DRAGONFLY POND

Subject: Science, Social Studies

Skills: Citizenship, Decision Making, Discussion, Media Construction, Problem Solving, Responsibility, Small Group

Duration: 2 lesson periods (or more depending on depth and discussion)

Setting: Classroom

Materials:

For each group of students:

—scissors
—masking tape
—paste or glue
—paper
—one set of land use cutouts
—one Dragonfly Pond cutout
—a large piece of paper (18"x24") upon which to fasten the cutouts

Michigan Curriculum Framework Content Standards and Benchmarks:

- **Science LEC- III.5 e-4:** Strand III. Using Life Science Knowledge, Standard 5. Ecosystems (LEC), Benchmark e-4. Describe positive and negative effects of humans on the environment. (Key concepts: Human effects on the environment-garbage, habitat destruction, land management, renewable and non-renewable resources. Real world contexts: Household wastes, school wastes, waste water treatment, habitat destruction due to community growth, reforestation projects, establishing parks or other green spaces, recycling.)
- **Science II.III.5.MS 5:** LEC Ecosystems, Standard III.5. Describe how materials cycle through an ecosystem. Benchmark MS 5. Explain how humans use and benefit from plant and animal materials.
- **Social Studies II.2.LE 2:** Strand II. Geographic Perspective, Standard 2. Human/Environment Interaction, Benchmark LE 2. Describe the location, use, and importance of different kinds of resources and explain how they are created and the consequences of their use.
- **Social Studies VI.1.LE 2:** Strand VI. Public Discourse and Decision Making, Standard 1. Identifying and Analyzing Issues, Benchmark LE 2. Explain how a particular public issue became a problem and why people disagree about it.
- **Social Studies VI.1.LE 3:** Strand VI. Public Discourse and Decision Making, Standard 1. Identifying and Analyzing Issues, Benchmark LE 3. Evaluate possible resolutions of a public issue.
- **Social Studies II.2.MS 3:** Geographic Perspective, Standard 2. Describe, compare, and explain the locations and characteristics of ecosystems. Benchmark MS 3. Explain the importance of different kinds of ecosystems to people.
- **Social Studies II.2.MS 4:** Geographic Perspective, Standard 2. Describe, compare, and explain the locations and characteristics of ecosystems. Benchmark MS 4. Explain how humans modify the environment and describe some of the possible consequences of those modifications.

Kent County Collaborative Core Curriculum (KC^4):

—**Science:** 5:4
—**Social Studies:** 4:4, 4:8, 4:9
6:3, 6:4, 6:5, 6:10
7:3
8:3, 8:9

OVERVIEW

Students design a plan of human land use activities around the image of a pond. They determine the best locations for homes, businesses, industries, and farms with respect for the environment.

OBJECTIVES

After participating in this activity, students will be able to:

- Evaluate the effects of different kinds of land use on wetland habitats.
- Discuss and evaluate lifestyle changes to minimize damaging effects on wetlands.
- Work together in small groups to determine wise land use.

BACKGROUND

Every human use of land affects wildlife habitat, positively or negatively. What humans do with land is a reflection of human priorities and lifestyles. The search for a modern day "good life" and all of its conveniences produces mixed results for wildlife, the natural environment, and thriving communities. Sometimes people see undeveloped areas of natural environment as little more than raw material for human use. Others believe that the natural environment is to be preserved without regard for human needs. Still others yearn for a balance between economic growth and a healthy and vigorous natural environment. Very real differences of opinion regarding balance exist between well-meaning people.

At the core of land use issues is the concept of growth. Growth in natural systems has inherent limits, imposed by a dynamic balance of energy between all parts of the system. Energy in natural systems is translated into food, water, shelter, space and continued survival. This means that the vitality of natural systems is expressed by their ability to be self-regulating. This capacity for self-regulation makes it possible for all natural members of an ecosystem to live in harmony. All the life forms of any ecosystem must be considered. The microbes in the soil are just as necessary to a habitat as the

plants and predators.

It is this natural dynamic balance, with all of its inherent and essential parts, that much of human land use has tended to disturb. Human activities can often go beyond the natural limits of a setting. Humans have the ability to import energy sources that allow a system to exceed its natural limits—or to remove energy sources that are necessary for a system to stay in balance. For example, people can build dams to create power, water can be captured for irrigation, and wetlands can be drained for homes and buildings. All of these activities affect wildlife habitat.

Wetlands, for example, are often seen as swampy wastelands, yet they are the nurseries for hundreds of forms of wildlife. Fish, frogs, toads, migrating birds, snakes, insects and a remarkable variety of plants all make wetlands their home.

Wetlands are highly vulnerable to development, pollution, and other forms of human interference with the natural flow of water. Hundreds of thousands of acres of valuable wetlands are lost each year—for example, to draining, dredging, filling, and pollution.

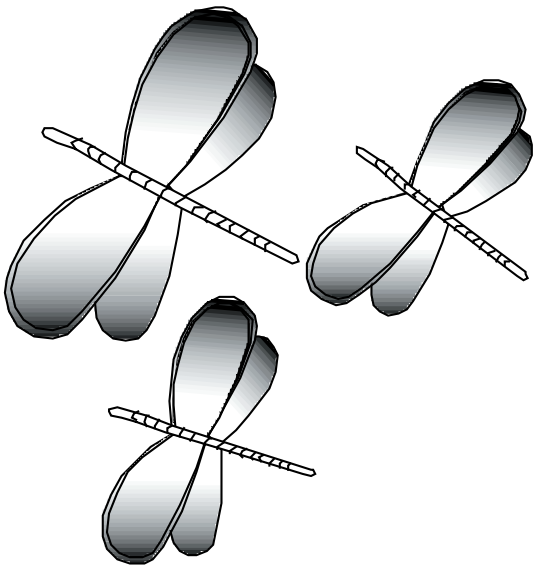
Given the extensive impacts humans have already had and continue to have on the land, a major challenge now facing humans is how to have a more responsible impact. How can we develop the awareness, knowledge, skills, and commitment that are necessary in order for humans to take responsible actions affecting the remaining areas of natural wildlife habitat? How can we develop the necessary understanding to restore a more natural dynamic balance in places where human disturbance has existed for centuries?

The major purpose of this activity is to encourage students to wrestle with these concerns. In this simulation, students use the "Dragonfly Pond" as a microcosm of environmental concerns involved in management decisions. They struggle with the arrangement of overlapping and conflicting land uses in an effort to preserve wetland habitat. When the students reach some kind of agreement about the local issues, the activity shifts to how their decisions affect other dragonfly ponds downstream. The activity ends with consideration of the idea that the planet is, on the largest scale, a single "Dragonfly Pond."

PROCEDURE

1. Prepare copies of the two cutout sheets ahead of time. Explain the activity. Tell the students that they will be responsible for arranging the pattern of land use around the Dragonfly Pond in such a way as to do the best they can to preserve the health of this beautiful aquatic area.

2. Divide the class into groups of three to five, with each group representing one of the interest groups. Students will stay in these groups until the end of the activity.



Possible interest groups are:

- residents - want to live in the area
- farmers - want to use the land to raise food and livestock
- business interests - want to use the land for commerce and economic growth
- gas station owners - want to make a living in servicing and repairing cars
- parks department personnel - want people to have a place for recreation
- highway department personnel - want to maintain access in the area
- bleach factory representatives - want to preserve jobs and commerce

NOTE: Add others that you think may be locally important.

3. Pass out the land use materials. Pass out the 18"x24" paper that will serve as the base for each group's pond and its associated land use activities. Have the students cut out the land use pieces and Dragonfly Pond. Tell them that all the land use cutouts must be used. Park and farmland may be cut to smaller pieces, but all the pieces must be used. Parts may touch, but not overlap. The students may also create additional land uses of their choosing. When they fasten the cutouts to their large base sheet, suggest that they use small loops of tape. This will allow them to change their minds before pasting the pieces down.

4. Once the students have cut out the necessary materials and are ready to begin the process of making land use decisions, have them first create a list of pros and cons for each land use. Guide the class discussion so that they consider the consequences of each land use.

Record these on the chalkboard. The following are only a few of the many possible examples:

PRO	CON
Businesses: •produce employment •provide commerce •create economic stability	•produce wastes and sewage •may contaminate water (detergents, pesticides) •use chemicals/fertilizers (lawns, etc.) •sometimes drain wetlands for development
Homes: •provide a sense of place •develop a sense of community •provide homes for growing populations	•generate wastes and sewage •use water •contribute to loss of wildlife habitat •sometimes drain wetlands for development
Farms: •produce food •economic value •provide jobs through seasonal employment •provide wildlife habitat	•many use pesticides and fertilizers that can potentially harm the environment •source of natural soil erosion •sometimes drain wetlands for farmlands •may produce sounds and odors that are unpleasant to neighbors

5. Have the students work in their teams for a long enough period of time to begin seriously to grapple with the challenge.

6. Invite each interest group to volunteer to display and describe their work in progress. Encourage discussion of their choices. In the discussions emphasize that:
   - No land use can be excluded.
   - Wildlife habitat must be preserved.
   - Everyone must agree.

7. Look for the consequences of their proposed land use plan. Be firm about the issues, but fair about this being a very difficult set of choices. Ask additional interest groups to volunteer to show their work in progress and to discuss their decisions. NOTE: For wildlife habitat, this is a "no-win" activity in many ways. The best that can be hoped for is that the land use plans will minimize the threats to the Dragonfly Pond.

8. Continue the discussion by asking more students to share their proposed plans. Again, be firm in discussing the consequences. Point out that shutting down the factory and businesses will likely destroy the economic base of Dragonfly Town. Abandoning the farm affects food supplies and employment. Farmlands provide habitat for some wildlife. However, if wetlands are drained to create farmland, that results in a loss of habitat for some wildlife as well as a loss of other important values of wetlands.

9. Give the students additional time to work in their groups to come up with what they believe to be the best possible land use plan under the circumstances. Being sensitive to their frustrations, display all the final land use plans above a chalkboard for all to see and discuss. Analyze and discuss the merits of each of the approaches. Point out that, although their solutions may not be perfect, they can minimize the damage to Dragonfly Pond.

10. Choose one of the students' images above the chalkboard. Next, on the chalkboard, continue Dragonfly Creek downstream. Many students tend to dump effluent below Dragonfly Pond and let it flow downstream. Show the route the stream might travel. On the chalkboard drawing, have the downstream part of Dragonfly Creek become another pond and wetland and label the new area Laughing Gull Lake. Continue the drawing to Reeds Wetland and finally into Salmon Bay. For more impact, use local water sources that flow to a local river and then to a Great Lake.

11. Ask the students to brainstorm possible problems that could be faced within each of these aquatic systems as a result of the human activities at Dragonfly Pond. Make inferences and predictions about the potential consequences of these activities. For example, you could emphasize the effluent from the bleach factory. How will it be treated? Where? By whom? Where will it go? With what effects?

12. Ask the students to look again at all of the land uses in this activity. If they had been considering any of them as inherently bad, have them consider a different question. What could the people who are actually in charge of these various land uses do in their practices to minimize the damage to Dragonfly Pond? End the activity with an emphasis on solutions rather than on problems. Point out, for example, the revolution taking place in the "mining" of industrial effluents through "scrubbers" to extract wastes as profitable resources. (Perhaps the students need to make a "scrubbing filter" for the bleach factory.) Agricultural practices are changing so as

to reduce the use of potentially harmful agents. Petroleum wastes are being recycled and domestic awareness regarding uses of pesticides and detergents is evolving.

13. Ask the students to create a list of things they can personally do to begin to reduce the potentially damaging effects of their own lifestyles on the "downstream" habitats that they may never have thought about. If possible, invite them to report periodically throughout the school year on their progress in carrying out these new practices. Consider with them in discussion the idea that all the waters of the planet are, in fact, part of a single "Dragonfly Pond."

ASSESSMENT OPTIONS

1. Ask students to write their answers to all or some of the following questions:
   - Name three things that businesses, home owners, and farmers can do to reduce or prevent damage to wetlands. Under what conditions, if any, do you think actions to reduce damage to wetlands would be appropriate? Why?
   - Under what conditions, if any, do you think actions to reduce damage to wetlands would be inappropriate? Why?
   - Select any action that you personally think would be appropriate and that you could take to reduce or prevent damage to wetlands. Describe what you would do.
2. Observe and critique the students as they work in small groups to design a land use plan around a pond. Look for participation from each student and evaluate cooperation.
3. Ask students to select a local issue and write a core democratic value paragraph to support their position on that issue.

Adaptations/Extensions

1. Do the activity again up to step 6. After each interest group has presented its plan, form new groups with each of the new groups having a representative from each interest group. Have the new groups devise plans that all of the interests can agree on. Discuss how, if at all, this is a realistic experience in working to balance various community interests.
2. Set up an action team to locate a dragonfly pond in your community. Determine the overall quality of the wetlands with which it is connected.
3. Trace any stream or river system that passes through your community from its source to its entrance into the Great Lakes and finally the Atlantic Ocean. List all the sites that you can identify that lower the quality of the waters in their journey and suggest how to reverse the process.
4. Read "Letting Swift River Go," a children's book about reservoirs and peoples rights.
5. Collect newspaper articles for local water-related and land use issues as a current events activity.
6. Learn more about environmental impact statements. Try to obtain actual copies of statements about wetlands and open spaces in your area. See what concerns are addressed in these documents.
7. Find out about private organizations that work to protect wetlands and/or open spaces. Two examples are The Nature Conservancy and Ducks Unlimited. Find out about what they do and how they do it.
8. Find out about zoning laws and land use regulations in your area. Would the plan your group proposed for Dragonfly Pond be allowed in your community?

Computer Extensions

1. Explore A Pond. Homepage. 8 May 2002. <http://www.uen.org/utahlink/pond/> Students can take a virtual tour of a pond. There are also options to Adopt-A-Pond.
2. Ducks Unlimited. Homepage. 22 Jan. 2002. <http://www.ducks.org> "The DU Mission: To fulfill the annual life cycle needs of North American waterfowl by protecting, enhancing, restoring and managing important wetlands and associated uplands. Ducks Unlimited stands today as a leader in wetland and wildlife conservation. Today, DU and our many partners utilize space-age technology and cutting-edge research to conserve habitat as efficiently and cost effectively as possible."

TEACHER MEMOS

SOURCE

Adapted with permission from Project WILD Aquatic: "Dragonfly Pond." Western Regional Environmental Education Council, 1992. Pages.154-159.

ADDITIONAL RESOURCES

Contacts:

American Planning Association (APA) or the Michigan Chapter of the APA
Ducks Unlimited (Local, State, and National Chapters)
Grand Valley Metro Council
Land Conservancy of West Michigan
Michigan Department of Environmental Quality (DEQ)
Michigan Department of Natural Resources
Michigan Land Use Institute
Mountain Ridge Development, LLC
Neighborhood Wetland Monitors- Kent County Area
Timberland Resource Conservation and Development
U.S. Army Corps of Engineers (the Corps)
U.S. Environmental Protection Agency (EPA)
United Growth for Kent County

References and Teacher Resources:

Chesky, Edward. Habitat Restoration: A Guide to Proactive Schools. Kitchener, Ontario, Canada: Waterloo County Board of Education, 1993.

Cwikiel, Wilfred. Michigan Wetlands: Yours to Protect. Conway, MI: Tip of the Mitt Watershed Council, 1992.

Mitsch, William J. and James G. Gosselink. Wetlands. 2nd ed. New York, NY: Van Nostrand Reinhold, 1993.

Morris, Marya. Wetlands Protection: A Local Government Handbook. Washington, DC: American Planning Association, 1991.

Polesetsky, Matthew. Global Resources: Opposing Viewpoints. San Diego, CA: Greenhaven Press, Inc.,1991.

Additional Lessons:

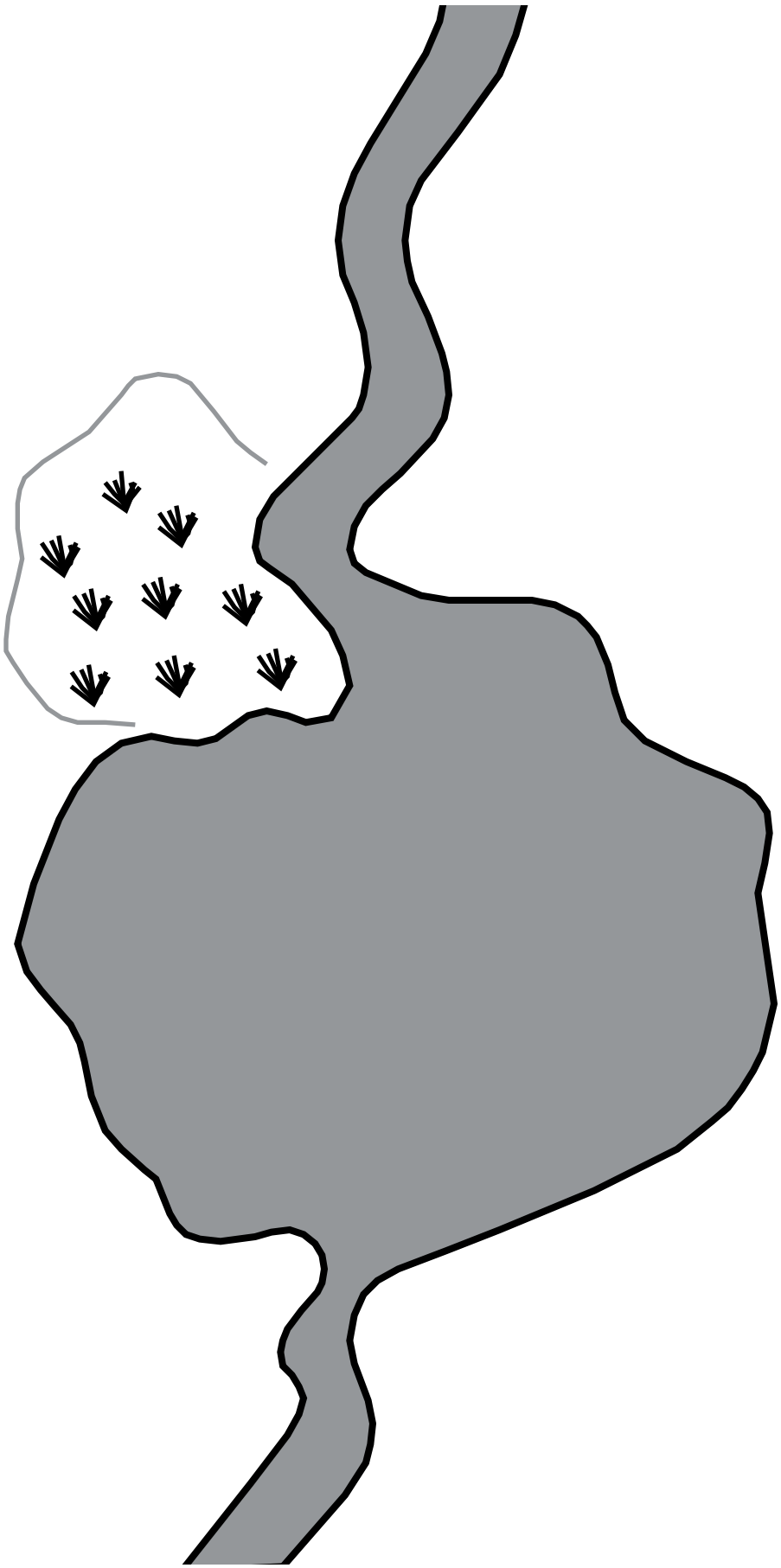
Project WILD: "To Zone or Not to Zone" Pg. 266-269, and "Cabin Conflict" Pg. 264-265.

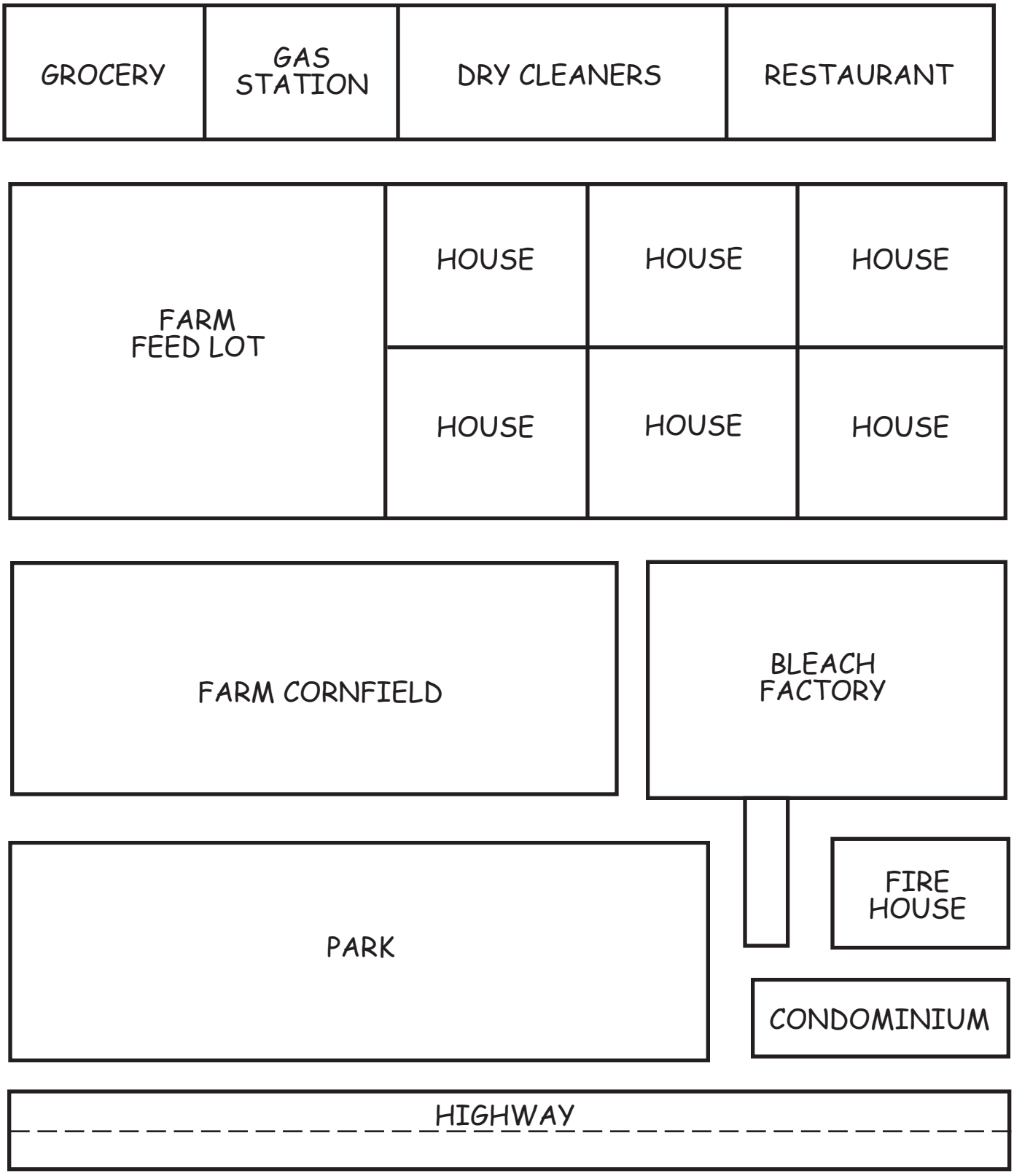
CONCEPTUAL FRAMEWORK REFERENCE

IA1,IB3,IB4,IC3,IC4,ID1,ID3,IE3,IIA2,IIB2,IID1,IID2,IVC, IVF1,V A1,BB1,VC1,VC2

The absence of land use planning that considers resources, ... integrity of ecosystems and the degradation of urban environments will continue to be the greatest threat to the quality of Michigan's environment.

—Governor's Relative Risk Report, 1992




GROCERY
GAS STATION
DRY CLEANERS
RESTAURANT
FARM FEED LOT
HOUSE
HOUSE
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HOUSE
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HOUSE
FARM CORNFIELD
BLEACH FACTORY
FIRE HOUSE
PARK
CONDOMINIUM
HIGHWAY