

Rough grading scale for first exam:

- A: 85-100
- B: 72-84
- C: 55-71
- D: 40-54
- F: below 40
- average score on first exam: 67

- Next week's discussion sections (Oct 28 - Nov 2) will review Problem Set 3:
 - Chapter 10, pages 290-291: problems 1 and 2
 - Chapter 11, pages 320-322: problems 3, 4, 8, and 9

Chapter 11: Externalities and Property Rights

- A. External costs
- B. External benefits
- C. Negotiation and the Coase Theorem
- D. Using taxes to internalize negative externalities
- E. Using subsidies to internalize positive externalities
- F. Regulation versus market-based solutions

First application: Dealing with sulfur dioxide air pollution

- Clean Air Act Amendments of 1990 issued permits to emit SO₂
- Companies were allowed to buy additional permits if needed or sell extra
- Goal was to achieve target reduction in air pollution at lowest cost

Results:

- pollution reduced well below goal
- Cost was 30% lower than original EPA plan

Second application: strategies for dealing with global warming



Some potential consequences of global warming:

- spread of tropical diseases
- big changes in agricultural productivity
- sea level rise (hundreds of years?)

Optimal economic solution: impose a tax on carbon emissions equal to marginal external cost

- About 75% of published studies assign a marginal external cost of \$5-\$25/ton (assuming a 3% discount rate)
- But some studies estimate a marginal external cost of hundreds or even thousands of dollars per ton

Alternative strategy: cap and trade

- Policy chooses level of carbon emissions we want to achieve
- Emitters can buy or sell permits (as in SO₂ system)

- Advocates of cap and trade argue that tax may not discourage emission sufficiently
- However, if the tax correctly reflects marginal external cost, we don't want to discourage emissions beyond that
- Cap and trade easier politics: government can allocate permits to favored interests

Chapter 11: Externalities and Property Rights

G. The tragedy of the commons

Question: what difference does it make whether a resource is privately owned or publicly shared?

1. Outcome when pasture is privately owned

Suppose I borrow money to buy a 500-pound calf for \$500

After interest and other costs, say next year I'll owe \$600

At that point, can sell 2-year-old cow for \$1/pound



Can graze these cows on a 10-acre pasture
 on a 10-acre pasture
 The more cows I put on
 this pasture, the less
 weight each one will
 gain



# of cows	weight per cow after 1 year
1	1000 lbs.
2	900 lbs.
3	800 lbs.
4	700 lbs.
5	600 lbs.
6	500 lbs.



# of cows	weight/cow	Total pounds			
1	1000	1000			
2	900	1800			
3	800	2400			
4	700	2800			
5	600	3000			
6	500	3000			

# of cows	weight/cow	Total pounds	ΔQ (lbs.)		
1	1000	1000	1000		
2	900	1800	800		
3	800	2400	600		
4	700	2800	400		
5	600	3000	200		
6	500	3000	0		

# of cows	weight/cow	Total pounds	ΔQ	ΔTC	
1	1000	1000	1000	600	
2	900	1800	800	600	
3	800	2400	600	600	
4	700	2800	400	600	
5	600	3000	200	600	
6	500	3000	0	600	

# of cows	weight/cow	Total pounds	ΔQ	ΔTC	MC= $\Delta TC / \Delta Q$
1	1000	1000	1000	600	60¢/lb.
2	900	1800	800	600	75¢/lb.
3	800	2400	600	600	\$1.00/lb.
4	700	2800	400	600	\$1.33/lb.
5	600	3000	200	600	\$3.00/lb.
6	500	3000	0	600	∞

Private owner would want to operate at point where MR (= \$1.00/lb) is equal to MC

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Income generated from the land is \$2400 - \$1800 = \$600

Chapter 11: Externalities and Property Rights

G. The tragedy of the commons

1. Outcome when pasture is privately owned
2. Outcome when pasture is publicly shared

Suppose now that nobody owns the land (= commons), and anybody who wants to can graze cows on it



# of cows	weight per cow after 1 year
1	1000 lbs.
2	900 lbs.
3	800 lbs.
4	700 lbs.
5	600 lbs.
6	500 lbs.

Suppose there are already 3 cows and your neighbor considers adding 1 more.

Your neighbor's private marginal cost = \$600
Your neighbor's private marginal benefit = \$700

Conclusion: if not privately owned, people will graze a lot more cows



If not privately owned, people would graze 5 cows, even though social MC = \$3.00/lb. and only sells for \$1.00/lb.

# of cows	weight/cow	Total pounds	ΔQ	ΔTC	MC = $\Delta TC / \Delta Q$
1	1000	1000	1000	600	60¢/lb.
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3	800	2400	600	600	\$1.00/lb.
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Reason: part of social MC is that other cows are less well fed, and I don't personally pay for that cost

Tragedy of commons:

If resource is not privately owned, it will be inefficiently overused.

Lack of private property rights makes poor countries even poorer

When land becomes too overgrazed to support cows, people add goats



Goats in Ethiopia

- Another example: early days of oil industry
- If my neighbor found oil on his property, I want to drill on mine before he can get it out



Spindletop, TX 1905
3 wells per acre

Nobody owns the fish in the sea



If I catch more fish with my little fishing boat ...

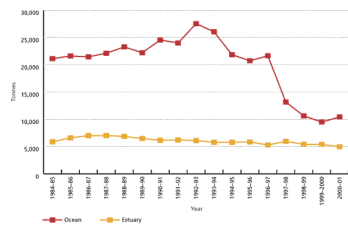
there will be fewer fish left to replenish future stocks



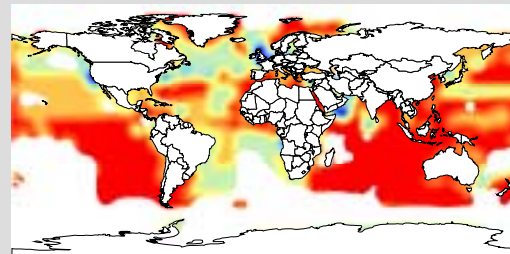
- Effect on my own future yield may be small
- But combined effect on all the other fishing boats may add up



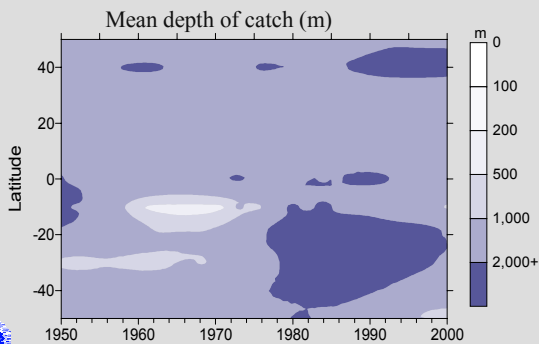
Commercial Marine Fisheries Catch



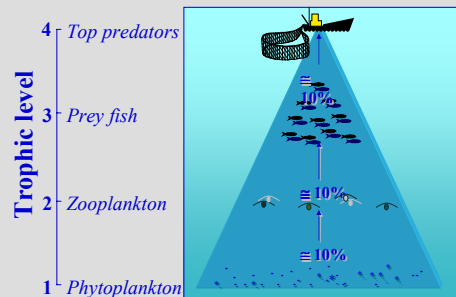
Fisheries catches would be declining faster, were it not for the expansion of fishing into deeper areas and further offshore, especially in the Southern Hemisphere...



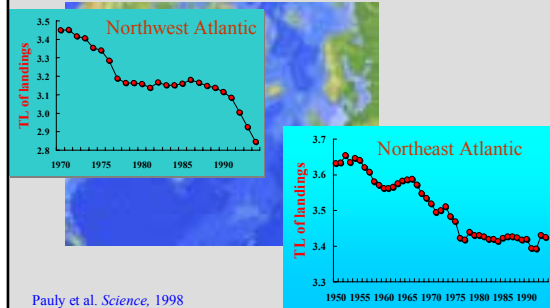
Here is an illustration of this expansion toward greater depth, especially in the Southern Hemisphere...



Now consider that ecosystem fluxes move up 'trophic pyramids' ...



Moreover, this process, wherein fisheries catches are increasingly based on organisms low in the food web, now known as 'fishing down marine food webs,' has been recently shown to be stronger and more widespread than originally estimated...



Pauly et al. *Science*, 1998

Conclusion: global overfishing is a tragedy of the commons