

Lecture 9: Valuing non-market forest outputs

FOR 4684 Natural Resource
Economics and Management



School of Forest Resources



What are “non-timber” forest products?

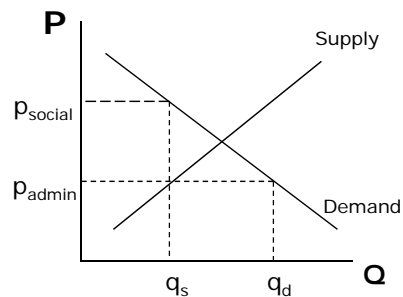
- Water
- Recreation
 - Fee-based
 - Non-fee based (dispersed, wilderness)
- Mineral resources
- Hunting / fishing
- Forage / grazing
- Forest food products (nuts, berries, mushrooms, roots)
- Aesthetics
- Biological diversity / ecosystem functions

Markets for non-timber forest outputs?

- Many have market prices
- Many have administrated markets
- For others, no market system for determining price and quantity
- Reasons for determining value of “non-timber” forest outputs:
 - Demand is high
 - Impact on market goods (timber) can be very high
 - Need to make rational decisions about quantity of these goods/services that should be supplied to society

Prices and rationing of non-market forest goods and services...

- Often, non-market forest goods have a price that is lower than what would exist in a free market.
- Let's the supply and demand curves for forest recreation on a national forest are shown to the right.
- The Forest Services sets, administratively, the price of admission to the forest at p_{admin}
 - Based on demand, q_d people want to use the forest for recreation
 - But at price p , the ability to supply facilities for recreation permits only q_s
- So, there is rationing of forest recreation because of crowding, queuing (waiting in long lines) and travel distance.
 - In effect, raising the social cost to p_{social}



Making decisions without market prices

- You can annualize the cost of delivering non-market outputs
- Useful for public projects such as campgrounds, boat ramps
- You can determine the cost per person or user of delivering the service and use that as a basis for the fee to use that good or service.

An example of determining cost for a non-market service

- The state is considering construction of a new boat ramp, which will cost \$250,000. Annual maintenance costs will be \$5000 and the boat ramp will have an expected life span of 25 years.
- The expected use will be 7000 boat launches per year.
- If the ARR for public funds is 4%, what is the cost to the state per boat launch?

$$PV_{\text{costs}} = \$250,000 + \$5000 \frac{1 - (1.04)^{-25}}{0.04} = \$328,110$$

$$EAA_{\text{costs}} = \$328,110 \frac{0.04}{1 - (1.04)^{-25}} = \$21,003$$

- Therefore, on an annual basis (7000 boat launches per year), the cost to the state is \$3 per launch.
- Decision criteria is subjective? Is \$3 per launch a reasonable fee? Will boaters pay this much? Will the \$3 fee reduce the numbers of users?

Relative values of resources

- Establish a ratio of relative value between a number of goods and services that have no markets
- If monetary value can be established for one good, than using ratios, value for all goods can be estimated.
- Wildlife trading between state agencies*.
 - Michigan will trade 2.5 ruffed grouse for 1 wild turkey
 - Kentucky will trade 2 river otter for 1 wild turkey
 - California will trade 5 pheasants for 1 wild turkey
 - Wisconsin sold Michigan 45 turkeys for \$22,500 (cost of \$500 per turkey for capture and transport)
 - What are the values of the following species based on the stated ratios?
 - Turkey: _____
 - River otter: _____
 - Pheasants: _____
 - Ruffed grouse: _____

* Urbain, John. 1992. Wild Turkey Explosion. Michigan Natural Resources. Sept./Oct. issue. Vol.61(4):4-9.

Consumer surplus

- Consumer surplus is an important measure of total value for goods and services
- It is not captured by the total revenue (price x quantity) in with a good or service.
- Let's say the following results are from a survey taken of 1000 sportsmen regarding how much they would be willing to pay for an annual hunting (only) permit (out-of-state).

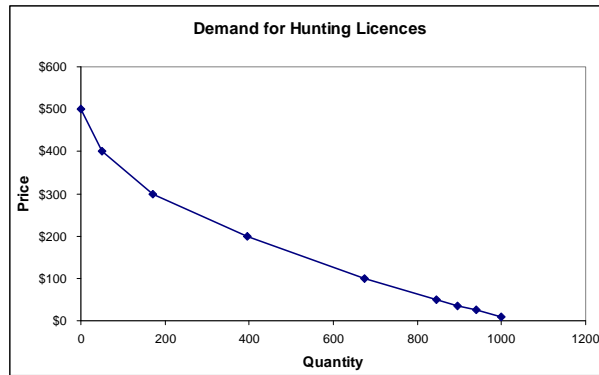
Willingness to pay results of 1000 out-of-state hunters

| Price | Number willing to pay |
|-------|-----------------------|
| \$500 | 0 |
| \$400 | 50 |
| \$300 | 120 |
| \$200 | 225 |
| \$100 | 280 |
| \$50 | 170 |
| \$35 | 50 |
| \$25 | 45 |
| \$10 | 60 |

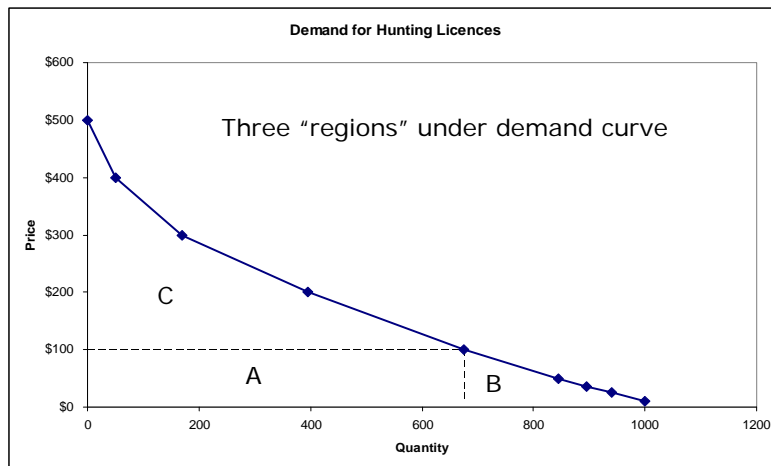
Demand curve from survey

Demand Table

| Price | Quantity |
|-------|----------|
| \$500 | 0 |
| \$400 | 50 |
| \$300 | 170 |
| \$200 | 395 |
| \$100 | 675 |
| \$50 | 845 |
| \$35 | 895 |
| \$25 | 940 |
| \$10 | 1000 |



Let's say the price is set by the Fish and Game Commission at \$100





Areas or “regions” under demand curve

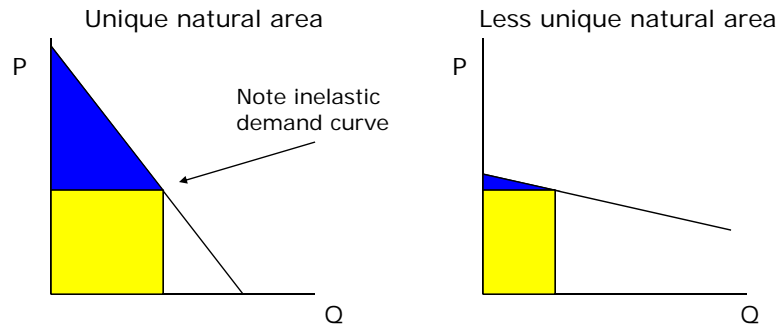
- Region “A”
 - Price x quantity – this represents the total revenue captured by the state Fish and Game commission from out of state licenses per 1000 hunters.
 - This is revenue captured and can be used to manage natural resources
- Region “B”
 - This area represents value not captured – these hunters don’t buy a license, are discouraged from hunting by the fee and this “value” is lost to society.
- Region “C”
 - This is called *consumer surplus*.
 - It is “surplus” value to those hunters who were willing to pay more than the price set for the resource.
 - While this value is not captured by the state agency, since these consumers get to participate in the activity, society does not lost this value.



Total benefit to society

- Measured by total revenue captured plus consumer surplus
- An important part of determining the social value of natural resources, especially when the price for use of those resources is very low.
- Consumer surplus varies by resource uniqueness...

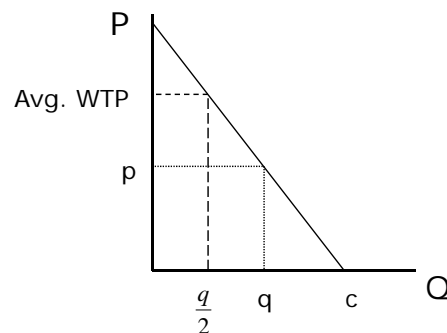
Consumer surplus under different demands



Note that the ratio of **consumer surplus** to **total revenue** ($P \times Q$) is greater for unique areas than for common areas.

Some calculations regarding willingness to pay and consumer surplus

- Using $q/2$ for quantity and the demand curve determines average willingness to pay
- Average consumer surplus:
 - Set price = \$0
 - Quantity of users = c
 - Total area under demand curve would then be consumer surplus
 - Divide total consumer surplus by c to get average consumer surplus.





Next lecture...

Water and wildlife
economics...