



SCIENCE/SOCIAL STUDIES

Oh, Deer!

SIMULATION OF A REAL-LIFE CHALLENGE (AGES 9-13)
Provides opportunities to make the involved decisions necessary to manage a high-density herd of white-tailed deer in a residential area, balancing the environmental and human issues.

PULL

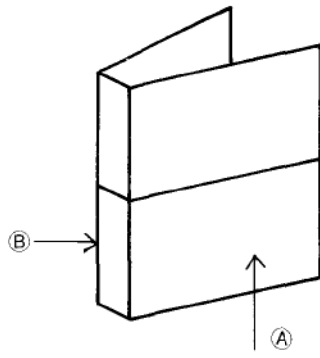
no. 981



oh, deer!

instructional computing courseware
for the **apple**® II computer

How to use your MECC folder cover inserts



Tear cover on perforated lines. Place half-page title section in the clear vinyl pocket (A) on the front of the binder. Insert finger-sized title in the clear plastic pocket on the spine (B).

oh, deer!

oh, deer!



minnesota educational computing consortium

oh, deer!

instructional computing courseware
for the **apple**® II computer

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INTRODUCTION

"Each species requires its own assortment of specialized places. We call them, collectively, food and cover."

— Aldo Leopold

The range of the white-tailed deer covers most of the United States and parts of Canada and Mexico. The whitetail is found in many types of habitat, from remote wilderness to residential areas. When people are living in an area inhabited by large numbers of deer, there are often differing views as to how the land should be shared.

OH, DEER! is a simulation in which students act as members of a committee studying methods of controlling the population of a deer herd. Students get a chance to experiment with many variables affecting the mathematical model of a deer herd. As in real life, the program presents realistic occurrences during the land management experience such as weather factors, varying public response, and a series of random events beyond the control of the student.

In addition to exploring wildlife population dynamics and management issues, students using the program are challenged to sift through human-defined values as applied to animals in their environment.

OH, DEER! is a **social studies** simulation involving these skills:

- understanding the influence of community attitudes and expectations on the natural environment;
- using conflict-resolution strategies to generate acceptable solutions to a problem; and
- working as a team to explore alternatives.

AND

OH, DEER! is a **science** simulation involving these skills:

- identifying and influencing variables;
- using and making predictions; and
- investigating scientific evidence in making personal decisions.

This manual is written to accompany the diskette OH, DEER! for use with the Apple II or //e Computer. These materials provide the classroom instructor with the background necessary to use the program effectively with students.

BACKGROUND INFORMATION

What happens when animals and people both "stake a claim" to a piece of land?

Conflict between wildlife and humans occurs in many communities. Residents of a suburban area, although usually appreciative of wildlife near their homes, often find that negative effects can accompany the aesthetics of living with nature.

OH, DEER! is a simulation that sets the stage for the student with a brief history of the land, people, and the white-tailed deer in a suburban area.

In most areas, the deer population is controlled by a hunting season. The land described in the simulation is a non-hunted area, shared by deer, humans, and other animals. There are no natural deer predators other than a small number of dogs that occasionally attack and kill a deer. Traffic in a residential area such as this leads to numerous car-deer collisions. This sometimes causes the injury or death of an animal and often damages cars.

Controversy arises over the browsing (feeding) by deer on residents' landscape plantings, lawns, and gardens. This causes thousands of dollars' damage each year. Some residents attract deer to their homes by putting out corn, oats, and alfalfa pellets. Other residents oppose artificial feeding because it encourages animals to continue feeding on privately-owned shrubs and plantings.

Feeding leads to large, dense concentrations of deer. It conditions animals and their young to accept the residential setting with its dependable high-quality food sources. This promotes survival and reproductive levels well above those which are normal in the wild. When reproductive rates are high, the deer population can grow **very** quickly.

The carrying capacity (the number of deer the land can support) of a residential area such as this can soon become much higher than many humans will tolerate.

Large numbers of deer can be hard to live with. Often, coexistence, or living in peace with each other, is a challenge.





DESCRIPTION

This simulation allows students to role play members of a problem-solving committee in Whitetail Hollow, a suburban community. The high density of white-tailed deer living on the eight square mile tract of land is a controversial issue within the community. Many residents experience damage to shrubs, lawns, and gardens due to deer browsing in their yards. In addition, collisions between deer and cars become more frequent as the deer herd increases in size.

While running the program, students attempt to develop a healthy deer herd of moderate size which is in balance with the natural browse and human tolerance. Students must make decisions based on natural variables and human-created conditions.

Curriculum Area: Science/Social Studies

Subject: Biology/Communities and Resources

Topic: Wildlife Population Dynamics and Management

Type: Simulation

Grade Range: 5 - 9

Reading Level: Grade 6 (Dale-Chall)

Classroom Use: Small Group or Individual

LEARNING OBJECTIVES

After using this courseware, students should be able to:

- work collaboratively as a team to explore alternative solutions to problems (Social Studies SELO III:C, E, G, H);*
- apply investigative thinking skills to make decisions based on logic and factual information (Science SELO III:B-1, Social Studies SELO I:D-H, II:A-H, III:B);*
- recognize the effect(s) of natural and human-created variables on the natural environment (Science SELO II:B-2, Social Studies SELO I-C);*
- use estimation and computation skills to determine ideal herd size figures for a defined parcel of land (Science SELO II:A-4).*

*Some Essential Learner Outcomes for Science and Social Studies, Minnesota State Department of Education, St. Paul, Minnesota.

PROGRAM PREVIEW

Welcome to Whitetail Hollow

OH, DEER! begins with an introduction to the land, the people, and the deer of Whitetail Hollow, a mythical community (Figure 1). The white-tailed deer population in the area has grown so quickly that many animals are coming into residents' yards to feed. In addition, collisions between cars and deer are becoming more frequent. Students are asked to serve on a committee to study the situation for a five-year period (Figure 2).



Figure 1

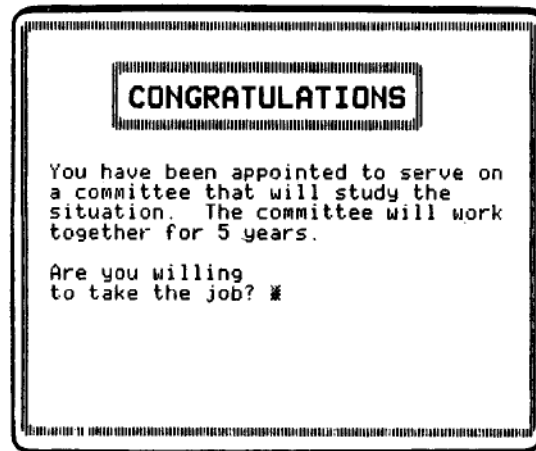


Figure 2

The land is described in detail, including number of square miles, vegetation, and the status of the land as a game refuge (Figure 3). This means that deer may not be sport-hunted.

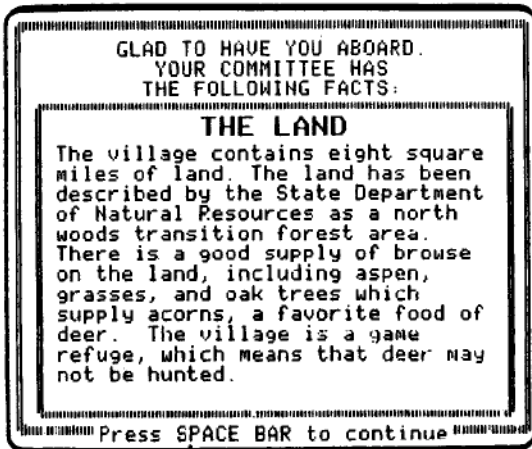


Figure 3

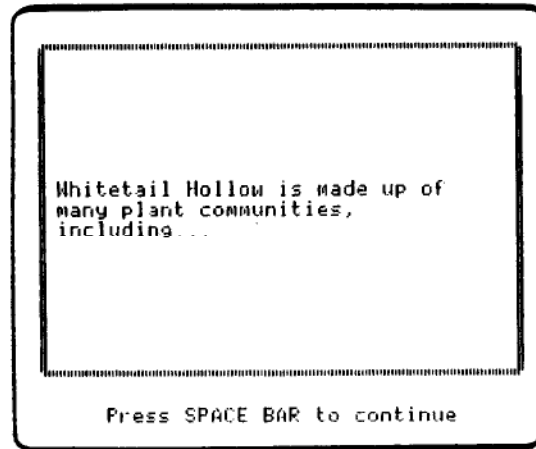


Figure 4

Whitetail Hollow contains three very specific habitat areas (Figure 4), including. . .

PROGRAM PREVIEW (continued)

coniferous forest, northern hardwoods, and marsh (Figures 5-7).

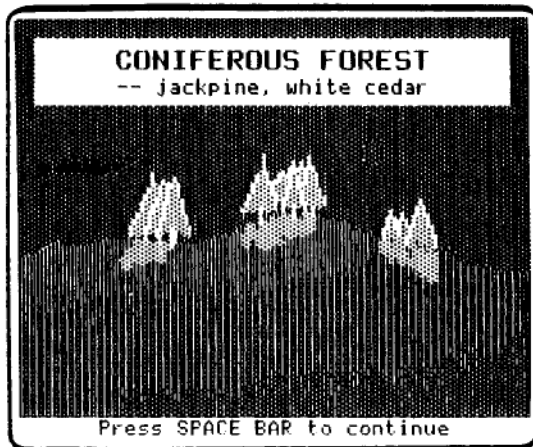


Figure 5

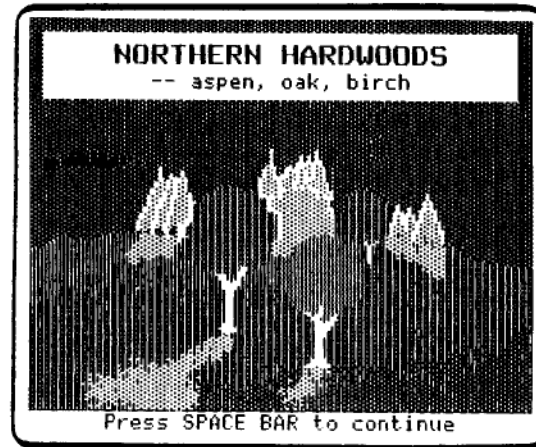


Figure 6



Figure 7



Figure 8

On this land, there also live some **humans** and **whitetail deer** (Figure 8).

PROGRAM PREVIEW (continued)

Residents of Whitetail Hollow have differing opinions about sharing the land with animals (Figure 9). Students see that in addition to controlling the size of the deer herd, interests of residents are to be considered (Figure 10).



Figure 9

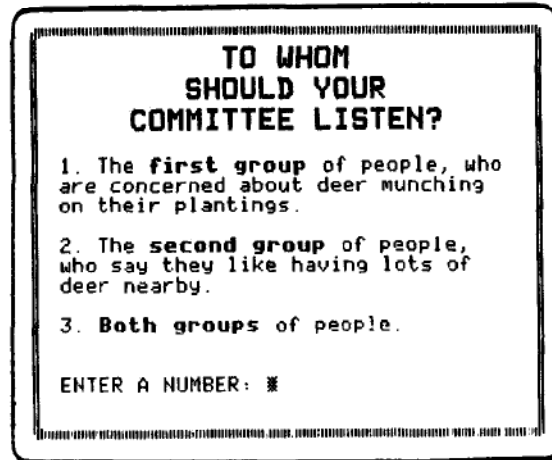


Figure 10

The Simulation

A full-color map introduces students to the land, food, houses, and animals of Whitetail Hollow (Figure 11). The herd is initialized (or divided into groups) according to age and sex percentages. These numbers actually reflect a real-life herd existing in an area like Whitetail Hollow (Figure 12). Notice that the size of the herd is 100% above what would be considered "ideal" for the habitat available on the land.

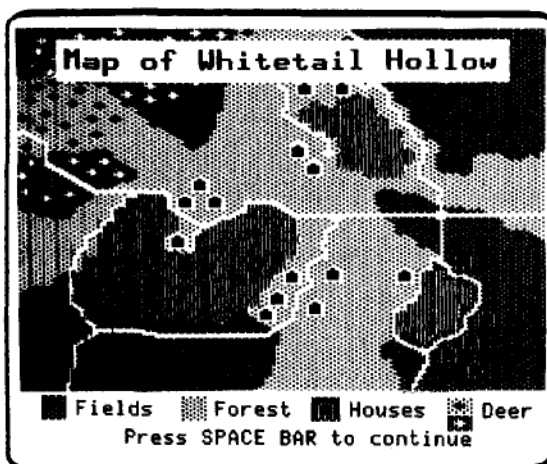


Figure 11

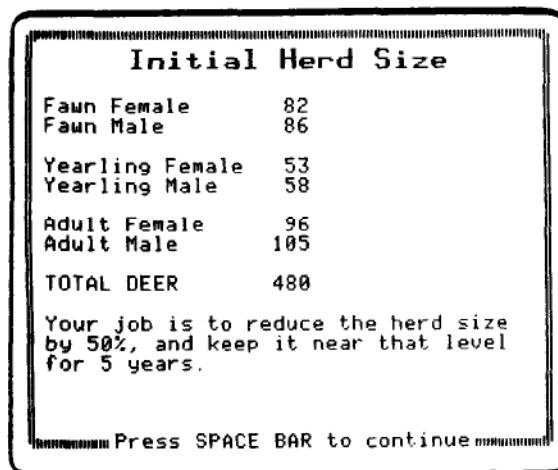


Figure 12

PROGRAM PREVIEW (continued)

As in real life, there are alternatives to consider as the committee works through the simulation. During each of the five years, students choose a course of action (Figure 13). Ignoring the situation results in the removal of no deer -- and leads to a conditioning of the animals to encourage their living near humans (Figure 14).

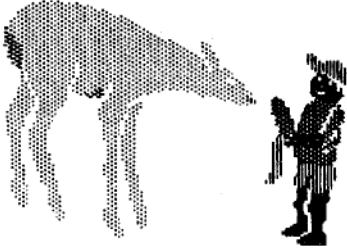
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CHOOSE ONE OF THE FOLLOWING: YR1
1. Take no action this year.
2. Remove deer by shooting.
3. Remove deer by trapping.
4. Plant food for deer in areas away
   from homes.
5. Spray repellents on shrubs deer
   are eating.
6. Scare deer away from homes
7. Or - do some research.
Which number? (1-7) █
    
```

Figure 13

```

You have chosen to take no action
this year. Residents continue to
feed deer, causing the animals to
stay near homes.



Press SPACE BAR to continue
    
```

Figure 14

Permission to remove deer by shooting or trapping (Figures 15 and 16) begins by requesting a permit from the Department of Natural Resources. Students determine the number of deer they wish to attempt to remove. The request is then accepted or rejected by the DNR, based on the current deer population.

```

The permit request will contain the
following information. Enter each
item and press <RETURN>.

TODAY'S DATE IS: 9/9/90

YOUR FULL NAME?
JACKIE KUCHLE

MR. OR MS.? MS

NUMBER OF DEER THE COMMITTEE WILL
ATTEMPT TO REMOVE? 125█
    
```

Figure 15

```

9/16/90
Dear MS. JACKIE KUCHLE:

Enclosed is a permit for the removal
of up to 125 deer from the village
of Whitetail Hollow between January
1, 1991, and March 31, 1991.

Please sign both copies of the
permit and return one to me.
Enclosed is a copy of additional
permit regulations.

Sincerely,

George Jensen
Director, Wildlife Division
Department of Natural Resources

Press SPACE BAR to continue
    
```

Figure 16

PROGRAM PREVIEW (continued)

Examples of other choices students may make are shown below (Figures 17-20).



Figure 17



Figure 18

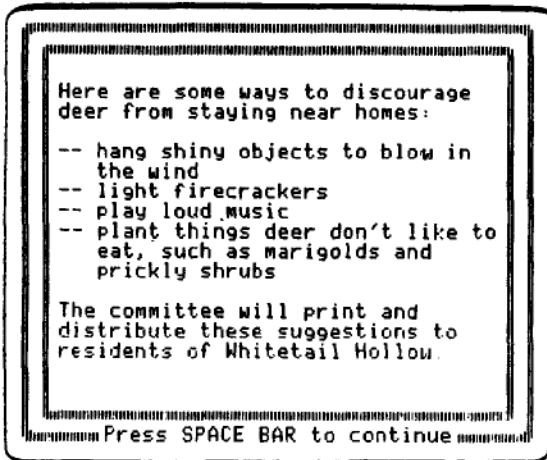


Figure 19

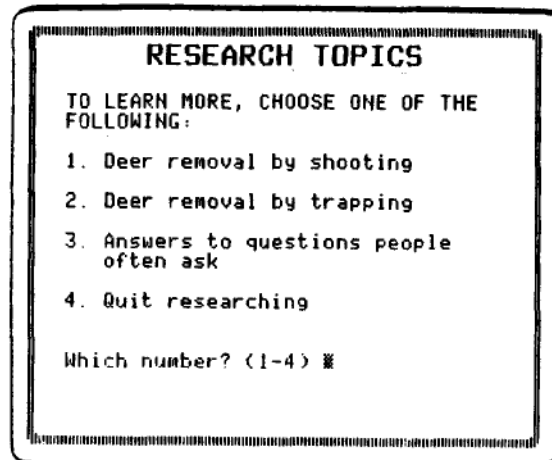


Figure 20

PROGRAM PREVIEW (continued)

Four screens report the results of any management method chosen by students. Figure 21 shows the spring population for year 3, after 21 deer were removed and 140 deer died due to winter conditions. Figure 22 reports the fall population, indicating the addition of new fawns and the movement of deer into higher age categories. Also on this screen is a helpful indicator word that describes the herd size in relation to the ideal number of 240 deer. **NOTE:** Remind students to record yearly data from this screen. See note at bottom of screen.

| SPRING RESULTS, BEFORE FAWNING | |
|--|------------|
| Fawn Female | 88 |
| Fawn Male | 96 |
| Yearling Female | 59 |
| Yearling Male | 68 |
| Adult Female | 133 |
| Adult Male | 153 |
| TOTAL DEER | 597 |
| Your team removed 21 deer. | |
| A moderate winter contributed to 140 deaths, including natural deaths, car kills, and dog kills. | |
| Press SPACE BAR to continue | |

Figure 21

| FALL POPULATION | | | | | |
|---|------------|------------|------------|-----|-----|
| Population Class | YR1 | YR2 | YR3 | YR4 | YR5 |
| Fawn Female | 96 | 125 | 134 | | |
| Fawn Male | 104 | 136 | 145 | | |
| Yearling Female | 49 | 80 | 88 | | |
| Yearling Male | 51 | 87 | 96 | | |
| Adult Female | 122 | 159 | 192 | | |
| Adult Male | 133 | 171 | 221 | | |
| TOTAL DEER | 555 | 758 | 876 | | |
| Herd currently OVER ideal herd size | | | | | |
| Have you recorded this information? (yes or no) * | | | | | |
| Press SPACE BAR to continue | | | | | |

Figure 22

Costs of management and damage to landscape plantings is reported in Figure 23. The public response (Figure 24) fluctuates according to the deer population level and the management choices made by students. It soon becomes clear that not everyone can be satisfied.

| COST TO RESIDENTS YEAR 3 | |
|-----------------------------|--------------------|
| Management Method..... | \$3,840.00 |
| Damages | |
| - Car/Deer Collisions.. | \$32,685.00 |
| - Landscape Damage..... | \$31,680.00 |
| TOTAL..... | \$68,205.00 |
| Press SPACE BAR to continue | |

Figure 23

| PUBLIC RESPONSE | |
|--|----------------|
| Your public approval rating is: | |
| 43% Approve | 57% Disapprove |
|  | |
| Press SPACE BAR to continue | |

Figure 24

PROGRAM PREVIEW (continued)

Occasional random events help make this simulation more like real life. Each year that students use the program, there is a 10% chance they will encounter a viral infection (Figure 25), a fire (Figure 26), or the construction of a condominium (Figure 27) in Whitetail Hollow.

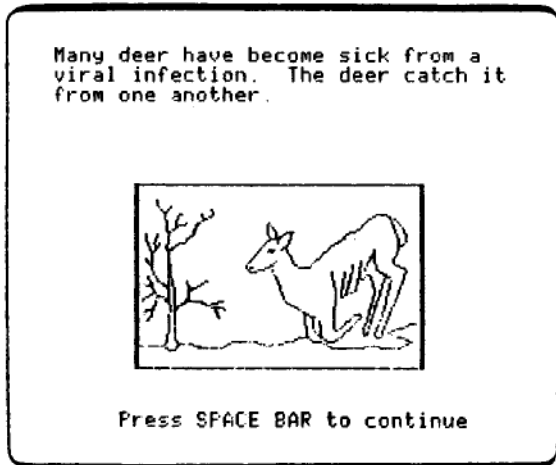


Figure 25



Figure 26

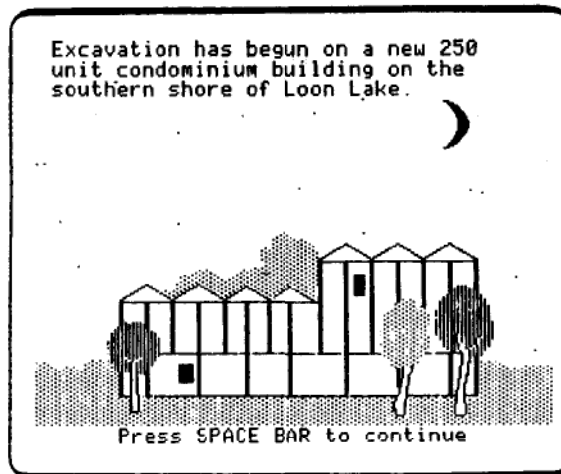


Figure 27

If one of these random events occurs, it is described **between** the spring and fall management reports. These events will influence the size of the deer herd.

PROGRAM PREVIEW (continued)

After five years of managing the land, students receive a summary of their management experience (Figure 28).

| Five Year Summary | | | | | |
|----------------------------|-----|-----|-----|------|------|
| | YR1 | YR2 | YR3 | YR4 | YR5 |
| Population | 555 | 758 | 876 | 1121 | 1257 |
| Management Costs (\$1000s) | 0 | 0 | 4 | 0 | 0 |
| Damages (\$1000s) | 35 | 31 | 64 | 76 | 156 |
| Approval (%) | 44 | 47 | 23 | 17 | 15 |
| Management Choice | 1 | 1 | 2 | 1 | 1 |

1 = no action 4 = plant food
 2 = shooting 5 = spray repellents
 3 = trapping 6 = scare deer
 Press SPACE BAR to continue

Figure 28

In addition, a "level of success" message is generated based on the ending size of the deer herd. Messages vary from very positive (Figure 29) to unsatisfactory (Figure 30).



Figure 29

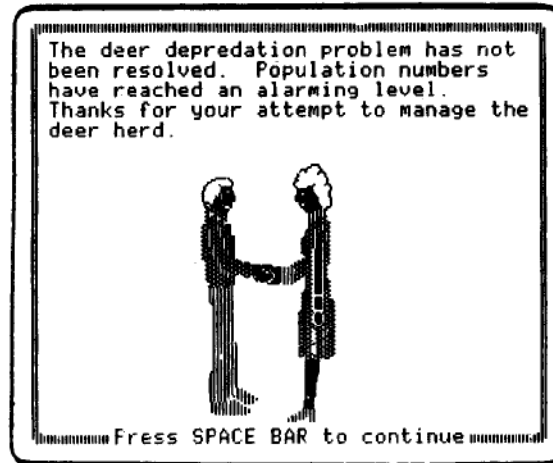


Figure 30

USE IN AN INSTRUCTIONAL SETTING

I. ABOUT EXPLORING

The value of this simulation is to help students investigate the notion of **exploring alternative solutions** to a problem . . .trying things out. . .seeing what happens!

OH, DEER! lets students become active participants in their own learning processes. Using cooperative learning, students work to achieve a goal—a manageable deer population.

Based on a real-life model, the program poses problems and provides feedback to students based on the results of their decisions.

There are many management strategies that can be used to achieve a satisfactory deer herd size. The program gives students opportunities to learn from their decisions. No single decision results in disaster. The worst that can happen to a committee is to allow the herd to increase or decrease to a great degree. In either case, the group is notified both during and at the end of the simulation whether there is room for improvement.

There are three parts to the problem-solving process that students must use while participating in the simulation:

1. Students must learn to **use the computer** in the way it is employed in the simulation.
2. They must learn to **use their management charts** to keep track of decisions and to add to their knowledge by interpreting their records.
3. They must learn how to do both of these tasks by **working together** with other committee members.

II. GET READY Before using OH, DEER! with your class:

Try. . . using the program with a couple of students or other teachers. This gives you a chance to see their reactions and to prepare for possible problems or questions other students may have.

III. GET SET With the entire class:

Journey through the **Whitetail Hollow** program together. Discuss the potential problems/possible solutions with the class.

If you would like, **take a "trial run"** through the simulation. Make sure everyone is aware of the general layout of the program.

USE IN AN INSTRUCTIONAL SETTING (continued)

IV. GO! A suggested plan for instruction follows:

DAY 1: Use the program called **WHITETAIL HOLLOW** to familiarize students with the animals, land, and people of the community.

DAY 2: Duplicate and distribute copies of **Handouts 2-7** on habitat, winter and summer weather, population, and terms. Discuss the needs of the white-tailed deer, their living conditions, and population patterns.

DAY 3: **Divide** your students into small groups of five or six. Duplicate, staple, and distribute Handouts **1a** through **1f** -- **one set to each group**. Each group will keep track of its yearly decisions and outcomes while running the program.

Use the role-playing cards to get the group involved in the spirit of the task. Many viewpoints are represented on the committee -- each student should "act the part" of the person whose card he or she draws.

Allow time for each group to draw role-playing cards and to divide the tasks.

Then... run **HERD MANAGEMENT**, one group at a time.

While not at the computer... use Handouts 2-7 to answer questions on Handout 1f. Encourage the group to **work together** and respond as if they were actually residents of a community like Whitetail Hollow.

Duplicate **model information** (8a & 8b) if desired. Students might be interested to see that the program is constructed using variables and numerical information specific to the animals and land being studied.

DAY 4: Follow-up activities:

- Hold a **debriefing session** (p. 14).
- Explore with a **futures wheel** (pp. 15-16).
- Expand ideas with **mind stretchers** (p. 22).

USE IN AN INSTRUCTIONAL SETTING (continued)

V. FOLLOW-UP

After students have completed the simulation, it's a good idea to hold a . . .

DEBRIEFING SESSION

. . .to help them discover the connection between the simulation and reality. . .and to relate what they've learned to other classroom activities.

SOME QUESTIONS YOU MIGHT ASK:

"What did you learn?" Answers may range from "our neighbors never liked what we did" to "we did it. . .the herd is smaller and most of the people are happy!"

Point out to students the reality of their observations. Like the students, a committee dealing with a problem like this usually cannot satisfy everyone.

"What strategies did you use? Which one(s) worked best?" It is important that students share strategies. They should be given another chance at the computer to test their new theories.

"What if. . . .?" Notice the value of exploring. . .of trying to see what happens. It will be clear that the groups who experiment with different ideas will gain the most from the simulation and gain a better understanding of the value of many strategies.

As with any simulation, the real model on which OH, DEER! is based is greatly simplified. This leads to two opportunities to extend learning beyond the computer:

1. There are differences between models and the realities they try to illustrate.
2. The curious student may expand his/her knowledge of the reality on which the model is based.

Participation in the OH, DEER! simulation will lend itself to additional exploration activities.

Use **MIND STRETCHERS** (p. 22) to spark student's investigation of how the OH, DEER! model parallels and/or differs from real life.

Use the **FUTURES WHEEL** (pp. 15-16) to explore the "what if" implications of occurrences.

With some substantial planning and guidance (and a bit of imagination!), you should be able to turn these challenges into a rich learning experience for your students.

USE IN AN INSTRUCTIONAL SETTING (continued)

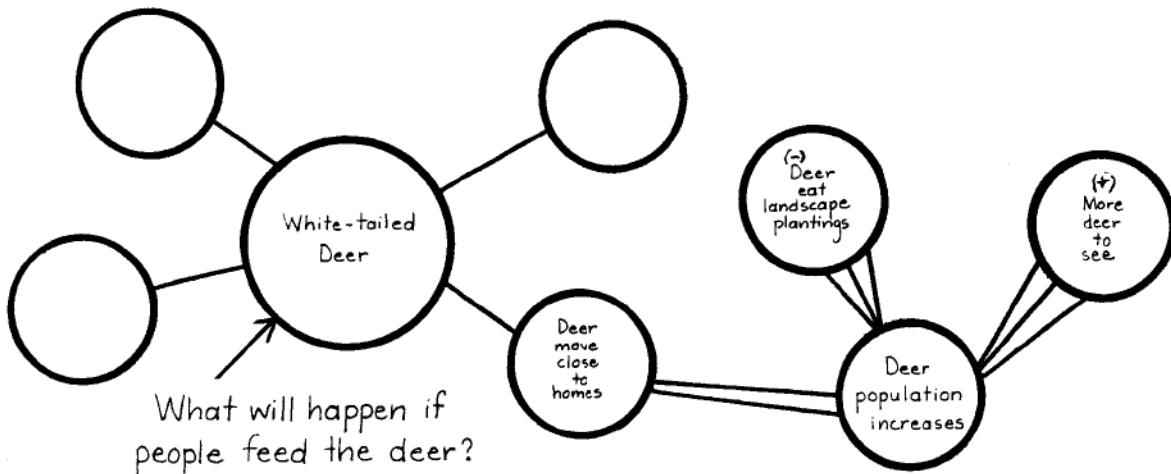
V. FOLLOW-UP (continued)

EXPLORING WITH A FUTURES WHEEL

A **futures wheel** is a tool used to explore possibilities. It is not a decision-making tool. It is used to help us become aware of some of the meanings and possible outcomes of events or policies.

HOW TO USE A FUTURES WHEEL

1. ASK what might happen if (event, trend, or policy) continues to (increase, decrease, or occur) in the future.
2. MAKE a diagram. Place the event/trend/policy at the center of a sheet of paper or on an overhead transparency.



DRAW a circle around it and ask some questions, for example: "What might happen if the deer population continues to increase in the future?" or... "What might happen if the village passes a law against feeding deer?"

3. AS STUDENTS RESPOND, place their answers around the middle "hub," circle them, and connect them with a single line to the middle circle. These responses are called "first order implications." They are indicated by a **single line**.
4. FOR EACH OF THESE FIRST IMPLICATIONS, ASK: "What things might occur as soon as this possibility happens? Connect the new implications with **two lines**.
5. CONTINUE this process for about **four or five** orders of implication. Third order implications are connected by three lines. Fourth order implications are connected by four lines, and so on.

Futures Wheels can get out of control. Sixth order implications should be close to an upper limit.

USE IN AN INSTRUCTIONAL SETTING (continued)

SOME SUGGESTIONS FOR SMALL GROUP WHEEL RUNNING

1. Form a group of 4-7 students.
2. Have a recorder list all possibilities.
3. Set a limit of five first order implications.
4. List at least one positive and one negative comment at each node.
5. Do all first order implications first, then all second order, etc.
6. Go out to at least three orders.
7. Use large sheets of paper!

LATER...

8. Label each effect as good (G) or bad (B).
9. Assign probabilities to each effect on a scale of 1 to 5 (1 = almost sure it will happen, 5 = almost sure it will not happen).
10. Determine whether the trend or policy is something you would like to see happen (Y = yes, N = no). Why or why not? What can you do about it?

The Futures Wheel concept was developed by Professor Jerry Glenn, University of Massachusetts.



STUDENT INSTRUCTIONS

WELCOME TO WHITETAIL HOLLOW

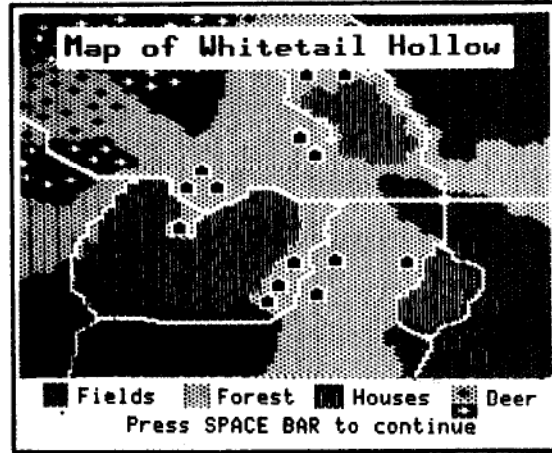
Your committee will manage the land for five years. Each year, you will make a management decision. Keep track of these and record the results on your management report forms.

Before you begin, fill out the information below:

COMMITTEE MEMBERS

- 1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

CHOOSE ONE OF THE FOLLOWING: YR1
1. Take no action this year.
2. Remove deer by shooting.
3. Remove deer by trapping.
4. Plant food for deer in areas away from homes.
5. Spray repellents on shrubs deer are eating.
6. Scare deer away from homes
7. Or - do some research.
Which number? (1-7)



TASKS

Typist—enter information into the computer.

- Record yearly population: FF (Fawn Female) FM (Fawn Male)
Record yearly population: YF (Yearling Female) YM (Yearling Male)
Record yearly population: AF (Adult Female) AM (Adult Male)
Record total population
Record "herd size" word (over, near, below)

REMEMBER:

The size of the deer herd is now 100% higher than Whitetail Hollow can support.

Within five years, you should have reduced the herd by one-half.

You will do this by using the methods on the left.



ROLE-PLAYING CARDS

1b

#1: COMMITTEE CHAIRPERSON

Name: Pat Goodleader
Occupation: Factory Worker

Position: You are a good listener and are able to explain things easily to the committee members. The group looks to you to help them make decisions each year. Usually, no one really knows whether you are for or against doing any managing of the deer herd.

#2 COMMITTEE MEMBER

Name: Tony Studios
Occupation: Student

Position: You are a graduate student in wildlife management at the State University near Whitetail Hollow. You feel that no matter what the people want, it is the deer the committee should consider. Your knowledge of deer habits, needs, and reproductive patterns is great.

#3: COMMITTEE MEMBER

Name: Chris Dollarsigns
Occupation: Certified Public Accountant

Position: You were appointed to the committee to keep close track of the money being spent to manage the deer herd. Your records should report yearly landscape damage costs and yearly management costs.

You are interested in keeping management costs as low as possible.

#4: COMMITTEE MEMBER

Name: Bobby Bigheart
Occupation: Professional Wrestler

Position: You have loved fawns ever since your father first read you the story of Bambi. You have organized a program to feed oats, corn, and alfalfa to the deer. In your opinion, no deer should be removed from the village.

#5: COMMITTEE MEMBER

Name: Terry Backenforth
Occupation: Bank Vice President

Position: You tend to make decisions based mainly on what you hear your friends say. Sometimes it sounds good to remove deer, sometimes it sounds terrible. You change your mind at least once a year.

#6: COMMITTEE MEMBER

Name: Marty McKnowledge
Occupation: Unemployed Teacher

Position: You feel that the people in Whitetail Hollow should be considered, not the deer. In order to keep the people happy, you will watch public opinion figures closely. Your opinions and ideas are based on what the people seem to want.

To the Instructor: Duplicate, cut apart, and distribute one set of cards to each group of students before beginning the simulation. While cards are face down, students choose one and "play the part" of the person described on the card they drew.



MANAGEMENT REPORT FORM

1c

HERD SIZE BEFORE YOU BEGIN

YR 1 = DECISION _____

| FALL POPULATION | | | | | | |
|--|-----|-----|-----|-----|-----|--|
| Population Class | YR1 | YR2 | YR3 | YR4 | YR5 | |
| Fawn Female | | | | | | |
| Fawn Male | | | | | | |
| Yearling Female | | | | | | |
| Yearling Male | | | | | | |
| Adult Female | | | | | | |
| Adult Male | | | | | | |
| TOTAL DEER | | | | | | |
| Herd currently _____ ideal herd size | | | | | | |
| Have you recorded this information? (yes or no) ☒ | | | | | | |

YR 2 = DECISION _____

| FALL POPULATION | | | | | | |
|--|-----|-----|-----|-----|-----|--|
| Population Class | YR1 | YR2 | YR3 | YR4 | YR5 | |
| Fawn Female | | | | | | |
| Fawn Male | | | | | | |
| Yearling Female | | | | | | |
| Yearling Male | | | | | | |
| Adult Female | | | | | | |
| Adult Male | | | | | | |
| TOTAL DEER | | | | | | |
| Herd currently _____ ideal herd size | | | | | | |
| Have you recorded this information? (yes or no) ☒ | | | | | | |



MANAGEMENT REPORT FORM

YR 3 = DECISION _____

FALL POPULATION

| Population Class | YR1 | YR2 | YR3 | YR4 | YR5 | |
|--|-----|-----|-----|-----|-----|--|
| Fawn Female | | | | | | |
| Fawn Male | | | | | | |
| Yearling Female | | | | | | |
| Yearling Male | | | | | | |
| Adult Female | | | | | | |
| Adult Male | | | | | | |
| TOTAL DEER | | | | | | |
| Herd currently _____ ideal herd size | | | | | | |
| Have you recorded this information? (yes or no) ☒ | | | | | | |

YR 4 = DECISION _____

FALL POPULATION

| Population Class | YR1 | YR2 | YR3 | YR4 | YR5 | |
|--|-----|-----|-----|-----|-----|--|
| Fawn Female | | | | | | |
| Fawn Male | | | | | | |
| Yearling Female | | | | | | |
| Yearling Male | | | | | | |
| Adult Female | | | | | | |
| Adult Male | | | | | | |
| TOTAL DEER | | | | | | |
| Herd currently _____ ideal herd size | | | | | | |
| Have you recorded this information? (yes or no) ☒ | | | | | | |



MANAGEMENT REPORT FORM

1e

YR 5 = DECISION _____

FALL POPULATION

| Population Class | YR1 | YR2 | YR3 | YR4 | YR5 | |
|--|-----|-----|-----|-----|-----|--|
| Fawn Female | | | | | | |
| Fawn Male | | | | | | |
| Yearling Female | | | | | | |
| Yearling Male | | | | | | |
| Adult Female | | | | | | |
| Adult Male | | | | | | |
| TOTAL DEER | | | | | | |
| Herd currently _____ ideal herd size | | | | | | |
| Have you recorded this information? (yes or no) * | | | | | | |

Five Year Summary

| | YR1 | YR2 | YR3 | YR4 | YR5 |
|---|-------|-------|-------|-------|-------|
| Population | _____ | _____ | _____ | _____ | _____ |
| Management Costs (\$1000s) | _____ | _____ | _____ | _____ | _____ |
| Damages (\$1000s) | _____ | _____ | _____ | _____ | _____ |
| Approval (%) | _____ | _____ | _____ | _____ | _____ |
| Management Choice | _____ | _____ | _____ | _____ | _____ |
| 1 = no action 4 = plant food 2 = shooting 5 = spray repellents 3 = trapping 6 = scare deer | | | | | |
| Press SPACE BAR to continue | | | | | |



MIND STRETCHERS

1. Can you satisfy everyone in your group? In Whitetail Hollow?

2. Deer and people both have rights. How do the rights of deer differ from those of people?

3. Who was in Whitetail Hollow first? How could you find out?

4. Can you think of conflict situations between humans and other animals?

5. What influenced costs? Was the cheapest management program the best?

6. What would happen in a community where large numbers of citizens wanted the deer to remain and sharpshooters came onto the land?

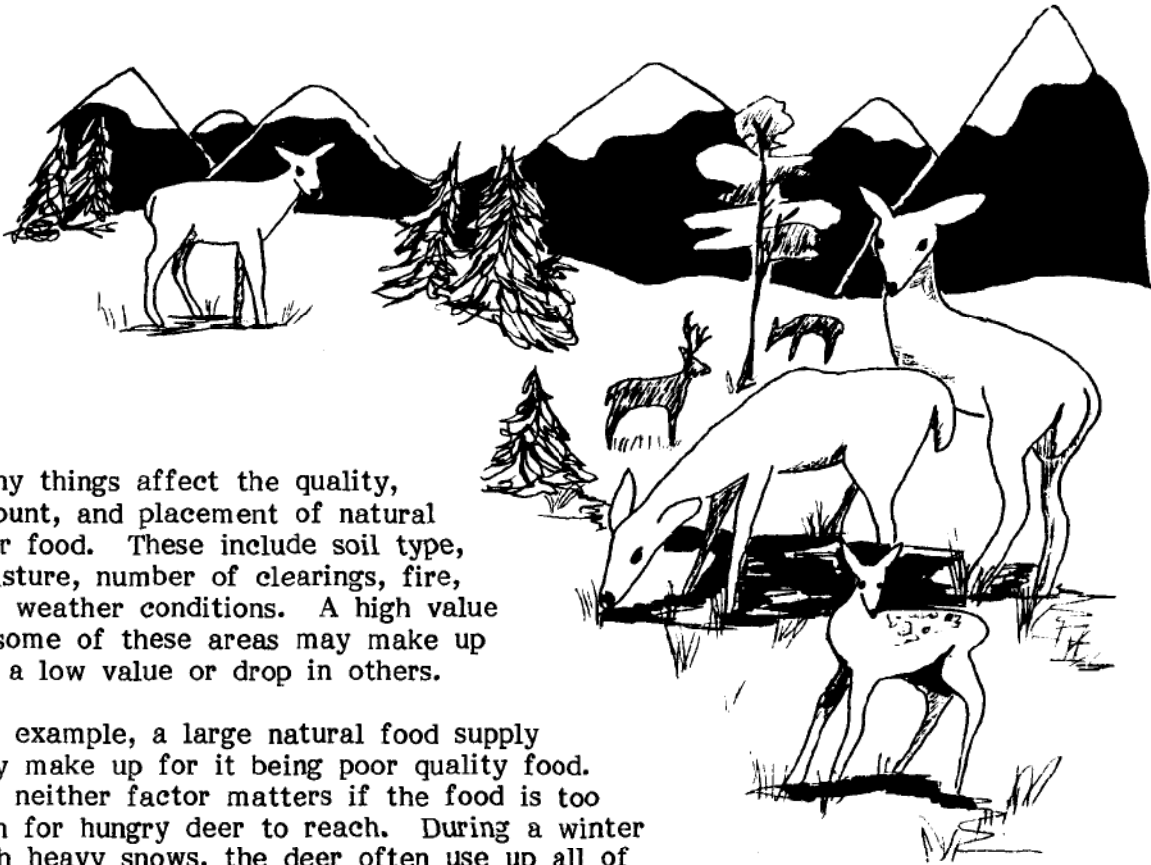
7. What things could a community do to use information to help opposing groups compromise on some decision?

**STUDENT READING: HABITAT**

The area where a deer lives must provide three basic things: food, water, and shelter. Together, these basic needs for living are called **habitat**. All animals have these survival needs—humans, white-tailed deer, even kangaroos!

The number of deer a piece of land can support depends on the quality and quantity of food, water, and shelter there. Good habitat produces healthy animals—and more of them. Poor habitat will produce fewer, less healthy deer.

Foods deer like best in the wild are dogwood, maple, young aspen, white cedar, old man's beard, lichen, acorns, and many other plants.



Many things affect the quality, amount, and placement of natural deer food. These include soil type, moisture, number of clearings, fire, and weather conditions. A high value in some of these areas may make up for a low value or drop in others.

For example, a large natural food supply may make up for it being poor quality food. But neither factor matters if the food is too high for hungry deer to reach. During a winter with heavy snows, the deer often use up all of their energy before reaching good browsing areas.

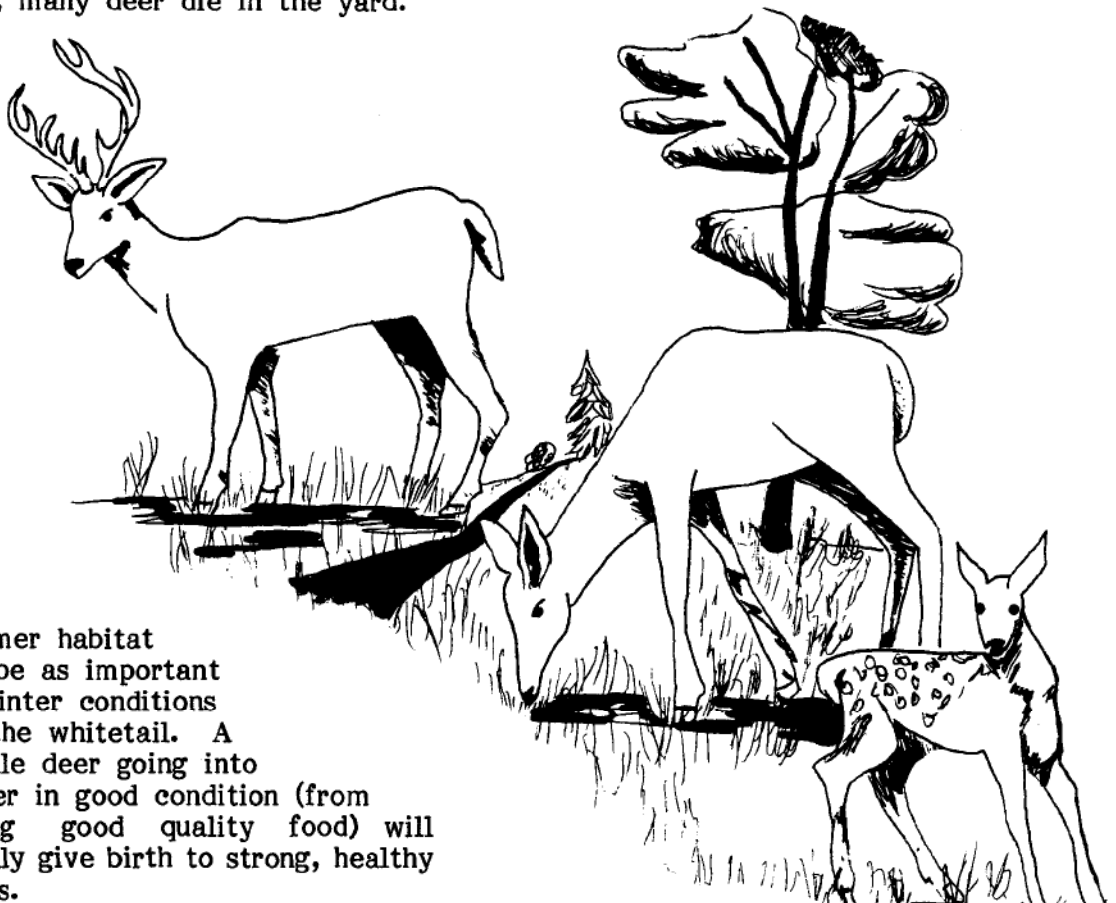
These things, in different combinations and amounts, are very important in the life of the deer. Habitat differences are sometimes the reason deer stay in an area or choose to leave.

**STUDENT READING: WINTER AND SUMMER CONDITIONS**

The size of a deer herd depends on the amount of winter food deer can reach. A yearling or adult deer needs about 10-12 pounds of browse each day. The better the quality of food, the less a deer needs to eat. During a winter with heavy snows, it is hard for deer to find enough food. This causes the loss of many fawns, either before or soon after birth.

During winter in the North, a deer herd usually forms a "deer yard." This headquarters is a sheltered area used by the deer for protection from weather. From the yard, a trail system is worked out for traveling to nearby food. In mild weather, deer may "yard up" for just a few weeks. In very cold, snowy weather, the yarding period may last most of the winter.

The trail network to this limited food range often causes winter food to be quickly used up. Also, the trails give roaming dogs the chance to attack. If a deer runs off the trail into deep snow, it is helpless to escape. Once the food supply gets low or used up, the snow past the trail is so deep that starving and tired deer cannot escape. Then, many deer die in the yard.

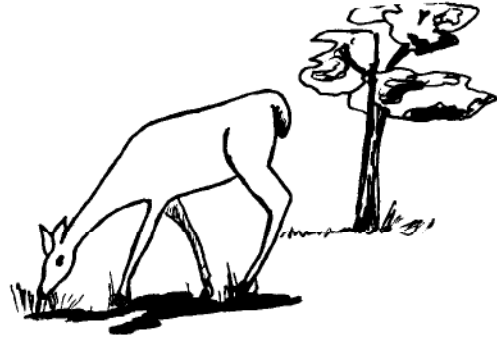


Summer habitat can be as important as winter conditions for the whitetail. A female deer going into winter in good condition (from eating good quality food) will usually give birth to strong, healthy fawns.



STUDENT READING: POPULATION FACTORS

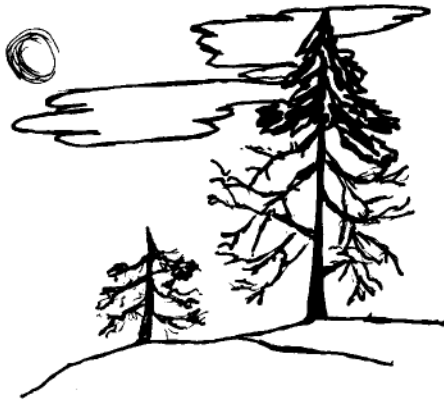
Good nutrition is important for deer reproduction. The rate at which female deer give birth to fawns depends on what type of food (and how much of it) they eat. The white-tailed deer, with good protection and a high reproduction rate, can double its population within two years.



The term **fawn** usually means an animal in its first year of life, **yearling** the second year, and **adult** the third and later years of life. **Adult** does not refer to sexual maturity, since the females of **all** categories are capable of reproduction. The female fawn reaches sexual maturity in its first fall and can give birth the following spring -- at one year of age.

Reproduction rates in each category depend on how many deer live in an area. For example, if a herd of 30 deer/square mile suddenly increases to a herd of 60 deer/square mile, reproduction will usually drop if the population is at or near carrying capacity.

Nature usually causes the deer population to rise or fall. Here are some laws of nature that apply to a herd of deer:

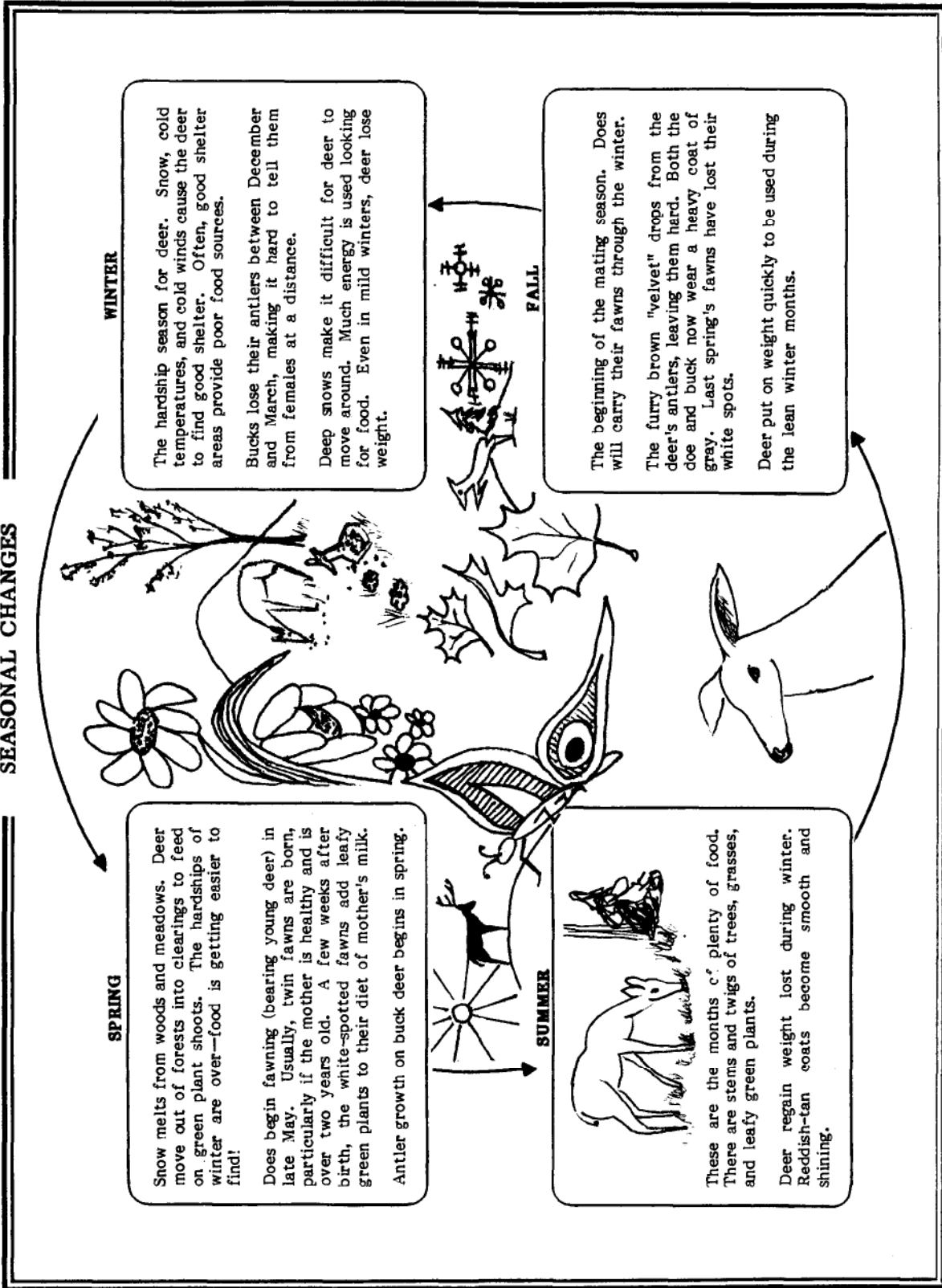


1. Deer usually give birth to more young than their habitat can support.
2. Things like as severe weather, disease, and natural disaster (flood, drought, fire) can lower a population. Natural mortality (death rate) does the same.
3. If the deer population of an area does not change over time, a number of animals equal to the number born must die each year.

Nature seems to follow a "rise and fall" pattern. After a mild winter, a large crop of animals is born. As the population grows, the deer use up food supplies. As they weaken, deer become easy targets for parasitic infections that can destroy large herds. When undernourished, deer often die of starvation.

So there is not a question of **whether** extra animals will die, only **how**.

**STUDENT READING:
THE WHITE-TAILED DEER:
SEASONAL CHANGES**



**STUDENT READINGS: TERMS**

TO BE AN EFFECTIVE LAND MANAGER, STUDY THESE TERMS...

**HABITAT**

The type of environment an animal needs to live in. This includes food, water, and shelter.

BALANCE

To make things even. There is a "balance of nature" when the food and shelter on a piece of land can satisfy the number of animals living there.

CARRYING CAPACITY

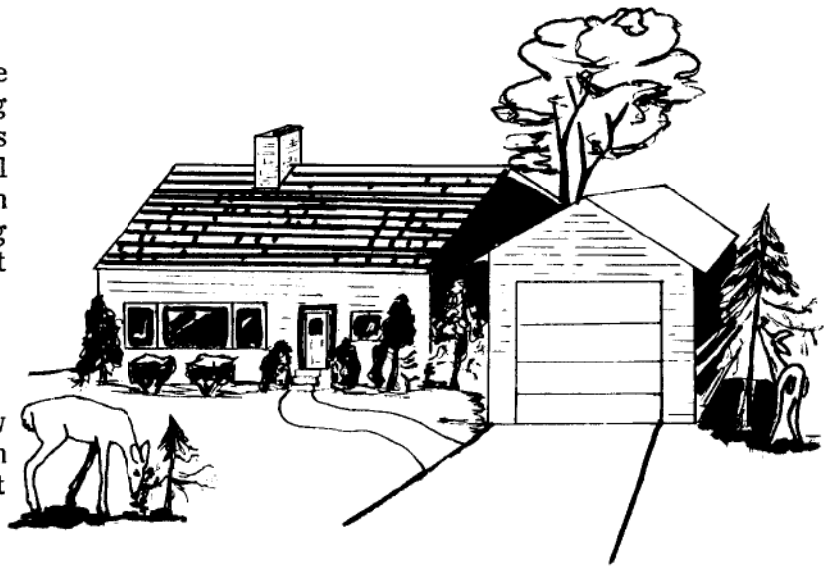
The number of animals that the land can support on a continuing basis. Carrying capacity depends on the weather, other animal populations, food, and shelter. In the simulation the actual carrying capacity is higher than most residents will tolerate.

ADAPTABILITY

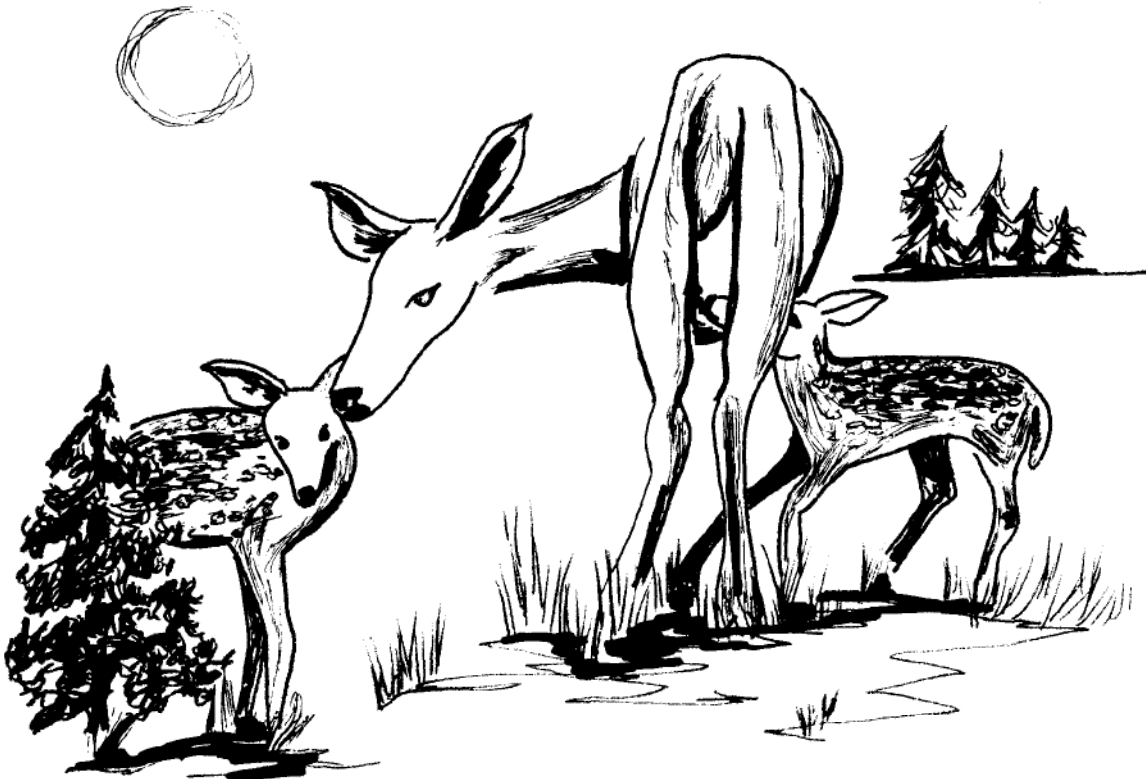
The ability of an animal to grow or live in an area, even when conditions are not the best for that animal.

BROWSE

Woody plant material eaten by deer. This includes twigs, stems, and bark on trees.

**DEPREDAATION**

Damage; in this case caused by the white-tailed deer.



REPRODUCTION

The process by which animals produce their young. The reproduction rate is stated in average number of fawns produced per year per female deer. The maximum reproduction rates in the simulation are as follows:

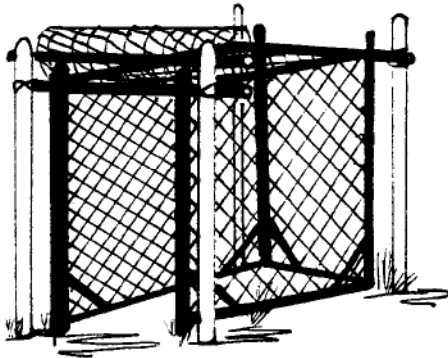
| | |
|---------------------------|------|
| Adult Female | 1.88 |
| Yearling Female | 1.55 |
| Fawn Female | .56 |

MORTALITY

The number of deaths in a given place or time. In the simulation, the mortality rate of the deer herd includes: natural factors such as old age, illness, starvation, and weather-related deaths, and other factors such as car/deer collisions, poaching (hunting illegally), and dog-kills.



STUDENT READING: TRAPPING METHODS

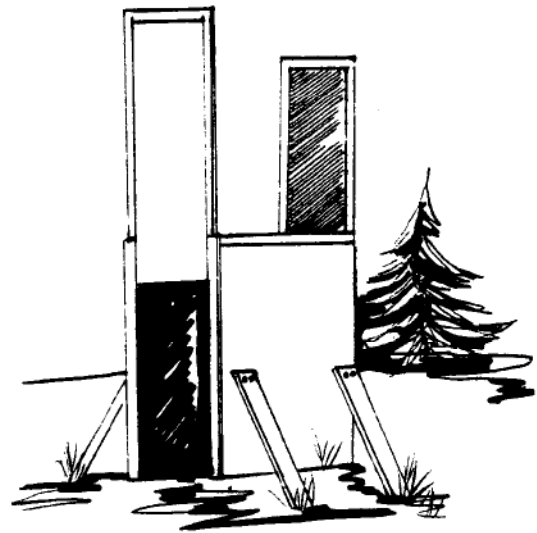


The **clover trap** (left) is made of pipe and netting. Deer are baited with corn, salt, or oats placed near the back of the trap. The trap collapses around the animal, keeping it from escaping.

This trap is safe near children and pets and is easy to move.

The **box trap** (right) is an open, wooden box. It is baited like the clover trap above. When an animal takes the bait, a heavy door snaps shut.

Box traps are dangerous near children and pets. They are also hard to move.



Rocket netting (left) is used to capture deer that will be moved from one spot to another. Humans wait at the corners of the netting. When an animal comes near, "rockets" (small explosives) are set off. The netting traps the deer.

This is a very expensive trapping method. It costs about \$200.00 per deer and takes many human hours (about 10-12) to trap an animal.



STUDENT READING: MODEL INFORMATION

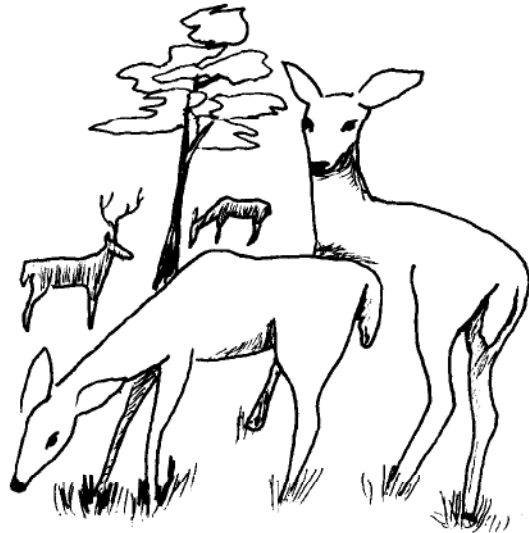
Model assumptions:

1. The white-tailed deer's life cycle starts with the birth of new fawns in May and June. The OH, DEER! program reports the population at two times each year: immediately following any deer removal (spring) and soon after fawning (fall).

2. The herd is initialized as follows:

| | | | |
|----|-------------------|-----|-----|
| FF | (Fawn Female) | 17% | 82 |
| FM | (Fawn Male) | 18% | 86 |
| YF | (Yearling Female) | 11% | 53 |
| YM | (Yearling Male) | 12% | 58 |
| AF | (Adult Female) | 20% | 96 |
| AM | (Adult Male) | 22% | 105 |

TOTAL DEER . . . 480



3. Reproductive rates are as follows:

| | |
|----|------------------|
| AF | 1.88 fetuses/doe |
| YF | 1.55 fetuses/doe |
| FF | .56 fetuses/doe |

4. 52% of all live births are male.
48% of all live births are female.

5. With the coming of spring, the previous year's fawns are now yearlings and the previous year's yearlings become adults. As new fawns are born, the deer life cycle starts once again.

6. The white-tailed deer at maximum reproduction and maximum protection can double its population every two to three years.

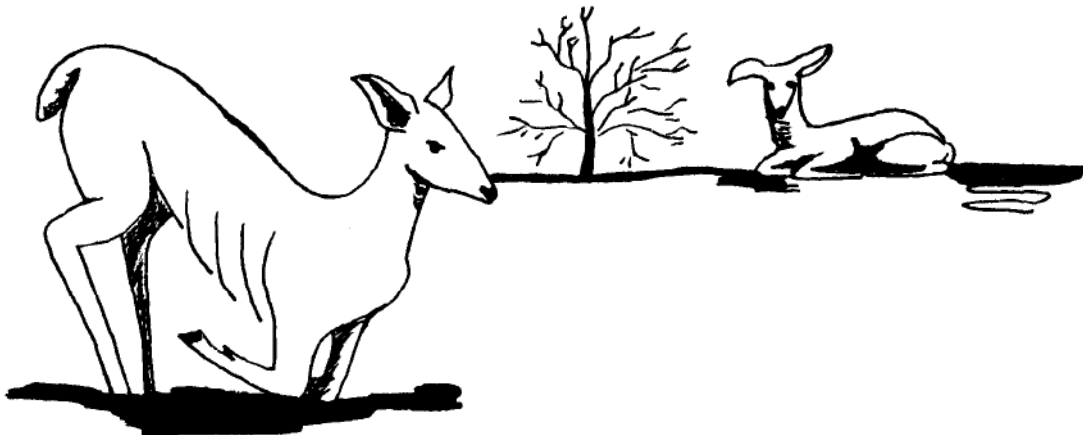
7. As total population increases, the birth rate falls, until an equilibrium (where births approximately = deaths) is reached at about 150 deer per square mile.

8. The OH, DEER! program includes three random events that may occur while running the simulation: a viral infection, a fire, and the construction of a large condominium. These events occur as follows:

- a) Each year of the simulation there is a 10% chance that a random event may occur.
- b) No event will occur more than one time during each five-year run.

**STUDENT READING: MODEL INFORMATION**

9. Yearly management costs incorporated into the model include:
- a) Shooting - \$3,000 overhead cost, including hiring the removal team, insurance, and removal of deer from the premises. The additional cost per deer shot is \$40 per animal.
 - b) Trapping - \$300 overhead cost, including hiring persons to trap, purchase/repair of traps, removal of deer from premises. The additional cost per deer trapped is between \$70 and \$190 per deer, which is based on the severity of the winter. It is most time-consuming (and costly) to bait deer into a trap during a mild winter since there is more natural food available.
 - c) Planting food - \$500 - \$800 per year.
 - d) Spraying repellents - cost varies with number of applications needed and number of people desiring spraying of their shrubs and trees. \$1.75/application, resulting in a total cost between \$20,000 and \$40,000/year.
 - e) Scaring deer away from homes \$200 - \$400 per year.
10. There is no emmigration or immigration (movement out of or into) of deer in the area being studied.
11. Mortality rate varies from 0 to 1, where 0 represents no mortality, 1 complete mortality. This rate is a direct effect of severity of winter. Average mortality rate is set at 20%. Mortality rate is not density dependent.
12. OH, DEER assumes that the natural winter mortality rate is independent of management decisions that have taken place during the year.



ADDITIONAL ACTIVITIES:

1. Science

- a) Discuss other animal/human encroachment problems in the news.
- b) Examine the relationship between the management of deer and other animal species residing in the same area. Does the management of one species directly or indirectly affect other animals in the area? If so, are the effects positive or negative?
- c) Identify types of deer-preferred browse and habitat.
- d) Discuss deer reproductive patterns and deer behavioral patterns (travel, feeding, stress level, and deer/human relationships).
- e) Identify habitat management methods.
- f) Research aerial spotting and animal counting methods.
- g) Compare and contrast deer removal methods in use.
- h) Invite representatives having differing viewpoints on animal management issues to speak to your students.

2. Mathematics

- a) Expand or reduce land parameters and project new values for variables in the simulation experience.
- b) Using "what-if" situations, calculate optimum deer populations for land parcels of 16 sq. miles, 32 sq. miles, etc.

3. Language Arts

- a) Hold debates and write position papers or "letters to the editor" in support or disagreement of the means chosen to manage a land parcel.
- b) Interview residents, land managers, and consultants involved in the managing of a land parcel.
- c) Compare and contrast the deer encroachment issue with similar situations in urban areas.
- d) Invite a speaker to discuss his/her involvement in an urban encroachment issue as a private citizen.
- e) Role-play land managers, deer, or residents (pro/con).
- f) Role-play outside consultants hired to inform residents of their options and to interpret the effects of action taken by the council.

4. Economics

- a) Discuss the costs of deer herd management and the cost-efficiency of management methods chosen.
- b) Project the future cost of maintaining a certain herd size.
- c) Examine tax structures within a community; notice the effect of management on other community expenditures.
- d) Project amounts of revenue loss resulting from the decision to maintain deer habitat rather than allowing residential construction.

5. Geography

- a) Explore the issues of land use and development.
- b) Discuss the importance of map-reading skills and the construction of a key.
- c) Examine the effect of overpopulation on vegetation in an area.

6. Art

- a) Construct a topographical model of a land parcel.
- b) Explore wildlife sketching and photography of animals in natural settings.



APPENDICES

CREDITS

The development team which worked together to produce this courseware product included Karen Hoelscher, Project Coordinator and Designer; Philip Bouchard, Design Analyst and Programmer; Cynthia Schroeder, Programmer; Bob Granvin, Programmer; and Jack Pejsa, Developer of Mathematical Model.

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Developmental Testing took place at the following sites:

1. Chelsea Heights School, St. Paul, Minnesota
2. Section of Wildlife, Department of Natural Resources, St. Paul, Minnesota
3. Minnesota Zoo, Apple Valley, Minnesota
4. MECC Classroom, St. Paul, Minnesota

TO THE READER:

The Minnesota Educational Computing Consortium has made every effort to ensure the instructional and technical quality of this courseware package. Your comments--as user or reviewer--are valued and will be considered for inclusion in any future version of the product. Please address comments to:

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St. Paul, Minnesota 55112

RESOURCES

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Personal interview(s) with Tom Isley, Assistant Chief -- Section of Wildlife, Minnesota DNR, June, 1982-August, 1983.

Personal interview with Dr. Peter Jordan, Wildlife Biologist, University of Minnesota, June 1982.

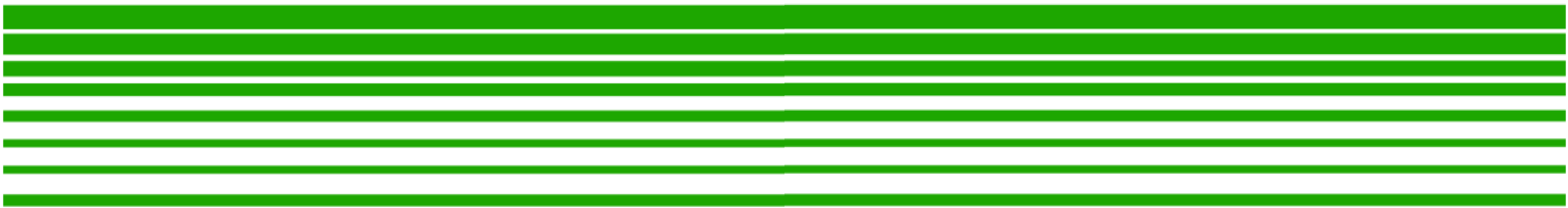
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