escapement trend?
2. What do you think would happen if the EV Scalar value changed every year instead of remaining constant?

3.6 - Environmental Effects -- Stochastic Mode

Motivating Question

Fishery biologists know that salmon survival during the first year of life is highly variable from year to year. This is called the "brood year survival rate" and is represented in model by the EV (Environmental Variability) Scalars. What happens to the model predictions if future survival rates don't match what the scientists predict?

Analysis Approach

Select a stock of interest and run the model in stochastic mode, allowing the EV Scalars to vary randomly from year to year during a given run of the model.

How To Do It

1. Launch and run the model.
2. Click the Run Menu.
3. Click Monte Carlo.
4. Set the number of games to 1.
5. Click Run Monte. When the run is completed, an escapement graph for the selected default fishery appears.
6. Click the Stock Menu.
7. Click Stock Graphs.
8. Click Escapements and notice that the escapement for the selected stock varies considerably from year to year.
9. Resize and move the Escapement Graph so the map icons are visible.
10. Click the Stock/EV Scalars button.
11. Click the tabs for years beyond 1995 to examine the EV Scalar values that were used during this Monte Carlo run.
12. Pick out the year with the highest EV Scalar value and notice that the resulting high escapement occurs several years later when the fish are mature.
13. Close the EV Scalar window.
14. Click the Wand button at the upper left of the Escapement Graph window.
15. Move the mouse pointer over other stock icons to produce Escapement Graphs for other stocks and observe their variable escapement.
16. Examine EV Scalars for other stocks also.

Discussion Questions

1. What fresh water environmental factors affect brood year survival rates?
2. What marine environmental factors affect brood year survival rates?
3. What types of human activities affect brood year survival rates?

3.7 - Shut down the fisheries!

Motivating Question

How quickly will weak stocks recover if all harvesting is stopped?

Analysis Approach

Use the meta-slider function to set all Harvest Rate Scalars (for each stock, fishery, year combination) to near zero (setting these scalars to zero might cause a program crash because it may create a "divide by zero" error). This will effectively eliminate all harvests.

How To Do It

1. Launch and run the model.
2. Click the Harvest Menu.
3. Click Harvest Rate Scalars.
4. Click the tab including year 2000.
5. Click the "Y Box", the "F Box", and the "S Box" at the top of the slider window.
6. For the year 2000, type in a Harvest Rate Scalar of 0.05 (do not use the sliders; they don't work properly). You may have to wait up to a minute for all the parameters to be changed.
7. Click apply and OK.
8. Click the Run button on the tool bar.
9. When the run is complete, set the Default Stock to Lyons Ferry (or another stock that had a declining escapement trend under the default management strategy).
10. Click the Stocks Menu.
11. Click Stock Graphs.
12. Click Escapements and observe the escapement trend.
13. Resize and move the Escapement Graph so the map icons are visible.
14. Click the Wand button at the upper left portion of the graph window.
15. Move the mouse pointer over other stock icons to observe escapement trends for other stocks.

Discussion Questions

1. How many stocks reach an equilibrium condition (i.e., a constant escapement trend) by year 2017?
2. Are there any stocks that do not increase when all fishing is eliminated?
3. How many years of a "no fishing" strategy would be needed to bring all stocks up to an acceptable escapement level?
4. How much lost revenue would the fishing fleets suffer under a "no fishing" strategy?

3.8 - Improve upstream survival around dams.

Motivating Question

Returning adult salmon on the Columbia River must pass over several large hydroelectric dams on their way to the spawning grounds. Even though all dams have fish ladders to help salmon over the dams, some mortalities still occur. How much does improving upstream survival of adults increase spawning escapements?

Analysis Approach

Prespawning mortalities are simulated in CRiSP Harvest by the IDL (inter-dam loss) parameters. The analysis approach is to record escapements for the Lyons Ferry stock under the default management strategy, change the future Lyons Ferry IDL parameters to simulate improved survival, re-run the model, and record the new escapement trend.

How To Do It

1. Launch and run the model.
2. Set the Default Stock to Lyons Ferry.
3. Click the Stocks Menu.
4. Click Stocks Graph.
5. Click Escapements.
6. Record the trend and value in year 2017 (or print the graph).
7. Close the Escapement Graph.
8. Click the Stock/Inter Dam Loss button.
9. Select the tab with year 2000.
10. Click the "Y Box" at the top of the window.
11. Set the IDL value for year 2000 to .900. This will increase the prespawning survival rate for the Lyons Ferry stock to 90% for all simulation years.
12. Click apply and OK.
13. Click the Run button on the tool bar.
14. Repeat steps 3 through 6 to observe the new escapements.

Discussion Questions

1. Do you think it is more effective to improve survival near the end of a fishes life (e.g., prespawning survival rates) or at the beginning (e.g., brood year survival rates)?

3.9 - Reducing ocean troll fisheries.

Motivating Question

Ocean fisheries are generally the least selective fisheries. That is, they tend to harvest the greatest number of stocks. How much will reducing ocean troll fisheries improve escapements of weak stocks?

Analysis Approach

We will drastically reduce the Alaska and West Coast of Vancouver Island troll fisheries and observe the effect on the Lyons Ferry stock and the Columbia River Net fishery.

How To Do It

1. Launch and run the model.
2. Set the Default Stock to Lyons Ferry.
3. Click the Stocks Menu.
4. Click Stocks Graph.
5. Click Escapements.
6. Record the Lyons Ferry Escapement in year 1998.
7. Close the Escapement Graph.
8. Repeat steps 2 through 7 to record the Upriver Brights escapement in year 1998.
9. Set the Default Fishery to Alaska Troll.
10. Click the Fishery Menu.
11. Click Fishery Graphs/Catches/Total.
12. Record the Alaska Troll catch for year 1998.
13. Close the catch graphs.
14. Repeat steps 9 through 13 to record the catches for the WCVI Troll and Columbia River Net fisheries in 1998.
15. Click Fishery/Catch Ceilings.
16. Select the Alaska Troll fishery.
17. Click the tab that contains year 1998.
18. Set the 1998 Alaska Troll Catch Ceiling to 50,000 and click apply.
19. Repeat steps 16 through 18 to set the 1998 WCVI Catch Ceiling at 50,000.
20. Click run the model.
21. Repeat steps 2 through 14 to record the 1998 escapements for the Lyons Ferry stock and the 1998 catches in the Alaska Troll, WCVI Troll, and the Columbia River Net fisheries.

Discussion Questions

1. How much did the Lyons Ferry escapement go up in 1998?
2. What happened to the Columbia River Net fishery catch in 1998? Why?