

## Town 1: Moose City

### Make one land decision

Problem: Since more and more people are moving into your town, the prices of homes and land have become very high. There are six vacant lots within the city that could be developed. The town could purchase the vacant land and use it for something else - homes or businesses, or small scale food operations.

- A. **Develop the 6 lots into homes/businesses.** In order to encourage development, you will spend \$3,000 to clean up the contaminated soil in the lots. You will earn \$1,000 in taxes each year from the homes and business on the lots.



| Ecosystem Services and Money Costs and Profit | Consequence                                                                                               | Who will this most affect? |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------------|
| +2 Water quality card                         | Toxins that runoff into the river will be removed                                                         |                            |
| +2 Human health card                          | Creating healthy buildings and homes for workers and residents                                            |                            |
| - 1 Air quality card                          | Even though you are developing in a "green" fashion, it still creates pollution                           |                            |
| -\$2,000                                      | The final cost of cleaning the land and hiring the environmental builder, plus the tax income for Year 1. |                            |
| <b>Residents who like this idea: 50%</b>      |                                                                                                           |                            |

Profit/cost over five years: + \$5,000

- B. **Allow small scale conventional farming on the 6 lots.** This option would provide food for the city and turn the lots into something attractive for people to look at. You will have to spend \$3,000 to clean the contaminated soil from the lots, but the farmers will pay rent on the land so you will ultimately recover your costs AND make some money (from \$500/year in taxes). In order keep costs down, many farmers are asking to be allowed to use chemicals, if necessary, to control weeds and pests.



| Ecosystem Services and Money Costs and Profit | Consequence                                                                                   | Who will this most affect? |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------|----------------------------|
| -2 Water quality card                         | Although the soil is now cleaned, new toxins will be added through fertilizers and pesticides |                            |
| -2 Biodiversity card                          | Chemicals used on the crops will affect local biodiversity                                    |                            |
| - 1 Air quality card                          | Conventional agriculture creates some air pollution through chemicals and farm equipment      |                            |
| +2 Human health card                          | People will be able to eat local, fresh food                                                  |                            |
| -\$2,500                                      | To clean the soil                                                                             |                            |
| <b>Residents who like this idea: 40%</b>      |                                                                                               |                            |

Profit/cost over five years: + \$2,500

- C. **Allow small scale organic farming on the 6 lots.** This option would provide food for the city and turn the lots into something attractive for people to look at. You will have to spend \$3,000 to clean the contaminated soil from the lots, but the farmers will pay rent on the land so you will ultimately recover your costs AND make some money (from \$500/year in taxes). Growing organic food costs more, so fewer low-income residents will be able to take advantage of the fresh, local food. Using organic practices will improve the environment of your city.

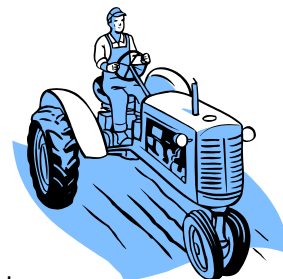


| Ecosystem Services and Money Costs and Profit | Consequence                                                                                | Who will this most affect? |
|-----------------------------------------------|--------------------------------------------------------------------------------------------|----------------------------|
| +2 Water quality card                         | The soil is cleaned and farmers will not use any chemicals                                 |                            |
| +2 Biodiversity card                          | Birds and insects will do well in the new habitat                                          |                            |
| + 1 Air quality card                          | Using organic practices and may improve air quality depending on the types of plants grown |                            |
| +4 Human health card                          | People will be able to eat local, fresh, organic food                                      |                            |
| - \$2,500                                     | To clean the soil                                                                          |                            |
| <b>Residents who like this idea: 90%</b>      |                                                                                            |                            |

Profit/cost over five years: + \$2,500

### Make one water decision

Problem: People in your city have been getting sick from their drinking water. When the water was tested, high levels of nitrates were found, probably due to the nitrogen fertilizers used on farms upstream in the town of Rabbit. When excess fertilizer ends up in the water, it can lead to low oxygen in the water, which is bad for aquatic life. Also, nitrates in drinking water can cause 'blue baby disease, which can cause brain damage or even death. Now you have to decide whether to build a drinking water treatment plant.



A. **Build a new drinking water treatment plant.** You have to spend \$7,000 to build the plant, but it would provide jobs which would bring \$1,000 in income taxes in each of the following years. The treatment plant would remove the extra nitrate that is in the drinking water, but not from the water in the streams or rivers.

| Ecosystem Services and Money Costs and Profit | Consequence                                                                                                                            | Who will this most affect? |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| -2 Water quality card                         | Water quality in streams would not improve because the excess nitrate would still be in the waterways, just not in the drinking water. |                            |
| -2 Biodiversity card                          | Biodiversity would not improve because the aquatic organisms because nitrate would only be taken out of drinking water.                |                            |
| +3 Human health                               | No deaths from "blue baby disease"                                                                                                     |                            |
| -\$6,000                                      | Cost of the treatment plant                                                                                                            |                            |
| <b>Residents who like this idea: 70%</b>      |                                                                                                                                        |                            |

Profit/cost over five years: + \$5,000

- B. **Convince the town of Rabbit to reduce their water pollution.** Rabbit does not want to do anything about its water pollution, so you have to find a way to convince them. You could ask farmers in Rabbit to reduce their use of fertilizers (which may reduce the amount of crops they produce), or you could ask them to use organic fertilizers instead of using lots of chemical fertilizer. Providing \$4,000 for Rabbit to begin changing its farming practices would be ideal.

| Ecosystem Services and Money Costs and Profit | Consequence                                                                                                                      | Who will this most affect? |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| +2 Water quality card                         | Water quality would improve because the excess nitrate would be reduced.                                                         |                            |
| +2 Biodiversity card                          | Biodiversity would improve because the aquatic organisms would no longer have to deal with high levels of nitrate in their water |                            |
| +2 Human health                               | Less deaths from “blue baby disease”                                                                                             |                            |
| -\$4,000                                      | Cost of changing farming practices in Rabbit                                                                                     |                            |
| <b>Residents who like this idea: 90%</b>      |                                                                                                                                  |                            |

Profit/cost over five years: \$0



- C. **Do nothing and agree to pay for medical fees of sick residents.** Paying for medical fees would cost at least \$6,000 right now. However, it could cost much more in the future depending on how many people get sick and how severe their illness is. This option would not address the underlying problem of water quality and may cause parents of sick babies to sue the town.

| Ecosystem Services and Money Costs and Profit | Consequence                                                                     | Who will this most affect? |
|-----------------------------------------------|---------------------------------------------------------------------------------|----------------------------|
| -4 Water quality card                         | Nitrate pollution will continue to increase                                     |                            |
| -2 Biodiversity card                          | Aquatic organisms would suffer from increasing levels of nitrate in their water |                            |
| -4 Human health                               | Deaths from “blue baby disease”                                                 |                            |
| -\$6,000                                      | Medical fees                                                                    |                            |
| <b>Residents who like this idea: 40%</b>      |                                                                                 |                            |

Profit/cost over five years: \$0

**Make one air decision**

Problem: Traffic has increased in Moose City, and people are getting frustrated with spending a lot of time driving to work, paying more money for gasoline, and having brown, polluted air. At the same time, people like being able to drive themselves to where they need to go, when they need to go. Some of the negative aspects of air pollution include causing breathing problems in people, acid rain (caused when pollution falls with rain) which pollutes water and soil and deteriorates buildings, and an ugly view of brown skies.



- A. **Build a light rail system (a type of non-polluting railroad) within the city.** This would cost \$10,000, but it would last for the next 25-30 years. Many taxpayers in the city incorrectly think of public transportation as dirty, unsafe and always late, but hopefully through education, you can convince people their own health will improve because the light rail doesn't create any pollution. If people accept the light rail, the light rail system will make \$2,000/year from the

| Ecosystem Services and Money Costs and Profit | Consequence                                                                          | Who will this most affect? |
|-----------------------------------------------|--------------------------------------------------------------------------------------|----------------------------|
| + 3 air quality cards                         | Light rail would reduce air pollution from cars, trucks, and buses.                  |                            |
| + 2 water quality cards                       | Without excess air pollution, acid rain will decrease.                               |                            |
| + 3 human health cards                        | Human health will improve, especially those with allergies and respiratory problems. |                            |
| - \$10,000                                    | It is expensive now, but it will begin to make money after five years.               |                            |
| <b>Residents who like this idea: 80%</b>      |                                                                                      |                            |

tickets.

Profit/cost over five years: + \$10,000

- B. **Encourage people to drive less and carpool:** This would cost \$3,000 because you would have to develop a public information campaign as well as build a carpool lane. If Moose City can reduce the number of people who drive to work, water and air pollution would go down, and human health would improve because there would be less pollution. Maybe they just need some convincing....

| Ecosystem Services and Money Costs and Profit | Consequence                                                     | Who will this most affect? |
|-----------------------------------------------|-----------------------------------------------------------------|----------------------------|
| + 2 air quality cards                         | Fewer cars means less air pollution.                            |                            |
| + 1 water quality card                        | Without excess air pollution, acid rain will decrease a little. |                            |
| + 1 human health card                         | Human health will improve a bit.                                |                            |
| - \$3,000                                     | Education campaign.                                             |                            |
| <b>Residents who like this idea: 40%</b>      |                                                                 |                            |

Profit/cost over five years: \$0

- C. **Increase urban tree cover.** Research has shown that as little as a 10% increase in tree cover in a city can reduce air pollutants by 1-15% (depending on the pollutant). In order to do this in Moose City, \$4,000 would need to be spent to buy and plant the trees. While many residents like the idea of more trees in the city, some are complaining that they would have to do more work (raking leaves, etc). You would also need to spend some money on maintaining the trees (\$100/year).



| Ecosystem Services and Money Costs and Profit | Consequence                                                                       | Who will this most affect? |
|-----------------------------------------------|-----------------------------------------------------------------------------------|----------------------------|
| + 4 air quality cards                         | Trees would reduce air pollution.                                                 |                            |
| + 1 water quality card                        | Less air pollution means fewer chemicals in the waterways.                        |                            |
| +1 human health cards                         | Although planting trees won't reduce the air pollution very much, it still helps! |                            |
| - \$4,000                                     | Cost of planting trees                                                            |                            |
| <b>Residents who like this idea: 70%</b>      |                                                                                   |                            |

Profit/cost over five years: - \$500

## Town 2: Rabbit

### Make one land decision

Problem: As more of the land in your town becomes part of larger farms, there is less room for younger people and retired farmers to buy small homes. Right now, there are two farms that are up for sale because the farmers are struggling to make a living. The town can either leave the land zoned for farming or it can be zoned for homes. The farms have a few small streams running through them, and one of them has a wetland, which are marshy areas that have lots of biodiversity, take pollution out of streams, and prevent floods and erosion.

- A. **Keep the land zoned as farmland, but transition to organic practices.** In order to avoid the use of pesticides, the town will only allow organic farming, which will keep the soil healthy and protect the wetland. The town will have to support the farmers while they transition to organic farming for a year at a cost of \$3,000. After the transition to organic farming is complete, the town will earn \$500 a year in taxes from the farmers.



| Ecosystem Services and Money Costs and Profit | Consequence                                                                             | Who will this most affect? |
|-----------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------|
| +4 Water quality card                         | The marsh will be protected and no more chemicals will be used.                         |                            |
| +2 Biodiversity card                          | The marsh and organic farm provide habitat for fish, frogs and birds                    |                            |
| - 1 Air quality card                          | Farming, even if organic, still uses fossil fuels                                       |                            |
| +4 Human health card                          | There will be fewer toxins in the water, and healthier, organic food for people to eat. |                            |
| - \$3,000                                     | Supporting organic farmers.                                                             |                            |
| <b>Residents who like this idea: 70%</b>      |                                                                                         |                            |

Profit/cost over five years: +\$2,500

- B. **Keep the land zoned as a conventional farm,** and allow farmers to continue using chemicals to kill weeds and pests. This will not dramatically improve the environment, but may allow some farmers to offer food at more competitive prices. This will earn the town \$500 a year in taxes, right away.



| Ecosystem Services and Money Costs and Profit | Consequence                                                                                               | Who will this most affect? |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------------|
| -4 Water quality card                         | The marsh will be less protected and chemicals will continue to be used.                                  |                            |
| -2 Biodiversity card                          | The marsh will be more polluted                                                                           |                            |
| - 2 Air quality card                          | Farm equipment uses fossil fuels, and some chemicals can also cause air pollution                         |                            |
| -2 Human health card                          | There will be continually more toxins in the water, but people will still have access to fresh vegetables |                            |
| + \$500                                       | Profit from taxes                                                                                         |                            |
| <b>Residents who like this idea: 80%</b>      |                                                                                                           |                            |

Profit/cost over five years: +\$2,500

- C. **Zone the land for development.** You will have to build a better road system for the new homes, and will have to connect them to the town's water and electrical systems. This will cost \$5,000, but you will make \$1,500 in property taxes each year. Building cheaper housing would be great for many local residents, who think the town of Rabbit has become too expensive. It would also allow the town to keep more people in the area, which will eventually help the economy, since those people would work and shop in town.



| Ecosystem Services and Money Costs and Profit | Consequence                                              | Who will this most affect? |
|-----------------------------------------------|----------------------------------------------------------|----------------------------|
| -4 Air quality card                           | Homes will use energy that increases air pollution       |                            |
| -4 Water quality card                         | The wetland will be lost                                 |                            |
| -4 Biodiversity card                          | The marsh and soil ecosystems will be lost               |                            |
| -3 Human health card                          | People will be harmed by decreased air and water quality |                            |
| - \$3500                                      | Costs minus profit from taxes                            |                            |

**Residents who like this idea: 60%**

Profit/cost over five years: +\$7,500



### Make one water decision

Problem: There is some open space in Rabbit where several farmers would like to grow corn. Although water quality isn't currently an issue in the town, a corn farm could create pollution, and it would require a lot of water from the river. Plus, the downstream city of Moose is already complaining about water pollution from Rabbit.

- A. **Use the land for a conventional corn farm.** Everyone loves eating corn! However, corn requires a lot of chemicals to grow (fertilizers) and is often genetically modified to resist pests. This means that the corn contains a toxin (a common one is called Bt, or *Bacillus thuringensis*), that is a poison to insects. When an insect tries to eat the corn, it is killed. Another drawback is that corn needs a lot of water to grow.



| Ecosystem Services and Money Costs and Profit | Consequence                                                                          | Who will this most affect? |
|-----------------------------------------------|--------------------------------------------------------------------------------------|----------------------------|
| - 1 Air quality card                          | Conventional farming uses a lot of fossil fuels                                      |                            |
| -4 Water quality card                         | Corn needs a lot of water and chemicals to grow                                      |                            |
| -3 Biodiversity card                          | Chemicals in the soil and in the corn will kill insects and possibly other organisms |                            |
| -1 Human health                               | The impacts of eating genetically modified corn is uncertain                         |                            |
| \$1,000                                       | Profit from taxes                                                                    |                            |
| <b>Residents who like this idea: 40%</b>      |                                                                                      |                            |

Profit/cost over five years: + \$5,000

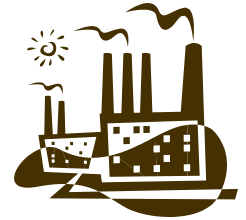
- B. **Use the land for an organic corn farm.** Everyone loves eating corn! Organic sweet corn is harder to grow, and the yields aren't as high because pests like to eat the corn. Consequently, farmers may need some support (a subsidy) to help them provide this product to your town, and so you won't make any profit from this farm in taxes.

| Ecosystem Services and Money Costs and Profit | Consequence                                                               | Who will this most affect? |
|-----------------------------------------------|---------------------------------------------------------------------------|----------------------------|
| - 1 Water quality card                        | Corn needs a lot of water to grow                                         |                            |
| +3 Biodiversity card                          | Organic practices will not harm the insects and other animals on the farm |                            |
| +3 Human health                               | Fresh, local food will benefit residents' health                          |                            |
| \$0                                           | No profit/cost                                                            |                            |
| <b>Residents who like this idea: 80%</b>      |                                                                           |                            |

Profit/cost over five years: +\$0

**Make one air decision:**

Problem: Air pollution moves up into the sky and moves with the wind. Due to the movement of air from nearby Moose City, your town receives a lot of air pollution, and residents are getting sick.



- A. **Convince Moose City to plant trees.** This would cost at least \$6,000 to plant trees in Moose City, which would reduce air pollutant levels between 1-15% (depending on the type of pollutant and how many trees you plant). You will need to provide maintenance costs for the trees (\$500/year).

| Ecosystem Services and Money Costs and Profit | Consequence                                       | Who will this most affect? |
|-----------------------------------------------|---------------------------------------------------|----------------------------|
| + 2 air quality card                          | Air pollution should slowly start to improve.     |                            |
| + 1 water quality card                        | Less air pollution means less water pollution     |                            |
| + 1 human health card                         | Human health will improve                         |                            |
| + 1 Biodiversity card                         | Less air pollution means less impact on organisms |                            |
| - \$6,000                                     | Plant trees in Moose City                         |                            |
| <b>Residents who like this idea: 80%</b>      |                                                   |                            |

Profit/cost over five years: -\$2,500



- B. **Pay for medical fees.** Paying for medical fees would cost at least \$4,000, although it could cost much more, depending on how many people get sick. You should put aside at least \$1,000 a year for additional cases of respiratory illness.

| Ecosystem Services and Money Costs and Profit | Consequence                                                                              | Who will this most affect? |
|-----------------------------------------------|------------------------------------------------------------------------------------------|----------------------------|
| -3 air quality cards                          | Air pollution would continue to increase                                                 |                            |
| - 3 water quality card                        | Air pollution eventually leads to water pollution through acid rain.                     |                            |
| - 3 human health cards                        | Human health would continue to decrease since nothing would be done about the pollution. |                            |
| -3 biodiversity cards                         | Biodiversity will continue to decline                                                    |                            |
| - \$4,000                                     | Health costs                                                                             |                            |
| <b>Residents who like this idea: 60%</b>      |                                                                                          |                            |

Profit/cost over five years: - \$5,000

### Town 3: Hawk

#### Make one land decision

Problem: Since most of the land in Hawk is protected by the government as a forest preserve, there can't be a lot of development. But, in the past, the State government has allowed some use of natural resources if it is justified. Local residents would like to use some of the land to develop apple orchards.



- A. **Allow orchards if they are certified by EcoApple.** EcoApple is a company that encourages growers to reduce the amount of chemicals and use integrated pest management systems. This means using beneficial insects to kill the harmful ones instead of always relying on chemical sprays. Allowing this type of orchard development would benefit the town through taxes (\$1,000/year). However, getting certified through EcoApple costs money, which the town will need to pay for each year (\$500/year).

| Ecosystem Services and Money Costs and Profit | Consequence                                                                                                                                           | Who will this most affect? |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| +2 Air quality card                           | Trees help clean the air and maintain shade and humidity                                                                                              |                            |
| +1 Water quality card                         | While some water pollution will happen initially when the trees are cut down, the new orchards should provide some of the same benefits as the forest |                            |
| 0 Biodiversity card                           | Since the forest is being cut down, some organisms may not survive locally.                                                                           |                            |
| 0 Human health card                           | Creating EcoApple orchards should not negatively affect human health                                                                                  |                            |
| + \$500                                       | Profit from taxes                                                                                                                                     |                            |
| <b>Residents who like this idea: 40%</b>      |                                                                                                                                                       |                            |

Profit/cost over 5 years: \$2,500



- B. **Allow traditional apple orchards.** Traditional apple orchards are easier and cheaper to begin and maintain, and the farmers would prefer this option. However, some residents are worried about the chemicals that would be used on the orchards, not just for themselves but for the workers in the orchards and the surrounding environment. Traditional apple orchards use a lot of chemicals to keep the insect pest numbers down. For example, cancer clusters of children have been found near apple orchards in Ulster County, NY. The town would make \$1,000 each year in taxes from the orchards.

| Ecosystem Services and Money Costs and Profit | Consequence                                                                                                                                                   | Who will this most affect? |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| +2 Air quality card                           | Trees help clean the air and maintain shade and humidity                                                                                                      |                            |
| -4 Water quality card                         | Chemicals would end up in the river                                                                                                                           |                            |
| - 2 Biodiversity card                         | Forest animals would have to find new habitat, soil microbes and insects would no longer survive in the dry soil. The trees would all be replaced with seeds. |                            |
| -4 Human health card                          | Chemicals can affect the people working in the orchards, eating the apples, and drinking the water nearby.                                                    |                            |
| + \$1,000                                     | Profit from taxes                                                                                                                                             |                            |
| <b>Residents who like this idea: 80%</b>      |                                                                                                                                                               |                            |

Profit/cost over five years: +\$5,000

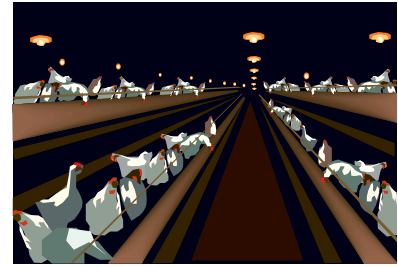
- C. **Don't allow the development of orchards.** This option wouldn't cost anything, except that some local people may not be able to find jobs. These people may not vote for politicians on the town board that refused logging. Trees would continue to provide forest biodiversity, and clean water and air.

| Ecosystem Services and Money Costs and Profit | Consequence                                                                            | Who will this most affect? |
|-----------------------------------------------|----------------------------------------------------------------------------------------|----------------------------|
| +2 Air quality card                           | Forests are important in cleaning air, even the polluted air from nearby cities        |                            |
| +2 Water quality card                         | Hawk's forest will continue to provide healthy water for its inhabitants.              |                            |
| +2 Biodiversity card                          | As the forest grows, it may create even more habitat for plants, animals and microbes. |                            |
| +2 Human health card                          | Healthy forests can lead to healthy people!                                            |                            |
| \$0                                           | No profit, no cost                                                                     |                            |
| <b>Residents who like this idea: 60%</b>      |                                                                                        |                            |

Profit/cost over five years: \$0

### Make one water decision

Problem: A local company would like to develop a chicken farm on land in Hawk, which could create a lot of water pollution.



- A. **Approve the chicken farm.** A conventional chicken farm would offer jobs to local people, a source of local meat and provide profit from taxes. However, there is a lot of pollution from large numbers of chickens, and these types of farms often use medications to keep their animals health in close quarters. The farm will have as many as 25,000 chickens.

| Ecosystem Services and Money Costs and Profit | Consequence                                            | Who will this most affect? |
|-----------------------------------------------|--------------------------------------------------------|----------------------------|
| - 3 Air quality card                          | Animal manure is a major air pollutant on farms        |                            |
| -4 Water quality card                         | Animal manure is a major pollutant of rivers           |                            |
| -3 Biodiversity card                          | Less biodiversity in the polluted waters               |                            |
| -4 Human health card                          | Polluted water and air can cause human health problems |                            |
| + \$1,000                                     | Profit from taxes paid by chicken farmers              |                            |

**Residents who like this idea: 90%**

Profit/cost over five years: +\$5,000

- B. **Approve the chicken farm only if it is organic.** With the problem of water pollution from the chicken waste as well as concern about the happiness of the chickens, some residents would like to have an organic and free-range farm. This means that the farmer would only be able to have 12,000 chickens because each chicken needs space to roam freely eating chemical-free grass and grain. The chicken poop could be sold as organic fertilizers to other farmers. It will cost the town \$4,000 to encourage the company to go organic, but the town will receive \$500 a year in taxes (half as much because the farmer can't raise as many chickens).



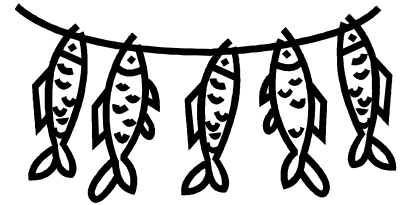
| Ecosystem Services and Money Costs and Profit | Consequence                                                                                                                  | Who will this most affect? |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| +2 Water quality card                         | Water will be cleaner than with a conventional farm                                                                          |                            |
| +2 Biodiversity card                          | Insects and other birds will be able to live on the farm and fewer chemicals in the river means healthier aquatic organisms. |                            |
| +2 Air quality cards                          | Eating locally will reduce air pollution.                                                                                    |                            |
| +4 Human health                               | Healthy, organic chickens will be available to residents.                                                                    |                            |
| -\$3500                                       | Cost of transitioning to organic practices minus the profit from taxes                                                       |                            |

**Residents who like this idea: 70%**

Profit/cost in five years: +\$2,500

### Make one air decision

Problem: Since the town of Hawk is situated in the northwestern corner of the county, it often receives a lot of air pollution from other parts of the county. This has caused polluted rain (called acid rain) to begin to pollute the Green River and the soil in the forest. There is a proposal to develop a fish farm in the town, which would bring much-needed income. However, these operations are often energy-intensive and thus could produce even more air (and water!) pollution.

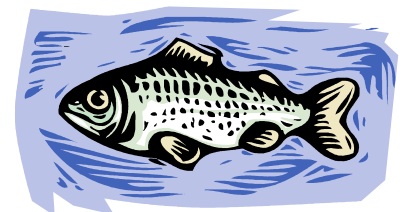


- A. **Allow a conventional fish farm.** The fish farm would raise salmon, which are a high-value fish that many people like to eat because it is heart-healthy. However, these farms require fresh water, protein-rich food (salmon are carnivores), and often antibiotics to keep the fish healthy in close quarters.

| Ecosystem Services and Money Costs and Profit | Consequence                                                                                           | Who will this most affect? |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------|
| - 1 air quality cards                         | Energy will be needed to run the fish farm                                                            |                            |
| - 3 water quality cards                       | Waste from the fish and antibiotics used during production could pollute nearby rivers and streams    |                            |
| - 1 Biodiversity cards                        | Poor water quality could affect stream biota                                                          |                            |
| + 0 human health card                         | Eating fish could improve people's health, but the contaminants from the fish farm would be a problem |                            |
| + \$1,000                                     | Profits from taxes                                                                                    |                            |
| <b>Residents who like this idea: 60%</b>      |                                                                                                       |                            |

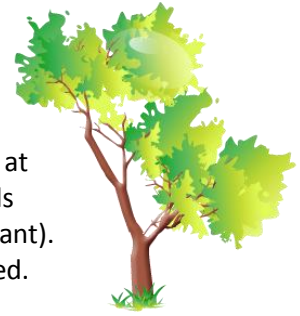
Profit in five years: +\$5,000

- B. **Allow a closed, indoor fish farm.** There are innovative fish farms that are indoors and raise vegetarian fish such as tilapia. They don't produce any waste by using hydroponics to grow plants in the tanks along with the fish. However, they do require a good amount of energy to run the tanks and the systems to operate the factory, and they don't produce as many fish.



| Ecosystem Services and Money Costs and Profit | Consequence                                                                                             | Who will this most affect? |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------|
| - 1 air quality cards                         | Air pollution would get worse over time, unless solar panels or another renewable energy source is used |                            |
| 0 water quality cards                         | Water pollution would not change                                                                        |                            |
| + 3 human health cards                        | Human health would be improved by the availability of local fish                                        |                            |
| \$500                                         | Profit from taxes                                                                                       |                            |
| <b>Residents who like this idea: 40%</b>      |                                                                                                         |                            |

Profit in five years: +\$2,500



- C. **Don't allow a fish farm, and convince Moose City to plant trees.** This would cost at least \$6,000 to plant trees in Moose City, which would reduce air pollutant levels between 1-15% (depending on the type of pollutant and how many trees you plant). No additional air pollution would result because no fish farm would be developed. However, you may have to provide funds to maintain the trees (\$500/year).

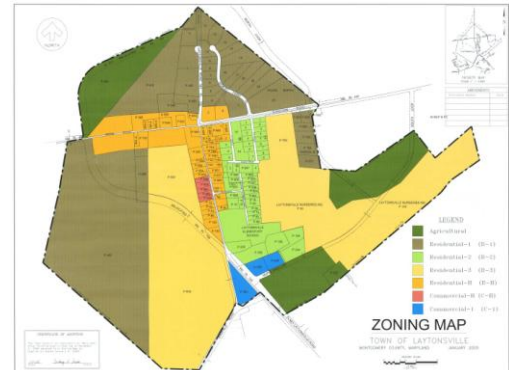
| Ecosystem Services and Money Costs and Profit | Consequence                                       | Who will this most affect? |
|-----------------------------------------------|---------------------------------------------------|----------------------------|
| + 2 air quality card                          | Air pollution should slowly start to improve.     |                            |
| + 1 water quality card                        | Less air pollution means less water pollution     |                            |
| + 1 human health card                         | Human health will improve                         |                            |
| + 1 Biodiversity card                         | Less air pollution means less impact on organisms |                            |
| - \$6,000                                     | Plant trees in Moose City                         |                            |
| <b>Residents who like this idea: 80%</b>      |                                                   |                            |

Profit/cost over five years: - \$2,500

### Town 4: View

#### Make one land decision

Problem: Due to development pressure within View, real estate prices have become very high. Several farmers would like to sell their land for development, while others would like to develop a local dairy business. All dairy operations will result in some beef and veal sales, since most male cows will not be kept on a dairy farm and older animals need to be removed from milking.



- A. **Allow the farmland to become zoned for homes.** You will have to pay \$2000 to build roads and connect people to the town’s water and electricity systems. You will earn \$1000 a year in property taxes each year. You will also make businesses very happy, since more people will be buying things in the town. However, there is opposition to this plan from some residents, who are afraid that View is becoming too populated.

| Ecosystem Services and Money Costs and Profit | Consequence                                                                   | Who will this most affect? |
|-----------------------------------------------|-------------------------------------------------------------------------------|----------------------------|
| -3 Air quality card                           | Increased traffic and energy use put pollution in the air                     |                            |
| -2 Water quality card                         | People in these homes will use more water and create wastewater               |                            |
| -3 Biodiversity card                          | The land will be used for people instead of other animals, plants or microbes |                            |
| -3 Human health card                          | More homes means more pollution from traffic and new buildings                |                            |
| - \$1,000                                     | Cost of new roads plus profit from taxes                                      |                            |
| <b>Residents who like this idea: 70%</b>      |                                                                               |                            |

Profit/cost in five years: +\$5,000



- B. **Use the land for a commercial, modern dairy farm with up to 300 cows.** This will not dramatically improve the environment, but may allow some farmers to offer food at more competitive prices, and to take advantage of the increase in demand for Greek yogurt. In New York State, farmers can have up to 300 cows on their property and not be considered a CAFO, or Concentrated Animal Feeding Operation, thus avoiding a lot of regulations. Modern dairy farms use a lot of grain to feed their animals instead of grass, and often need to use antibiotics to keep their animals healthy in confined conditions while eating grain. Allowing such a modern dairy farm will earn the town \$500 a year in taxes.

| Ecosystem Services and Money Costs and Profit | Consequence                                                                                                  | Who will this most affect? |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------|
| - 2 Air quality card                          | Animal waste can cause air as well as water pollution                                                        |                            |
| -4 Water quality card                         | Animal waste is the one of the top causes of water pollution in New York State                               |                            |
| -1 Biodiversity card                          | While some open space will be preserved, the land will mostly be used for cows and to grow food for the cows |                            |
| -3 Human health card                          | Waste from the cows and chemicals from the fields can be a human health hazard for workers and residents     |                            |
| + \$500                                       | Profit from taxes                                                                                            |                            |
| <b>Residents who like this idea: 40%</b>      |                                                                                                              |                            |

Profit/cost in five years: + \$2,500

- C. **Use the land for an organic dairy farm with up to 150 cows.** Fewer cows means less waste, and raising them organically means their food is grown organically and their products can be sold at a higher price. Allowing such a dairy farm will earn the town \$500 a year in taxes.

| Ecosystem Services and Money Costs and Profit | Consequence                                                                                                   | Who will this most affect? |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------|----------------------------|
| - 1 Air quality card                          | Animal waste can cause air as well as water pollution                                                         |                            |
| -2 Water quality card                         | Animal waste is the one of the top causes of water pollution in New York State                                |                            |
| 0 Biodiversity card                           | Since chemicals will not be used to grow the cows' food, there should not be a huge reduction in biodiversity |                            |
| - 1 Human health card                         | Waste from the cows can be a human health hazard for workers and residents                                    |                            |
| + \$500                                       | Profit from taxes                                                                                             |                            |
| <b>Residents who like this idea: 80%</b>      |                                                                                                               |                            |

Profit/cost in five years: +\$2,500

### Make one water decision

Problem: Your town has been struggling with water shortages and water contamination in the past years. The Beaver Creek receives runoff from Hawk, and the creek has experienced several fish kills as a result of eutrophication. In this process, excess fertilizers in the water cause algae to grow quickly, and when it dies and is decomposed, the decomposers use up the oxygen in the water, causing the fish to die. Eutrophication causes dead zones all along the coast of the United States and around the world, but especially in the Gulf of Mexico.

- A. **Pay upstream farmers to use fewer chemicals.** You will spend \$5000 to train farmers in Hawk on organic practices and how to reduce their chemical use. There is no guarantee, however, that the farmers will actually change their farming practices.

| Ecosystem Services and Money Costs and Profit | Consequence                                                           | Who will this most affect? |
|-----------------------------------------------|-----------------------------------------------------------------------|----------------------------|
| +2 Water quality card                         | Beaver Creek would have less pollution                                |                            |
| +1 Biodiversity card                          | A healthier creek will provide habitat for aquatic animals and plants |                            |
| +1 Human health card                          | Safer drinking water                                                  |                            |
| - \$5000                                      | Cost of paying and educating farmers.                                 |                            |
| <b>Residents who like this idea: 50%</b>      |                                                                       |                            |

Profit/cost in five years: \$0

- B. **Build a new drinking water treatment plant.** You have to spend \$7,000 to build the plant, but it would provide jobs which would bring \$1,000 in income taxes in each of the following years. The treatment plant would remove the extra nitrate that is in the drinking water, but not from the water in the streams or rivers.

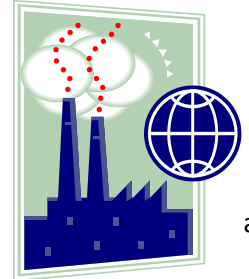
| Ecosystem Services and Money Costs and Profit | Consequence                                                                                                                            | Who will this most affect? |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| -2 Water quality card                         | Water quality in streams would not improve because the excess nitrate would still be in the waterways, just not in the drinking water. |                            |
| -2 Biodiversity card                          | Biodiversity would not improve because the aquatic organisms because nitrate would only be taken out of drinking water.                |                            |
| +3 Human health                               | Improved water quality                                                                                                                 |                            |
| -\$6,000                                      | Cost of the treatment plant                                                                                                            |                            |
| <b>Residents who like this idea: 80%</b>      |                                                                                                                                        |                            |

Profit/cost over five years: + \$5,000

**Make one air decision:**

Problem: For the last 20 years, the town has been sending its garbage via trucks to a landfill in Pennsylvania. There is a proposal to build an energy-efficient waste incinerator. This incinerator would, instead of releasing heat and toxic emissions, capture those emissions and use them to create energy for the town. While this is more expensive, it would provide another energy source for the town.

- A. **Build an energy-efficient incinerator:** You have to spend \$7,000 to build the incinerator, but, you will save money in the future because you will be able to create your own energy from the heat of the fire that is burning the trash. You can expect to save \$1,000 a year in energy costs by using the incinerator as a source of energy. However, an incinerator would produce toxic ashes that would have to go to a landfill and could create some groundwater pollution (which many people use drinking water in View). You will have some maintenance costs (\$500/year).



as

| Ecosystem Services and Money Costs and Profit | Consequence                                                                                        | Who will this most affect? |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------|----------------------------|
| + 0 water quality card                        | Groundwater pollution may occur from the ashes of the incinerator.                                 |                            |
| + 3 air quality cards                         | Air quality will improve because you will not release pollution from trucks or the plant.          |                            |
| + 1 human health card                         | Human health will improve because fumes will not be released (as compared to a normal incinerator) |                            |
| - \$6,500                                     | High cost, but it will last a long time and you will save \$1,000 a year in energy costs           |                            |
| <b>Residents who like this idea: 40%</b>      |                                                                                                    |                            |

Profit/cost in five years: +\$2,500

- B. **Build a normal incinerator.** This will cost \$3,000, but it will provide construction and maintenance jobs. Normal incinerators, however, create air pollution and ash, which has to be disposed of properly. This ash is often a combination of hazardous materials, and it is generally sent to a landfill. Depending on how the ash is disposed of, it could contribute to water pollution due to runoff from the landfill. You will have some maintenance costs (\$500/year).

| Ecosystem Services and Money Costs and Profit | Consequence                                                                 | Who will this most affect? |
|-----------------------------------------------|-----------------------------------------------------------------------------|----------------------------|
| - 3 air quality cards                         | This incinerator will create a lot of air pollution.                        |                            |
| - 3 water quality cards                       | Water pollution will result from runoff from the toxic ash that is created. |                            |
| - 3 human health cards                        | Human health will suffer from air and water pollution.                      |                            |
| - \$3,500                                     | Cheaper than the energy-efficient incinerator                               |                            |
| <b>Residents who like this idea: 70%</b>      |                                                                             |                            |

Profit/cost in five years: -\$2,500



C. **Don't build an incinerator.** Instead, spend \$2,000 a year to continue to ship your town's waste to Pennsylvania, where it will be deposited in a landfill. This option would contribute to air pollution because of the trucks that have to haul the waste, and it will impact human health from both the air pollution and the runoff from the landfill (although this will only affect the people in Pennsylvania).

| Ecosystem Services and Money Costs and Profit | Consequence                                                                                                                                  | Who will this most affect? |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| - 1 air quality card                          | This will create air pollution from the trucks that transport the waste.                                                                     |                            |
| -2 water quality cards                        | This will create water pollution from the landfill runoff.                                                                                   |                            |
| - 2 human health cards                        | Human health will suffer from air and water pollution, not just in your town, but also the town in Pennsylvania that is receiving the waste. |                            |
| - \$2,000                                     | Cheaper than building either incinerator                                                                                                     |                            |
| <b>Residents who like this idea: 60%</b>      |                                                                                                                                              |                            |

Profit/cost in five years: -\$8,000

## Town 5: Woods

### Make one land decision

Problem: Like the other towns in the county, Woods is facing development pressure. A large (200 acre) piece of forest is up for sale, and many people in the town are discussing if the land should remain forested or become zoned for farming.



- A. **Allow development of a grass-fed beef farm.** This kind of development would remove the forest, but it would limit the numbers of cows that are allowed on the farm to 100 (each free-ranging cow needs about 2 acres for food). The cows would need access to pasture year-round, but will also need some grain and hay in the winter.

| Ecosystem Services and Money Costs and Profit | Consequence                                                                                    | Who will this most affect? |
|-----------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------|
| -2 Air quality card                           | Trees help clean the air and maintain shade and humidity.                                      |                            |
| -2 Water quality card                         | Forests can reduce runoff and take up water pollution; animal waste may create water pollution |                            |
| -1 Biodiversity card                          | Forests provide habitat for many organisms                                                     |                            |
| - 1 Human health card                         | People might end up eating more meat                                                           |                            |
| + \$2,000                                     | Initial profit of \$1,000 from logs and then taxes on the farming activities                   |                            |
| <b>Residents who like this idea: 70%</b>      |                                                                                                |                            |

Profit/cost in five years: +\$5,000

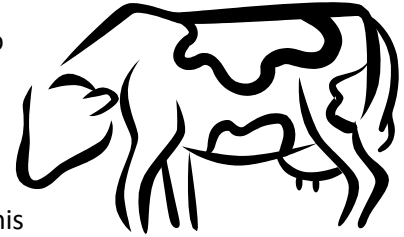
- B. **Keep the land as forest.** This option doesn't cost anything, and it would make residents who enjoy the outdoors very happy. However, it also wouldn't provide many jobs or any businesses.



| Ecosystem Services and Money Costs and Profit | Consequence                                                                            | Who will this most affect? |
|-----------------------------------------------|----------------------------------------------------------------------------------------|----------------------------|
| +2 Air quality card                           | Forests are important in cleaning air, even the polluted air from nearby cities        |                            |
| +2 Water quality card                         | Wood's forest will continue to provide healthy water for its inhabitants.              |                            |
| +2 Biodiversity card                          | As the forest grows, it may create even more habitat for plants, animals and microbes. |                            |
| +2 Human health card                          | Healthy forests can lead to healthy people!                                            |                            |
| \$0                                           | No profit, no cost                                                                     |                            |
| <b>Residents who like this idea: 50%</b>      |                                                                                        |                            |

Profit/cost in five years: \$0

- C. **Allow development of a conventional beef farm.** If you don't want to raise free-range cows, you can have a lot more animals on your land. On 200 acres, you can have enough cows for a medium-sized CAFO (concentrated animal feeding operation) – between 300-999. However, you'll need to deal with a lot of manure and you will need to purchase food for the animals. Residents are interested in this option, however, because their beef may be cheaper.



| Ecosystem Services and Money Costs and Profit | Consequence                                                                    | Who will this most affect? |
|-----------------------------------------------|--------------------------------------------------------------------------------|----------------------------|
| -2 Air quality card                           | Animal manure can be an air pollutant.                                         |                            |
| -3 Water quality card                         | Cow manure is a significant cause of water pollution in the U.S.               |                            |
| -2 Biodiversity card                          | The land will be used for people instead of other animals, plants or microbes. |                            |
| -3 Human health card                          | Air and water pollution may result, and people might end up eating more meat.  |                            |
| + \$2,000                                     | Initial profit of \$1,000 from logs and then taxes on the farming activities   |                            |
| <b>Residents who like this idea: 80%</b>      |                                                                                |                            |

Profit in five years: +\$5,000

### Make one water decision

Problem: Since you receive runoff from Rabbit and the lumber mills in town sometimes dump the chemicals used to bleach and clean the wood to make paper into the river, you have some water pollution issues. Although most of the people use well water, some people have been getting sick as pollution has moved through the groundwater from the river. You have to decide whether to develop a town-wide drinking water supply system or whether to provide medical expense coverage for people who may get sick.

- A. **Build a drinking water treatment plant.** This would cost \$7,000 and possibly more in the future for maintenance. This would also create jobs, bringing in \$1000 a year in income taxes. This project would create jobs for local construction workers and people who would work in the water treatment plant. The town would benefit because now all of the water would be clean, and residents wouldn't have to worry about getting sick from drinking their well water.



| Ecosystem Services and Money Costs and Profit | Consequence                                                                       | Who will this most affect? |
|-----------------------------------------------|-----------------------------------------------------------------------------------|----------------------------|
| +0 Water quality card                         | While drinking water will be treated, streams and rivers will remain contaminated |                            |
| +0 Biodiversity card                          | Only drinking water will be treated                                               |                            |
| +4 Human health card                          | Safer drinking water                                                              |                            |
| - \$6000                                      | Cost of building the treatment plant minus the income from taxes                  |                            |
| <b>Residents who like this idea: 70%</b>      |                                                                                   |                            |

Profit/cost in five years: +\$5,000

- B. **Train farmers and loggers to use fewer chemicals.** You will spend \$3,000 training farmers and paper-makers to use fewer chemicals, which can reduce the amount of chemicals in the streams, rivers, and groundwater. However it will not clean up the existing pollution problems.

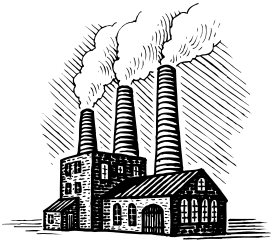


| Ecosystem Services and Money Costs and Profit | Consequence                                                          | Who will this most affect? |
|-----------------------------------------------|----------------------------------------------------------------------|----------------------------|
| +2 Water quality card                         | Healthier rivers                                                     |                            |
| +1 Biodiversity card                          | Healthier rivers will provide habitat for aquatic animals and plants |                            |
| +2 Human health card                          | Safer drinking water                                                 |                            |
| - \$3,000                                     | Cost of paying and educating farmers and paper-makers.               |                            |
| <b>Residents who like this idea: 80%</b>      |                                                                      |                            |

Profit/cost in five years: \$0

## Make one air decision

Problem: There is a proposal to develop a new lumber mill in town along with either a coal-fired power plant or a green energy plant to help power the mill.



A. **Support building a lumber mill with solar energy:**

This would provide new jobs, and the town would receive \$2,000 a year in tax revenue. In order to encourage the mill owners to build with solar, the town would have to pay \$4,000 in incentives. Using solar energy would eliminate the threat of air or water pollution, and residents who are worried about their health would probably support the project.



| Ecosystem Services and Money Costs and Profit | Consequence                                                         | Who will this most affect? |
|-----------------------------------------------|---------------------------------------------------------------------|----------------------------|
| + 1 air quality card                          | The green energy plant will not create extra air pollution          |                            |
| + 1 water quality card                        | Without excess air pollution, acid rain will not be created as much |                            |
| - 2 biodiversity cards                        | Cutting down forests will negatively affect the ecosystem           |                            |
| + 2 human health card                         | Human health will improve                                           |                            |
| - \$2,000                                     | Building green is more expensive                                    |                            |
| <b>Residents who like this idea: 50%</b>      |                                                                     |                            |

Profit/cost in five years: +\$10,000

- B. **Support building a lumber mill with fossil fuel energy.** This would provide new jobs, and provide the town with \$2,000 in taxes per year. However, the energy for the mill would come from a fossil fuels (natural gas), which would create more air pollution, like carbon dioxide, nitrous oxides, and sulfur dioxides. All of these contribute to acid rain, global warming and health problems.

| Ecosystem Services and Money Costs and Profit | Consequence                                                                        | Who will this most affect? |
|-----------------------------------------------|------------------------------------------------------------------------------------|----------------------------|
| - 3 air pollution cards                       | Building both the mill and the coal-fired power plant will increase air pollution. |                            |
| - 2 water pollution cards                     | With more air pollution, more acid rain will occur.                                |                            |
| - 2 biodiversity cards                        | Cutting down forests will negatively affect the ecosystem                          |                            |
| - 2 human health cards                        | Human health will suffer from acid rain, polluted water, and poor air quality.     |                            |
| + \$2,000                                     | Profit in taxes                                                                    |                            |
| <b>Residents who like this idea: 40%</b>      |                                                                                    |                            |

Profit/cost in five years: +\$10,000



- C. **Reject the lumber mill**: This would not provide any jobs, and might make some people angry who want jobs. It would also mean that the town wouldn't make any money from taxes. However, it would eliminate the threat of water and air pollution. Many people think that since there are already a few struggling lumber mills in town, another one would make things worse for current mill owners. Many residents worry that they won't have enough wood to make all of the mills profitable.



| Ecosystem Services and Money Costs and Profit | Consequence                                                                                                    | Who will this most affect? |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------|
| + 3 air pollution cards                       | The trees will help the air quality, and the lack of new buildings will mean less air pollution.               |                            |
| + 3 water quality cards                       | The trees will improve water quality, and the lack of new buildings will mean less pollution in the waterways. |                            |
| + 2 biodiversity cards                        | Without a new mill, fewer trees will be cut down in the forest.                                                |                            |
| + 3 human health cards                        | Without additional air and water pollution, health problems should improve.                                    |                            |
| \$0                                           | No profit, no cost                                                                                             |                            |
| <b>Residents who like this idea: 40%</b>      |                                                                                                                |                            |

Profit/cost in five years: \$0