Watershed Management – What Every Riparian Property Owner Should Know and Do

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This is the first of a two-part article about watershed management. The focus of this article is on riparian property owners and specific things waterfront property owners should know and do to protect lakes and streams. The second article, that will appear in the next issue of the The Michigan Riparian, will be entitled *Watershed Management – What Every Government Official Should Know*. The second article will look at watershed management from a governmental perspective and focus on watershed planning and water resource protection policy.

What is a Watershed?

A watershed is the land area that drains to a lake or stream. A watershed boundary is typically defined by examining a topographic map that shows the land elevation around a particular lake or stream. Once a watershed boundary has been identified, soils, land cover, drainage patterns and a variety of other features can be evaluated. Watersheds are essentially large catchment basins that convey everything to the lowest point – a lake or stream.

The Importance of Watershed Management

Water quality is often a reflection of the watershed. Lakes and streams with highly urbanized watersheds tend to be of poorer quality than lakes and streams in less developed watersheds. There is often a tendency to view a problem in a lake or stream with no regard for the watershed. For example, excessive plant growth is often cited as a problem in lakes, and millions of dollars are spent annually for aquatic plant control. Yet, in some instances, the increase in plant growth is merely a symptom of another problem, such as fertilizer runoff from the watershed. Until the watershed problem is addressed, the symptom will persist.

Watershed management is especially important in the shoreland areas immediately adjacent to lakes and streams. All too often, trees, shrubs, and brush are cleared from the shoreline. Natural vegetation is then replaced with turf grass and a sea wall is installed. Many riparian spend considerable time and effort removing logs, sticks, rocks, and other natural "debris" from their shorelines not realizing that all the things that have been removed are habitat for plants and animals. There is a whole food web that exists within a natural shoreline. When the habitat is cleared, the food web falls apart.

It has long been recognized that logs, sticks, and other woody structure in river systems provide habitat for a variety of aquatic insects. These insects are the foundation of the food chain and are essential to sustaining a healthy fishery. Recent research indicates that same holds true for lakes. For a riparian property owner, these are extremely important findings and underscore the need to properly manage shoreland property.

Impacts of Shoreland Development

Several recent studies have examined the impact of shoreland development. The recurring conclusion of these studies is that excessive development of shorelands is adversely impacting the quality of our lakes and streams.

A recent national assessment found that poor shoreline habitat was the biggest problem facing the nation's lakes.[1] Further, the national assessment found that lakes with poor shoreline habitat were three times more likely to be in poor biological condition.

In one Wisconsin study, runoff from lawn areas was compared to runoff from undeveloped wooded areas.[2] This study found that the amount of water that runs off a lawn was generally 10 or more times greater than runoff from an undeveloped wooded site. As a result of the increased rate of runoff, the phosphorus and nitrogen transported from the lawn was 10 to 100 times greater than the amount transported from the undeveloped wooded site. The same study found nitrate and phosphorus levels in groundwater under lawns was 3 to 4 times higher than groundwater under wooded sites. The researchers concluded that nutrients from lawns can leach to the water table and ultimately the lake, even if surface runoff itself does not reach the lake.

In a study of the impact of increased development around Higgins Lake in Roscommon County, researchers found that the concentration of phosphorus in near-shore waters was about 1.5 times higher than the concentration found in the deep lake basins, and E. coli bacteria levels in groundwater increased in concentration as building density exceeded 0.40 buildings per acre.[3] Septic systems were cited as the most likely source for increased phosphorus in near-shore lake water and groundwater.

Why the Fuss about Phosphorus?

Phosphorus is the nutrient that most often stimulates the excessive growth of aquatic plants and algae, leading to a number of problems collectively known as eutrophication. Once in a lake, a pound of phosphorus can generate hundreds of pounds of aquatic vegetation. Lawn fertilizers and septic seepage are primary sources of phosphorus.

Cultural eutrophication (accelerated lake aging) was recently implicated as a cause of amphibian disease, limb deformities, and mortality.[4] In this study, increased nitrogen and phosphorus enrichment was linked to the emergence and production of an infectious parasite. Eutrophication promoted amphibian disease by increasing the density of infected snail hosts and by enhancing per-snail production of the infectious parasites which, in turn, infected amphibian larvae. Given that cultural eutrophication is often linked to increased shoreland development, this study could have broad significance.

In a study of 14 lakes in the Upper Peninsula of Michigan and northern Wisconsin, bluegill growth rates were significantly reduced as the intensity of lakeshore residential development increased.[5] The loss of near-shore habitat, specifically

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woody debris such as dead trees, was cited as a possible explanation for the decline in growth rate. The results of this study suggest that the development of lakeshores that results in the alteration of shoreline and near-shore habitat may reduce the capacity of lakes to maintain productive fish populations.

In a study of 40 Vermont Lakes, near-shore habitat in developed and natural shoreline areas was compared.[6] At each site a number of components were measured including shoreline tree cover, shading, the amount and type of woody structure, leaf material, sediment type, and the presence of damselflies and dragonflies. The difference between the developed and natural sites was substantial. Developed areas had less tree cover, less shading (and warmer water), less woody structure, less leaf material, and fewer damselflies and dragonflies (a.k.a. fish food). The conclusion of this study was that although the conversion of natural shorelines to lawns may appear harmless to humans, the physical, chemical, and biological characteristics of near-shore areas are radically changed by this activity. As this change occurs, plants and animals that depend on this near-shore habitat for survival will eventually disappear.

A study of 28 lakes in the Pacific Northwest and a literature review of 24 North American lakes found shoreline development can have direct impact on aquatic habitats, food webs, and ultimately fish.[7] In this study, dramatic declines in terrestrial insects were observed in fish diets as shoreline development density increased. The terrestrial insects provided much greater sustenance to fish than openwater and bottom-dwelling prey. The data from this study indicated a clear link between shoreline development, riparian vegetation, and the prevalence of terrestrial insects in fish diets, and indicated shoreland development can alter food webs. This report concluded that one important step that can be taken to preserve the function of lake food webs is to retain riparian vegetation along shorelines.

What to Know and Do

While the recurring conclusion of recent studies is that shoreland development is altering the quality of our lakes, the take-home message is that these impacts can be minimized. Riparians can make a difference, a big difference! The question is, will the difference be good or bad? Shorelands must be thought of as a shared resource between land and water. To maintain healthy lakes and fisheries, the vegetation and woody structure along the shoreline and in near-shore areas of lakes must be preserved.

What You Can Do

- Maintain a natural landscape with natural vegetation
- Leave or maintain a vegetation buffer (i.e., a greenbelt) strip along the shore
- Do not install lawns on slopes that drain to the lake
- Do not add fertilizer to lakeshore lawns
- Limit the amount of impervious area on your property such as sidewalks and driveways
- Reduce erosion
- Enhance infiltration of runoff from rooftops, driveways, and other impervious areas
- Do not remove woody vegetation from nearshore areas
- Install rain gardens to enhance runoff infiltration

Modified from: Evaluating the Effects of Nearshore Development on Wisconsin Lakes. U.S. Geological Survey. Fact Sheet 2006-3033.

The illustrations on the following pages demonstrate things you can do to protect your lake. Remember, while the individual impacts of shoreland alterations may appear subtle, the collective impact is profound. Shoreland disruption must become the exception rather than the rule.

References

[1] U.S. Environmental Protection Agency. 2009. National lakes assessment: A collaborative survey of the nation's lakes. EPA 841-R-09-001. U.S. Environmental Protection Agency, Office of Water and Office of Research and Development, Washington D.C.

[2] U.S. Geological Survey 2006. Evaluating the effects of nearshore development on Wisconsin lakes. Fact Sheet 2006-3033.

[3] Minnerick, R.J. 2001. Effects of residential development on the water quality of Higgins Lake, Michigan 1995-99. U.S. Geological Survey Water-Resources Investigation Report 01-4055.

[4] Johnson, P.T.J., M.J. Chase, K.L. Dosch, R.B. Hartson, J.A. Gross, D.J. Larson, D.R. Sutherland, and S.R. Carpenter. 2007. Aquatic eutrophication promotes pathogenic infection in amphibians. National Academy of Sciences. Vol. 104, No. 40 p. 15781-15786.

[5] Schindler, D.E., S.I. Geib and M.R. Williams. 2000. Patterns of fish growth along a residential development gradient in north temperate lakes. Ecosystems 3:229-237.

[6] Merrell, K., E.A. Howe, and S. Warren. 2009. Examining shorelines, littorally. Lakeline, 29(1): p. 8-13.

[7] Francis, T.B. 2009. Urbanization vs. natural habitat. Lakeline, 29(1): p. 14-17.

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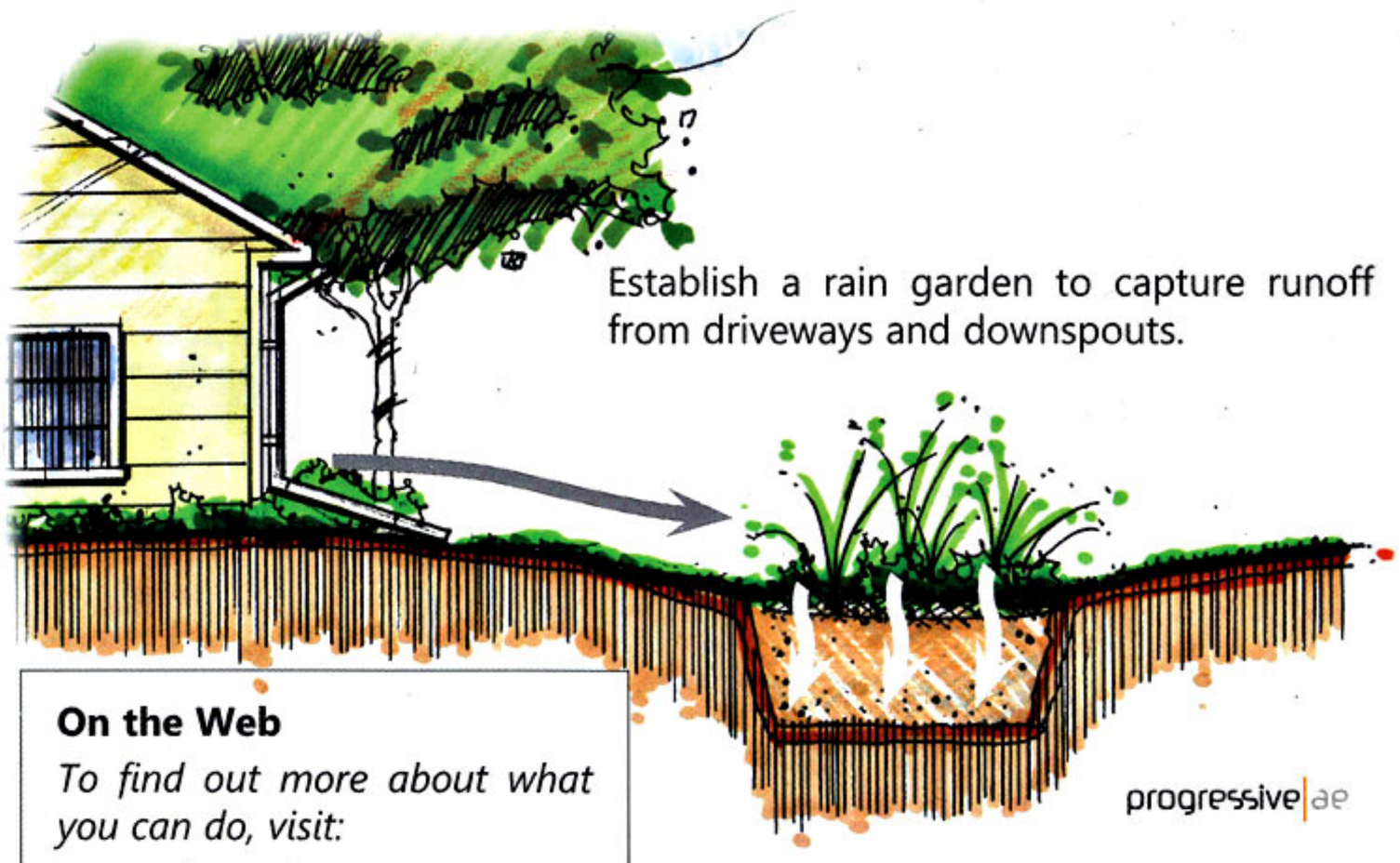

Establish a rain garden to capture runoff from driveways and downspouts.

On the Web

To find out more about what you can do, visit:

www.raingardens.org

www.shoreline.msu.edu

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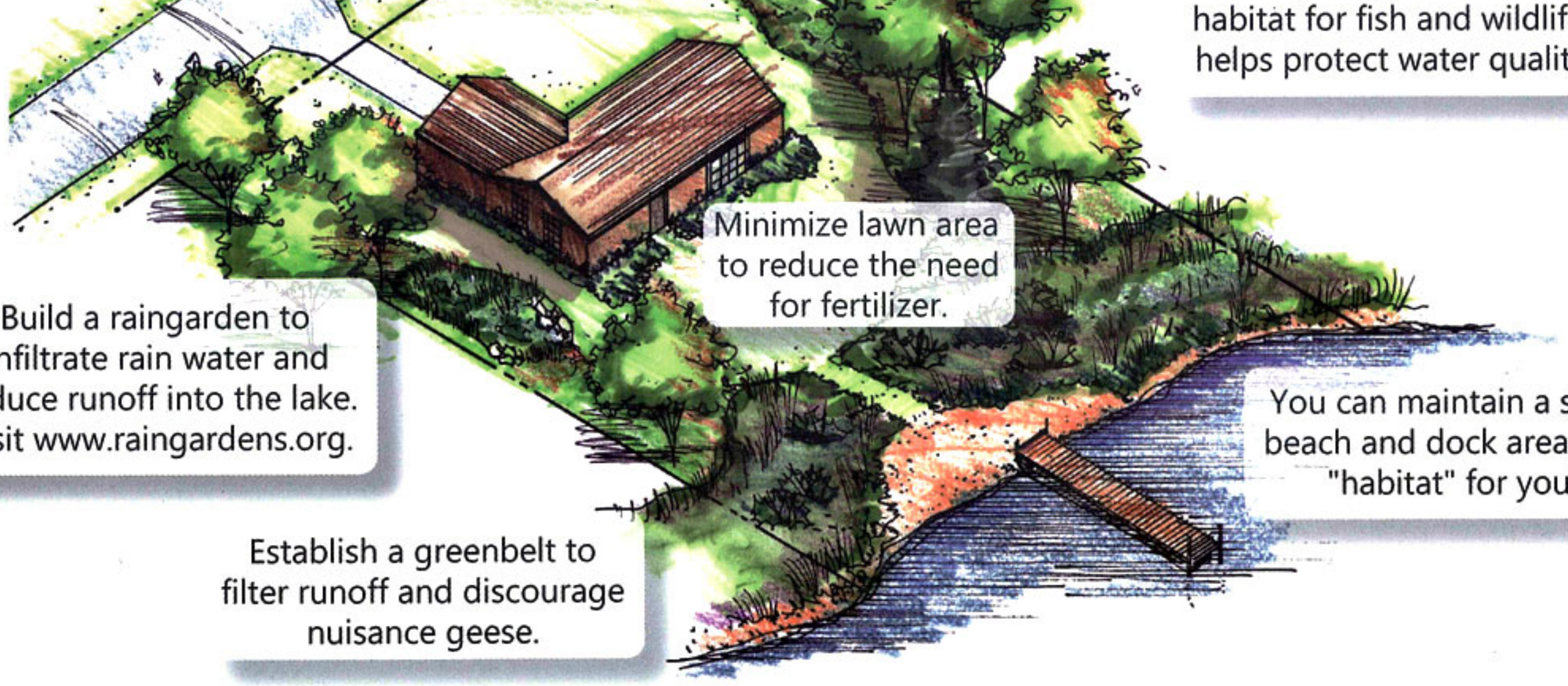
Caring for Your Shoreland

Your shoreland can be maintained to provide beach and boat access for you while maintaining habitat for fish and wildlife.

Most lakeside soils have more than enough phosphorus to grow lawns, trees, and shrubs. Adding phosphorus fertilizer is usually not necessary, and can cause excessive growth of aquatic plants.

Don't dump into storm drains; pollutants may be piped directly to the lake.

Maintain a greenbelt of trees, shrubs, and ground cover—it's habitat for fish and wildlife, and helps protect water quality too.

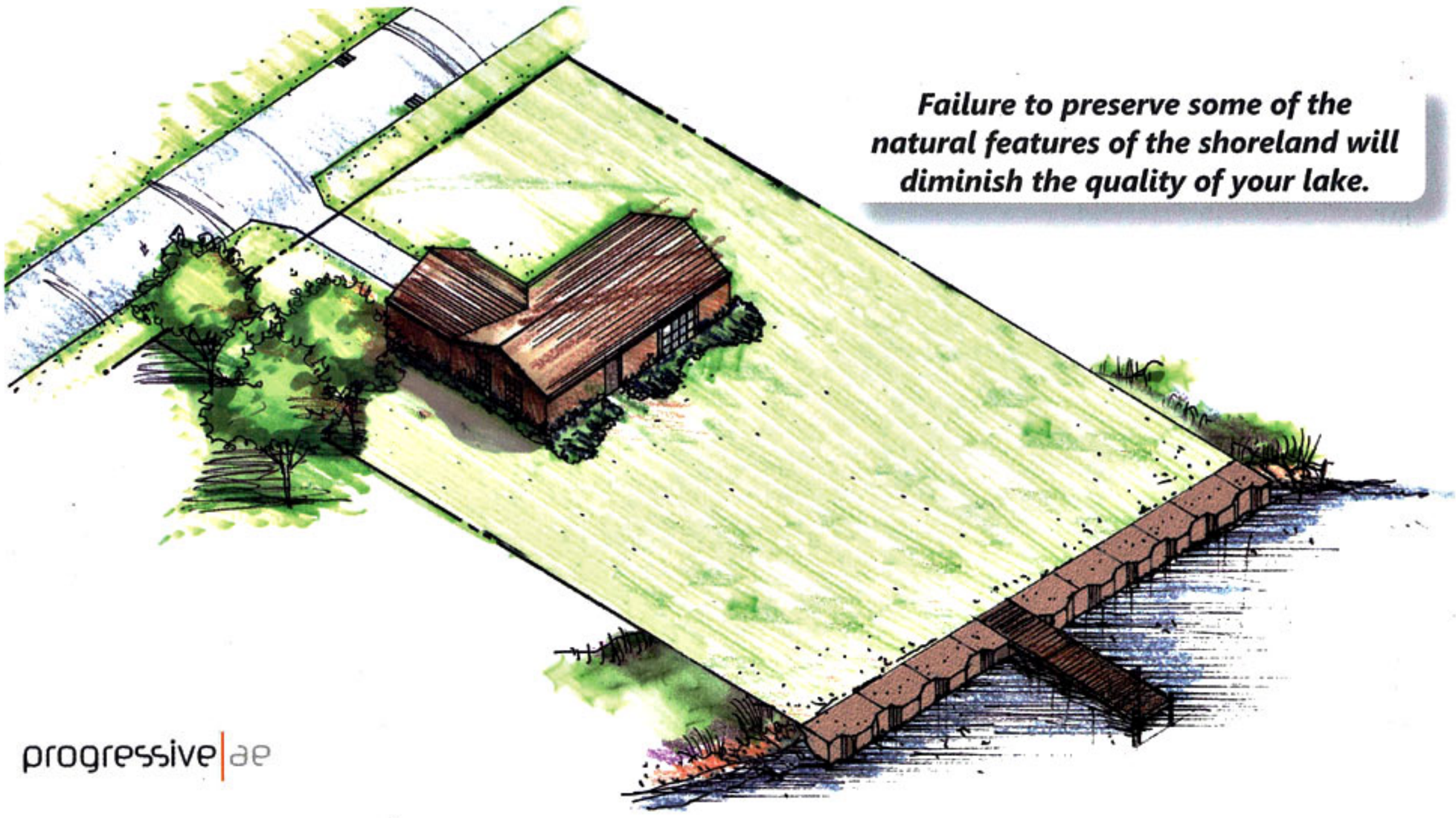


Minimize lawn area to reduce the need for fertilizer.

Build a raingarden to infiltrate rain water and reduce runoff into the lake. Visit www.raingardens.org.

You can maintain a small beach and dock area—it's "habitat" for you!

Establish a greenbelt to filter runoff and discourage nuisance geese.



Failure to preserve some of the natural features of the shoreland will diminish the quality of your lake.

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