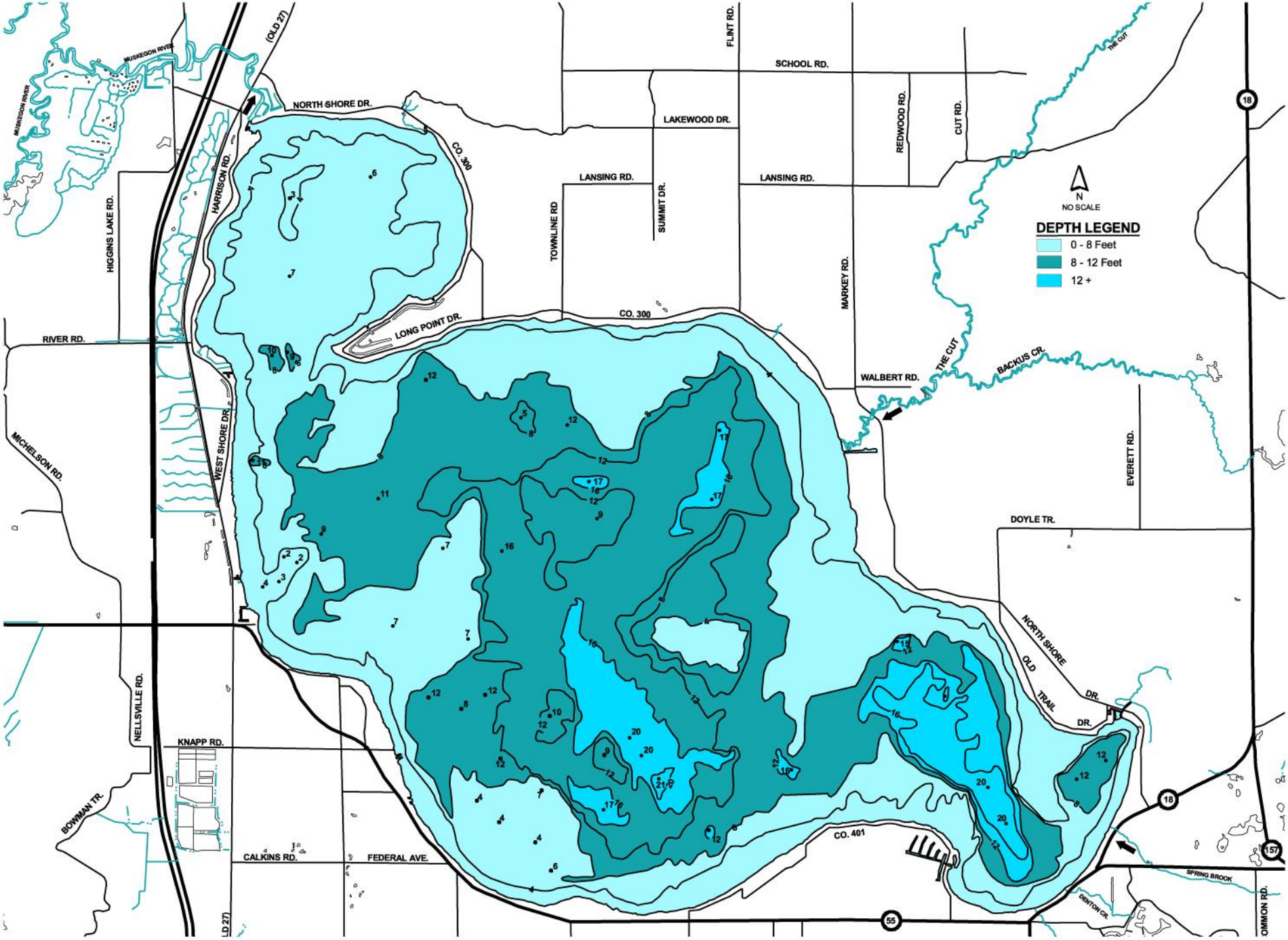
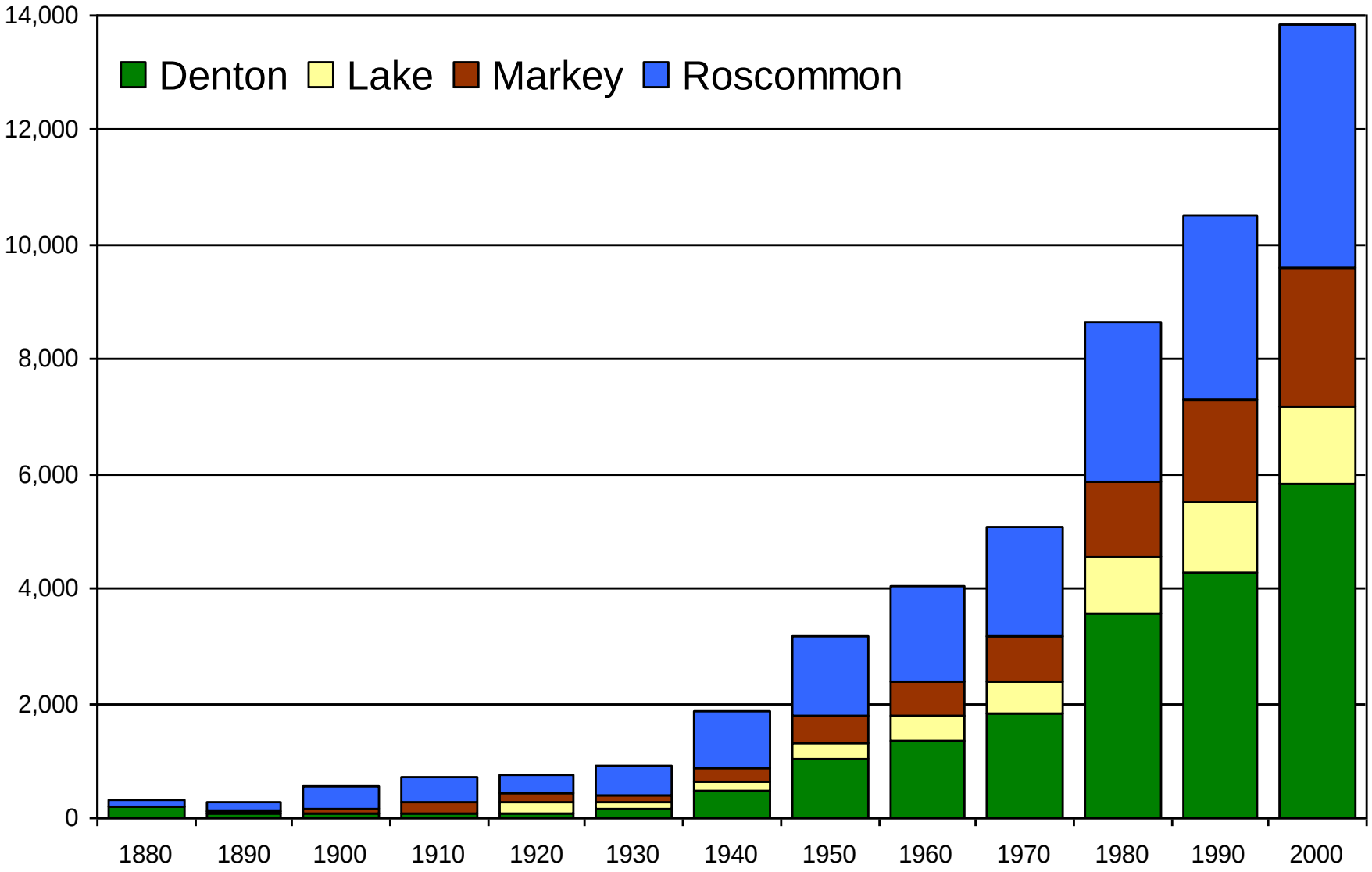
Low Impact Development and Ordinances for Lake Shorelines

Houghton Lake Improvement Board
February 2011

Presenter: Tony Groves, Progressive AE


DEPTH LEGEND
0 - 8 Feet
8 - 12 Feet
12 +
N
NO SCALE
MUSKEGON RIVER
(OLD 27)
NORTH SHORE DR.
HARRISON RD.
HIGGINS LAKE RD.
RIVER RD.
MICHELSON RD.
WEST SHORE DR.
NELLSVILLE RD.
BOWMAN TR.
KNAPP RD.
CALKINS RD.
FEDERAL AVE.
CO. 300
LONG POINT DR.
TOWNLINE RD
FLINT RD.
SCHOOL RD.
LAKEWOOD DR.
SUMMIT DR.
LANSING RD.
MARKEY RD.
REDWOOD RD.
CUT RD.
THE CUT
WALBERT RD.
BACKUS CR.
EVERETT RD.
DOYLE TR.
NORTH SHORE DR.
OLD TRAIL DR.
CO. 401
SPRING BROOK
DENTON CR.
OMMON RD.
18
55
157


HIGGINS LAKE
175
US 127
18
CUT RIVER
BACKUS CREEK
HOUGHTON LAKE
M55
18
157
M55
SPRING BROOK CR
W. HOUGHTON LK. DR.
CHAPPEN CR
LAKE JAMES
DENTON CR
US 127
18


Denton
Lake
Markey
Roscommon
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000

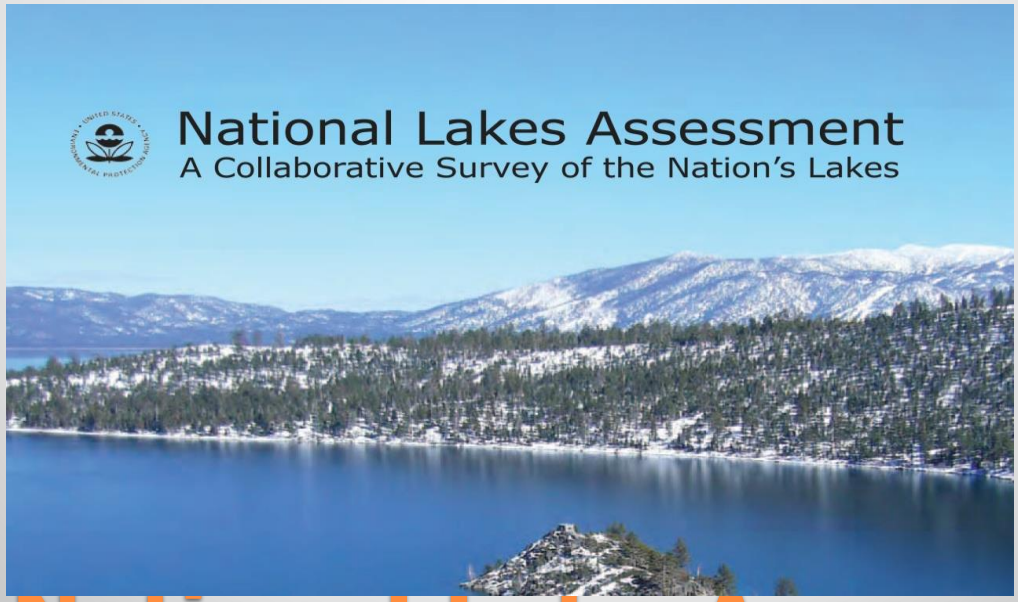
- Local planning and zoning will dictate the type, location, and density of development.
- Phosphorus is the nutrient that most often causes premature lake aging and accelerated eutrophication.
- Watershed management plans should include a planning and zoning component and phosphorus controls.

Watershed Management

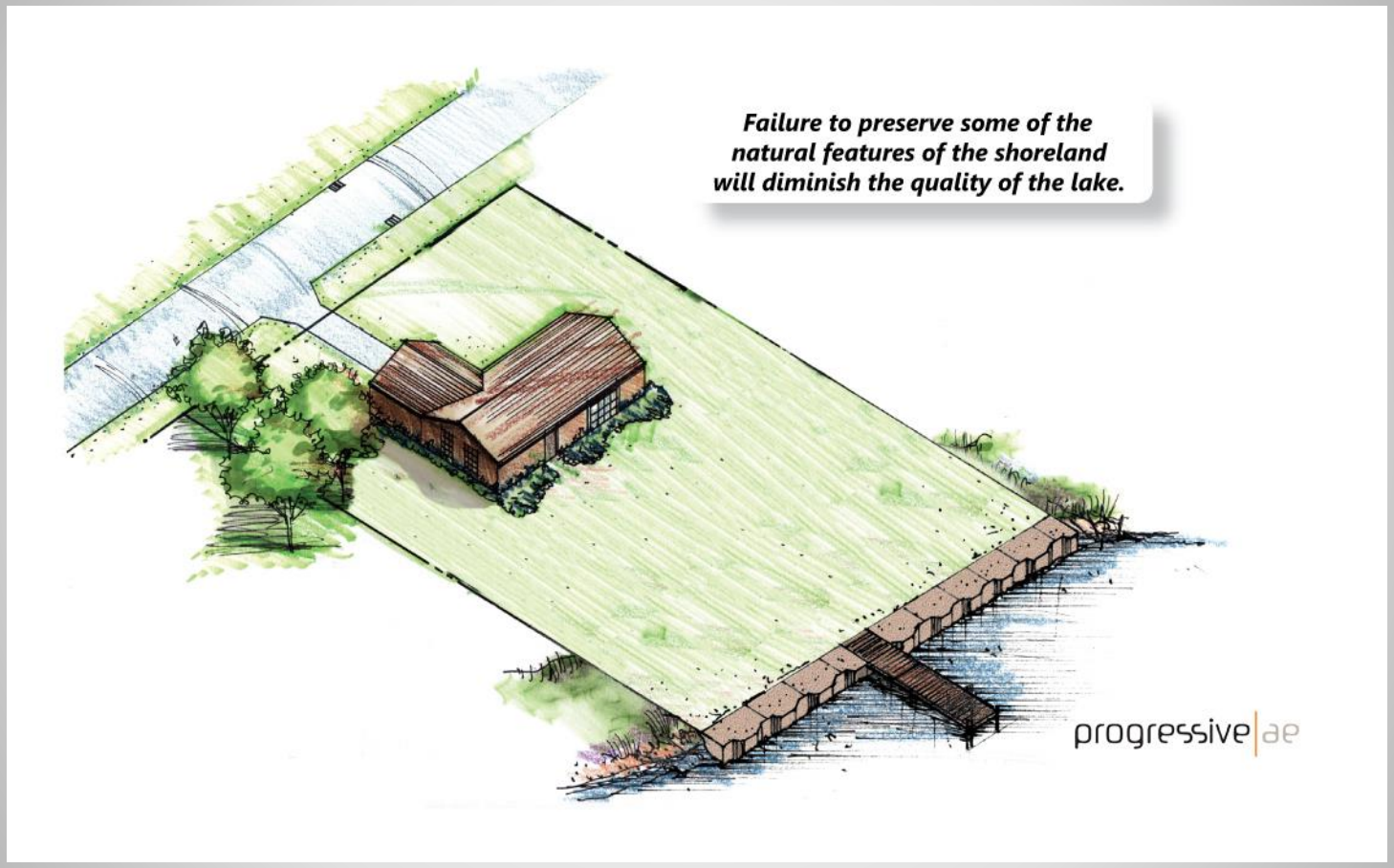
Findings:

Degradation of natural shoreline habitat is the <u>most</u> significant stressor of the nation's lakes.

Poor biological health is three times more likely in lakes with poor shoreline habitat.



EPA's National Lake Assessment


Failure to preserve some of the natural features of the shoreland will diminish the quality of the lake.
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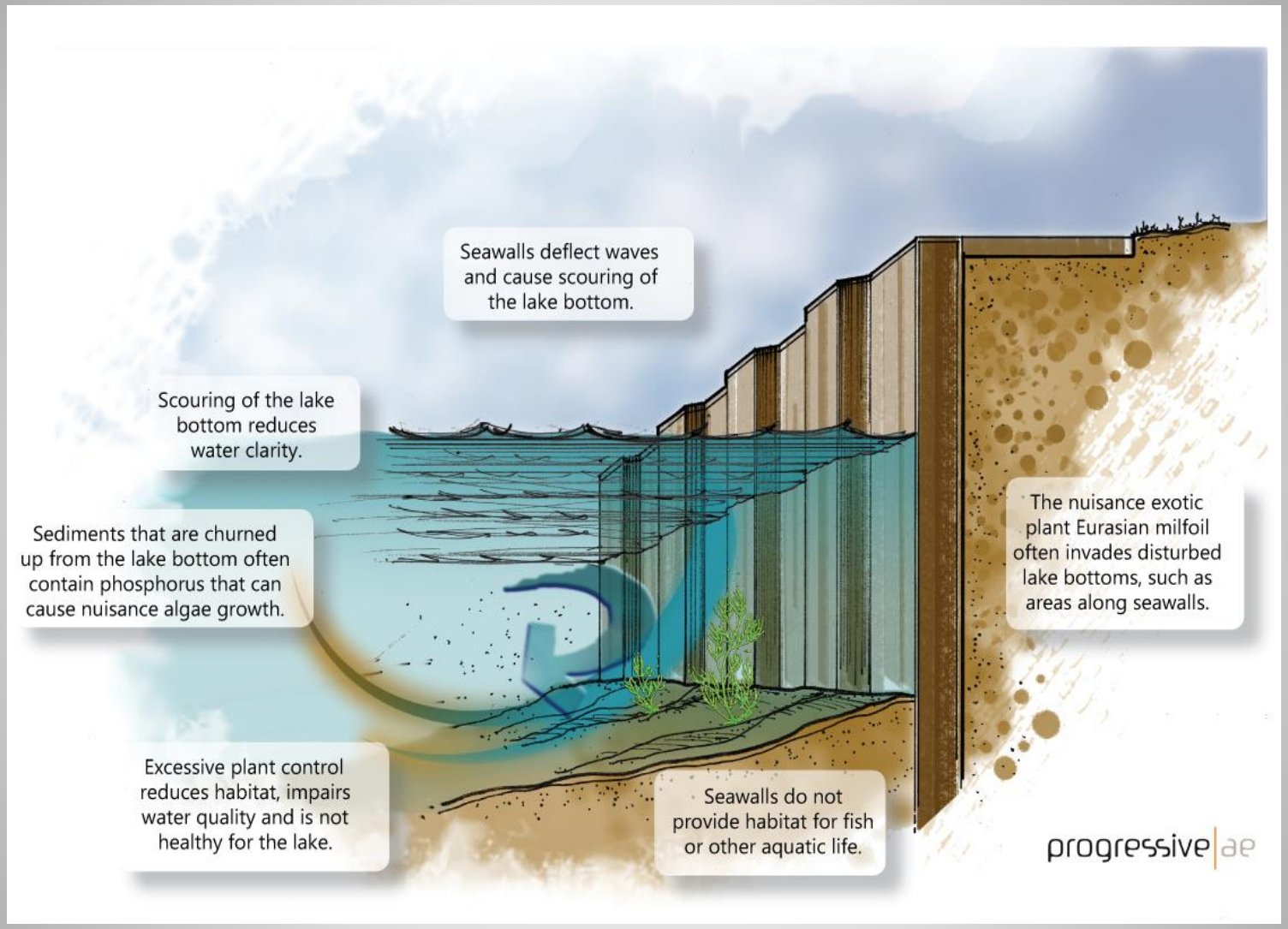
Seawalls deflect waves and cause scouring of the lake bottom.
Scouring of the lake bottom reduces water clarity.
Sediments that are churned up from the lake bottom often contain phosphorus that can cause nuisance algae growth.
The nuisance exotic plant Eurasian milfoil often invades disturbed lake bottoms, such as areas along seawalls.
Excessive plant control reduces habitat, impairs water quality and is not healthy for the lake.
Seawalls do not provide habitat for fish or other aquatic life.
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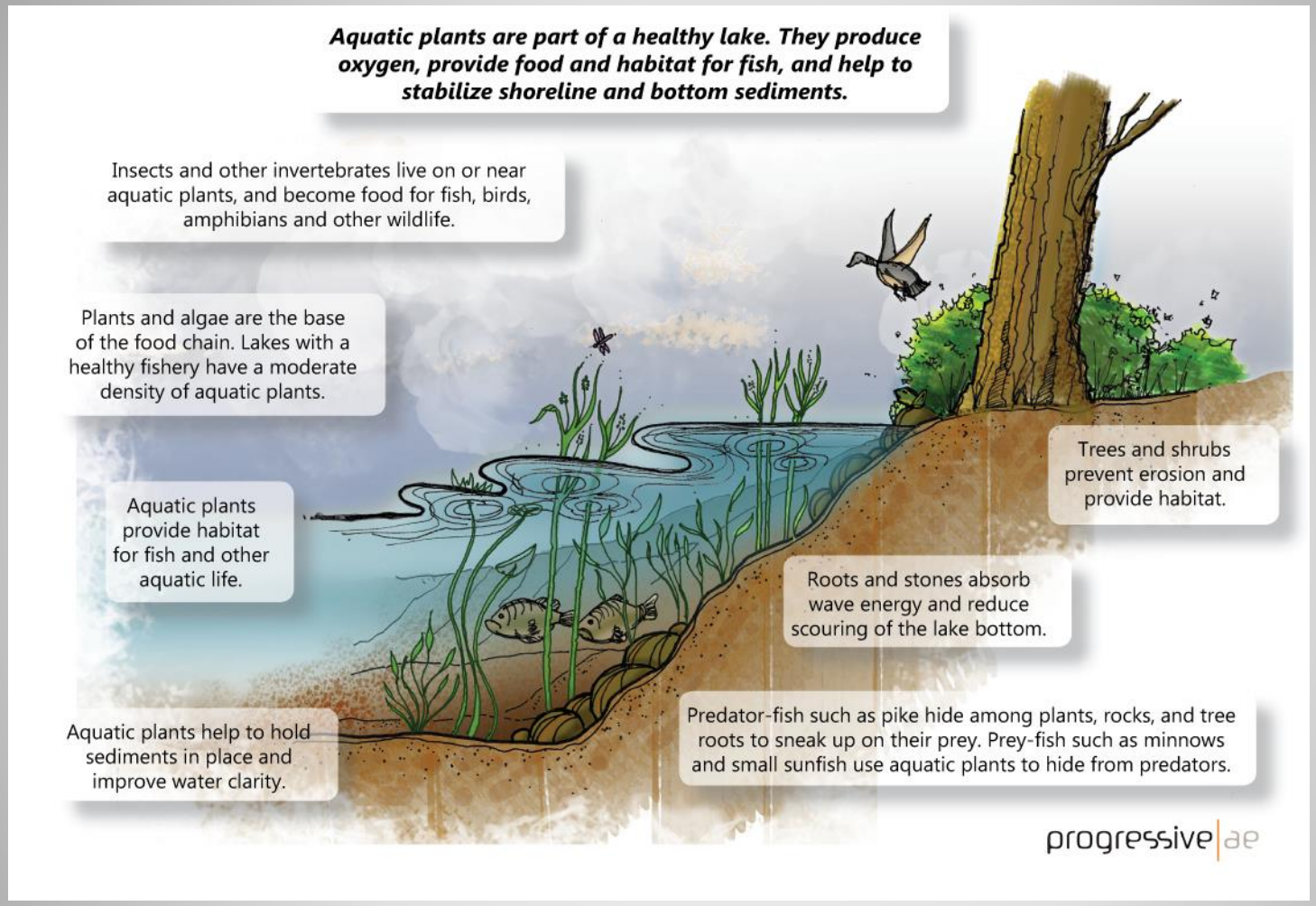
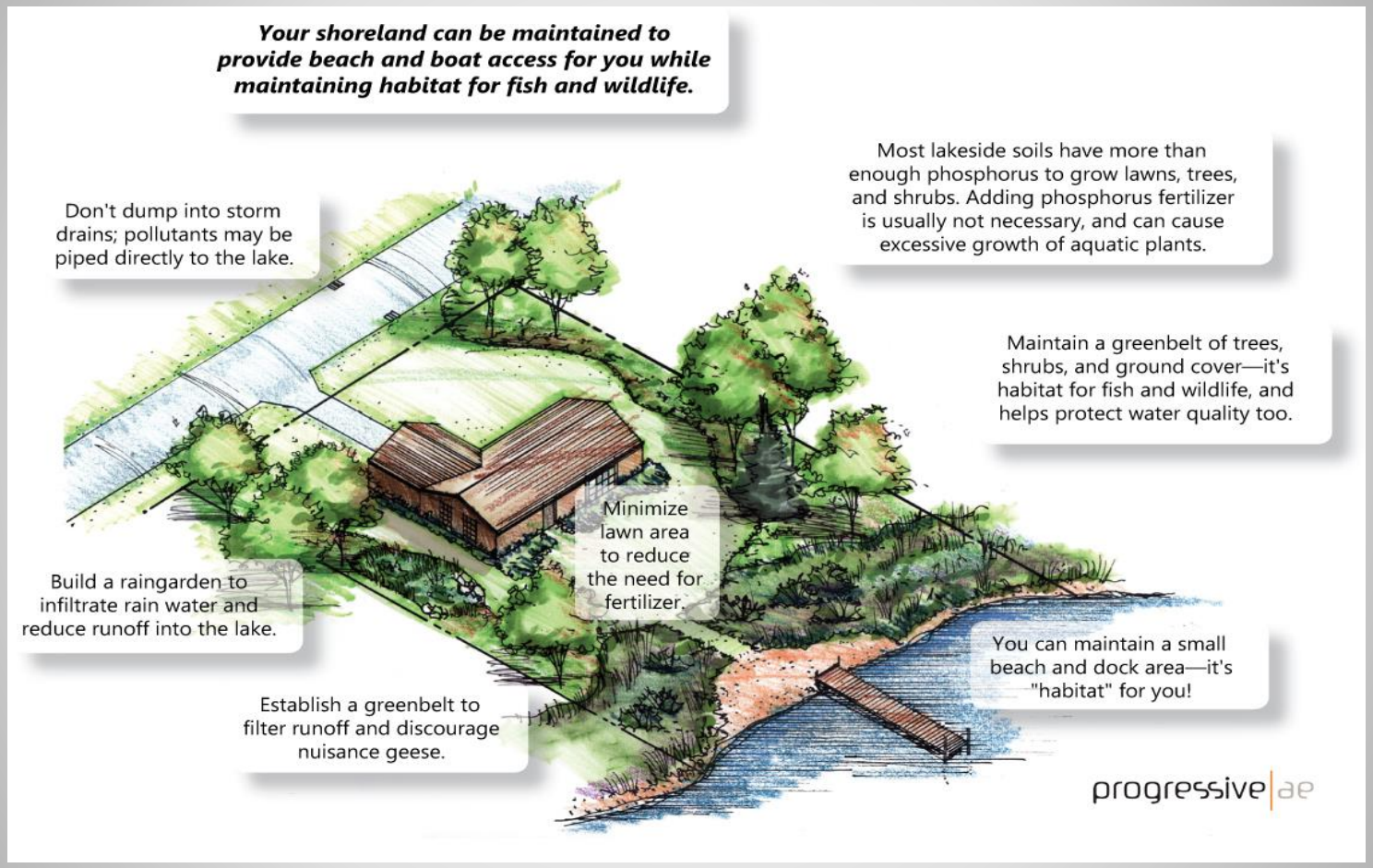


Natural Shorelines

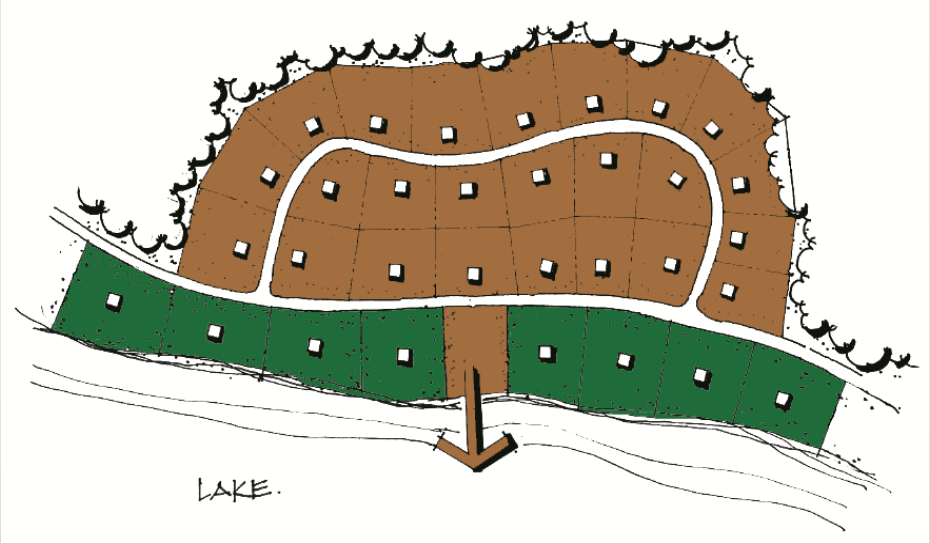


Maintain Natural Cover

Ordinances

- Keyhole (anti-funneling) ordinances
- Phosphorus fertilizer ordinances
- Shoreland overlay ordinances
- Low impact development (LID)

Keyhole development occurs when a lakefront lot is used to provide lake access to a larger development located away from the lake.



Keyhole Development

- Land use conflicts
- Lake and shoreland congestion
- Increased pollution
- Multi-use conflicts
- Decreased property values

Keyhole Problems

- *Legal Basis:*

  Hess vs. Charter Township of West Bloomfield

  Square Lake Hills Condominium Association vs. *Bloomfield Township*

- *Zoning authority v general law "police power" authority*

- *Ordinances should have a logical basis and clearly articulate standards*

Keyhole Ordinances

- Minnesota, Wisconsin, Maine, and Florida have state-wide phosphorus lawn fertilizer standards.

- Several communities in Michigan have adopted fertilizer standards, and Michigan has adopted state-wide standards (effective January 1, 2012).

Phosphorus Fertilizer Ordinances

- Apply to lawns (turf) and exempt agricultural activities.
- Allow phosphorus fertilizers on newly-established lawns.
- Restricts phosphorus fertilizer on established lawns, unless soil test indicates a phosphorus deficiency.

Phosphorus Fertilizer Regulations

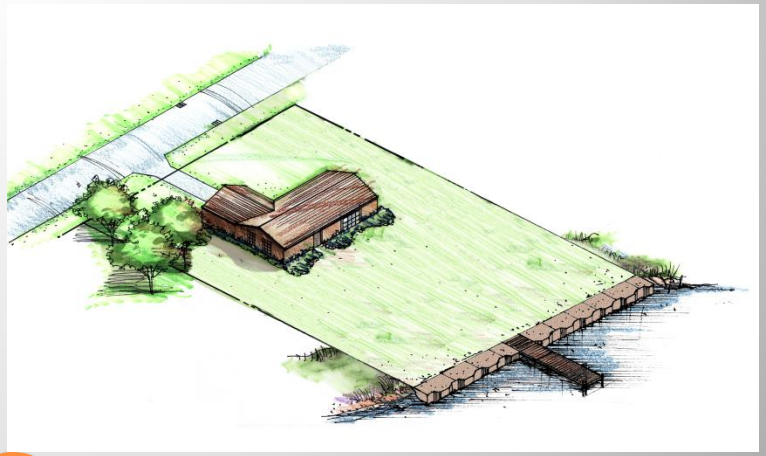
Minnesota Experience

- By 2006, phosphorus-free fertilizer found in 97% of stores and 82% of lawn fertilizers used were phosphorus-free
- No increase in cost for phosphorus-free fertilizers
- 292 tons of phosphorus in 2003 v 151 tons in 2006
- Enforcement not an issue

Fertilizer Ordinance Effectiveness

An ***overlay district*** is a zoning district that applies to a specific geographic area, such as a lake or stream shoreland.

In an overlay district, development must meet all the conditions of the underlying district in addition to the provisions of the overlay district.



Overlay Districts

- Minnesota, Maine and Wisconsin have state-wide Shoreland Overlay standards
- Michigan's Natural Rivers Program
- Can be used to promote uniform development regulations across several zoning districts or political jurisdictions.

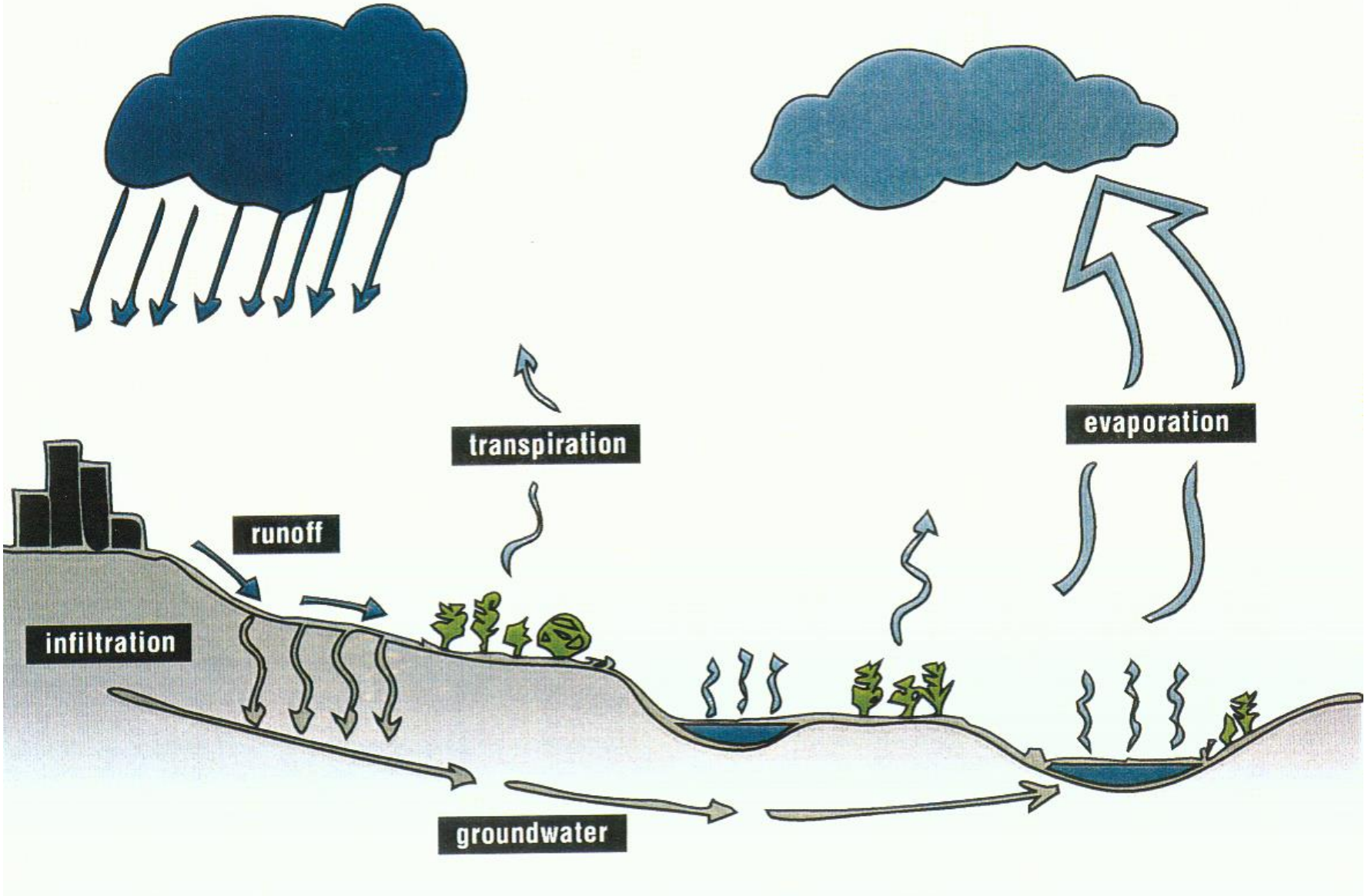
Shoreland Overlay District

- Statement of purpose
- Listing of permitted and prohibited uses
- Setbacks
- Vegetative cover requirements
- Limits on imperviousness

Shoreland Overlay Provisions

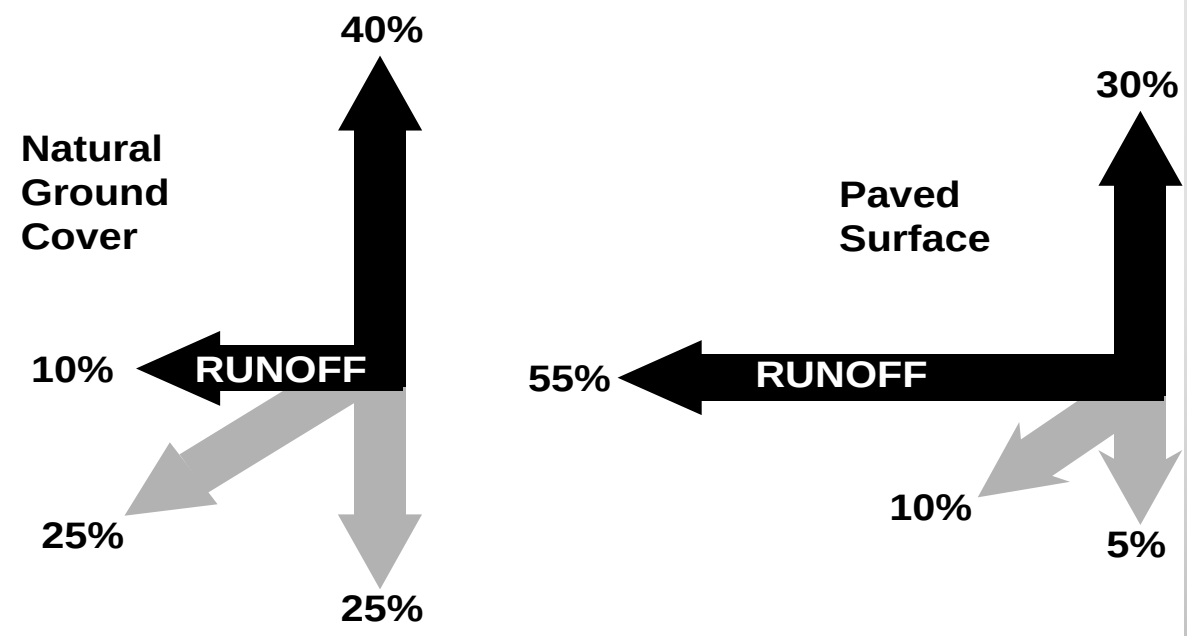
Low Impact Development (LID) is an approach to land development that uses various planning and design practices to protect natural resources and reduce infrastructure costs.

Low Impact Development (LID)

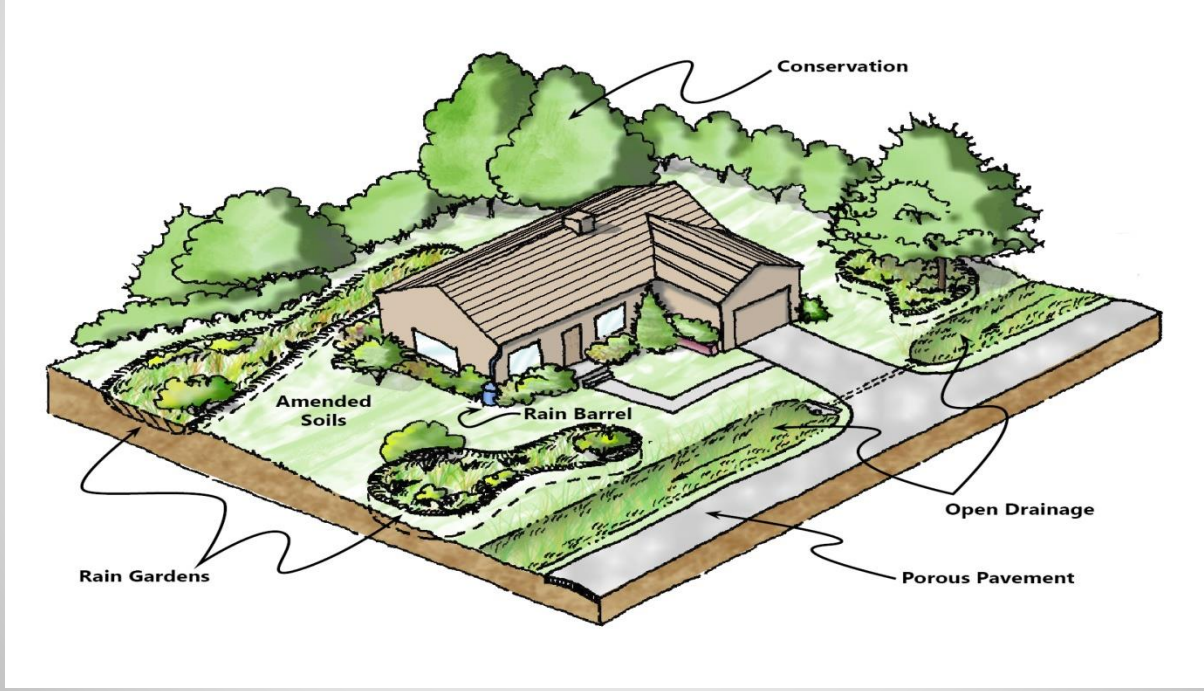


The Hydrologic Cycle

With a LID, development is planned and designed in a way that will not substantially alter the natural hydrologic regime, especially as it relates to the quantity of *runoff* versus *infiltration*.



LID’s are designed to maintain the natural hydrologic cycle by decentralizing and managing stormwater at its source.



- Pavers with voids (grass or gravel)
- Porous asphalt
- Porous concrete

Permeable Pavement

- Storm water is filtered, stored and detained
- Vegetation in a shallow growing medium
- Effective urban solution
- Can also reduce urban heat island effect

Green Roofs

- Shallow swale to convey runoff
- Minimal gradient to encourage infiltration and slow runoff
- Not meant to store runoff

Grass Swales

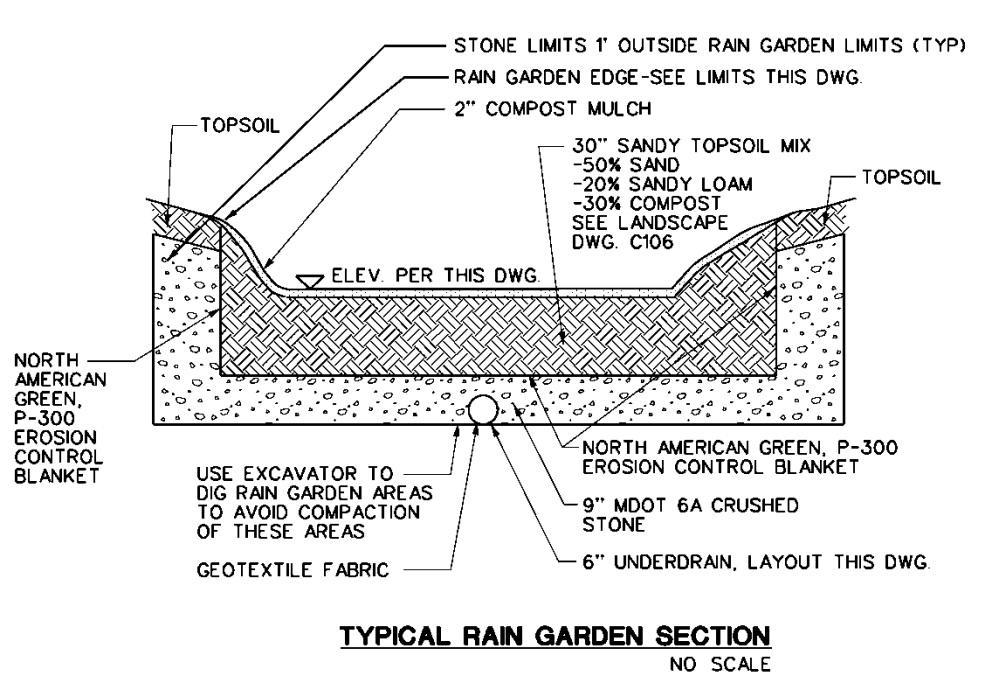
Source: DuluthStreams.org

- Check dams create storage of runoff
- Minimal gradients

Source: Virginia Stormwater Management Program

Grassed Swales with Check Dams

- Vegetative surface over granular backfill
- Utilize underdrain for dewatering if subsoils aren't infiltratable within 72 hours
- Drought resistant plants
- Sandy soils preferred
- One foot or less for depth of impoundment is typical
- Removes sediments, nutrients, metal, oil and grease

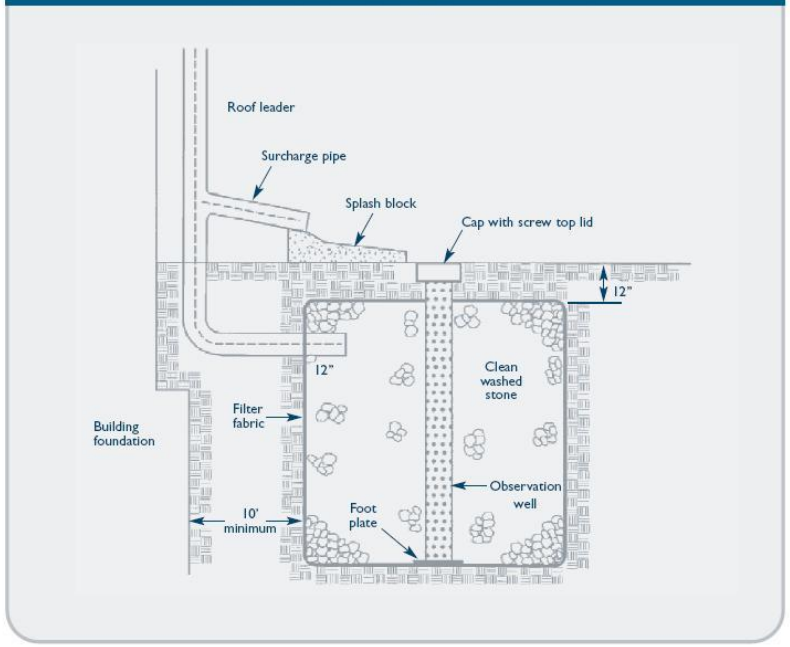


Bioretention/Rain Gardens

Source: Dominican Center at Marywood, Grand Rapids, MI

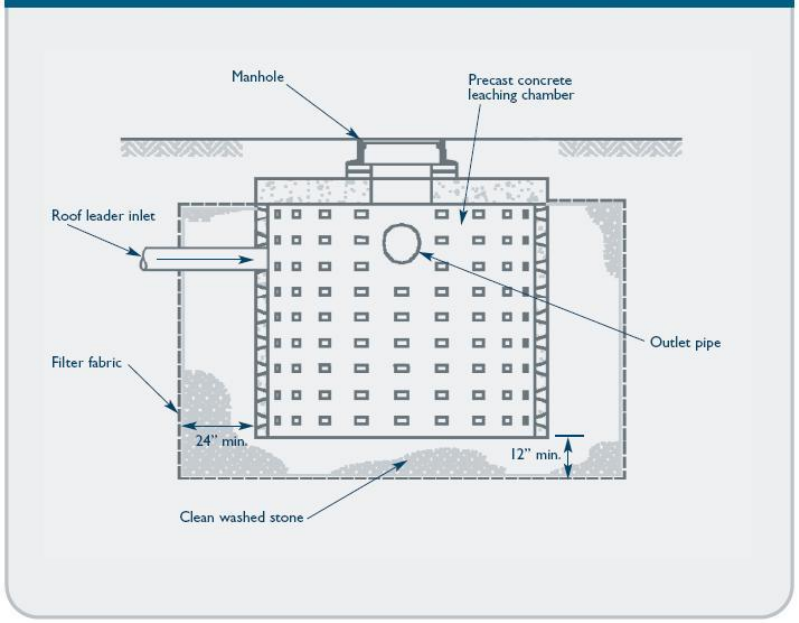
- Stone filled pit
- Captures runoff from roof

Figure 11-S5-1 Schematic of a Dry Well



Source: Adapted from Center for Watershed Protection, 2000.

Figure 11-S5-2 Precast Concrete Dry Well Design



Source: Fuss & O'Neill, Inc.

Dry Wells

- Stone filled open trench
- Runoff is collected during a storm event
- Releases runoff into soil
- Infiltratable soils required

Source: www.michigan.gov

Infiltration Trenches

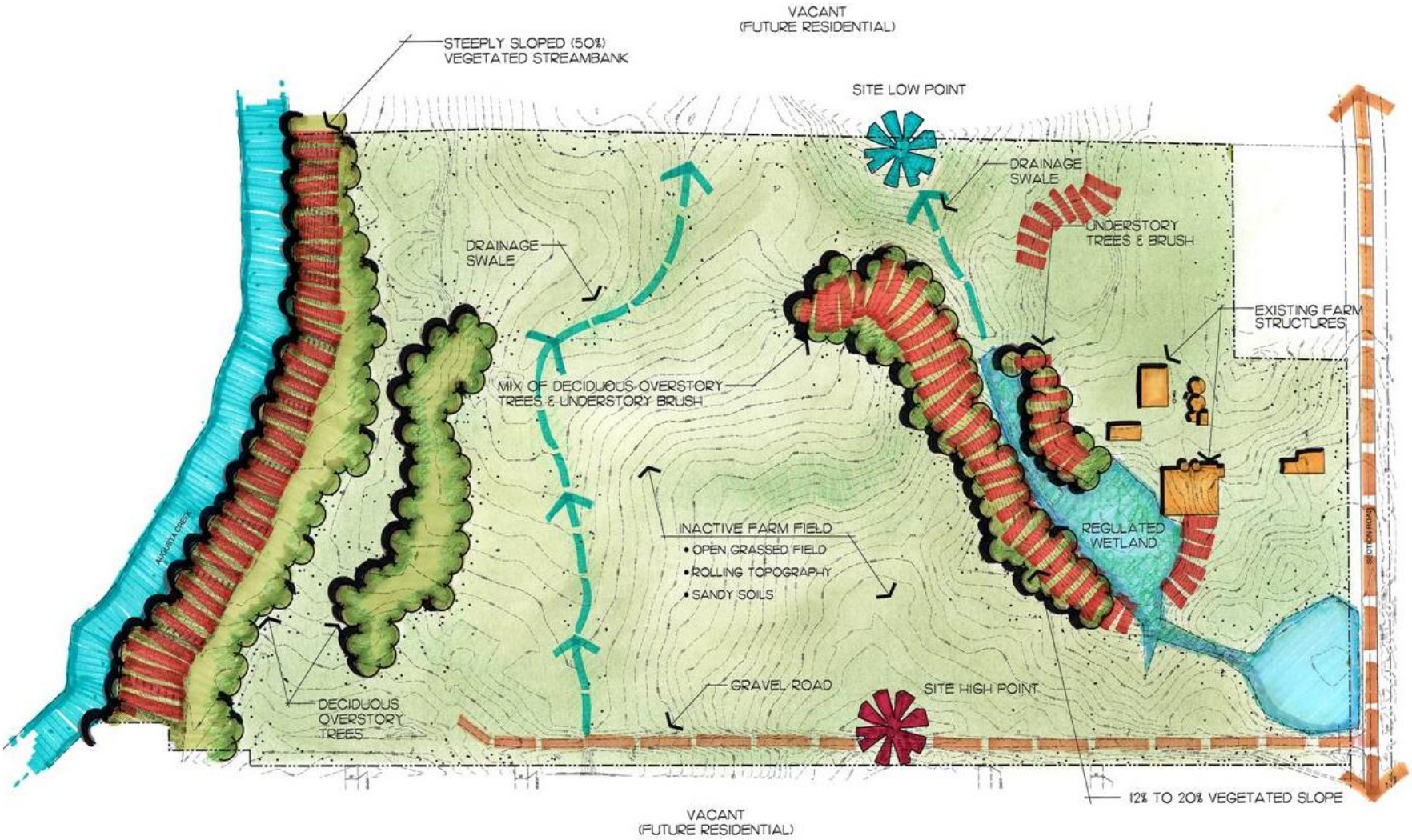
- Capture roof runoff from downspouts
- Often reused for irrigation

Rain Barrels

- Larger volume collection than rain barrels
- Manufactured tanks or constructed underground storage
- Often used for irrigation

A portion of the rainwater falling on the roof is collected in a cistern reducing potable water demand. Photo courtesy of VHB

Cisterns



SITE ANALYSIS PLAN

LOW IMPACT DEVELOPMENT PLANNING

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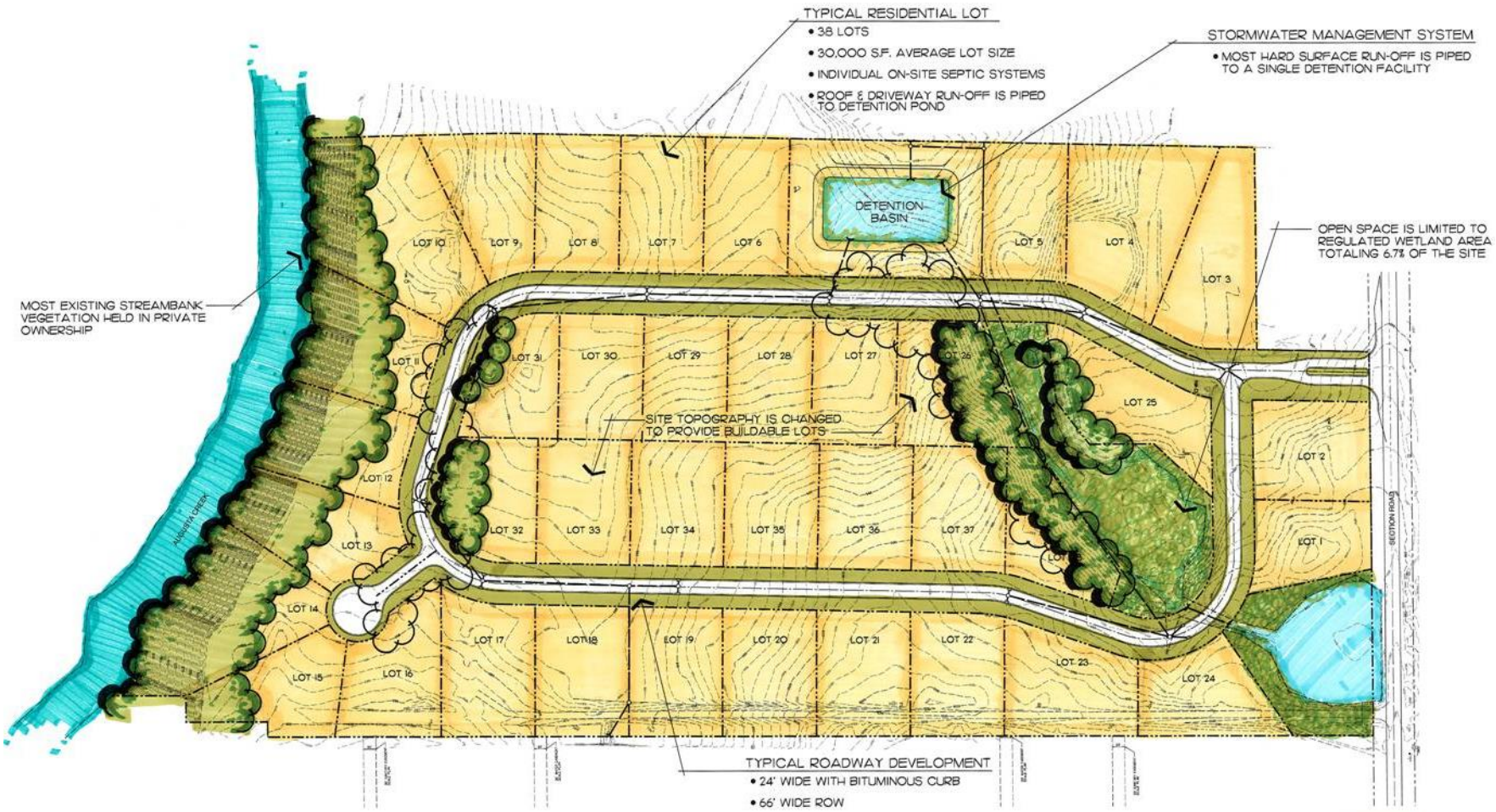
LSL

Four Township
Water Resources
Council, Inc.

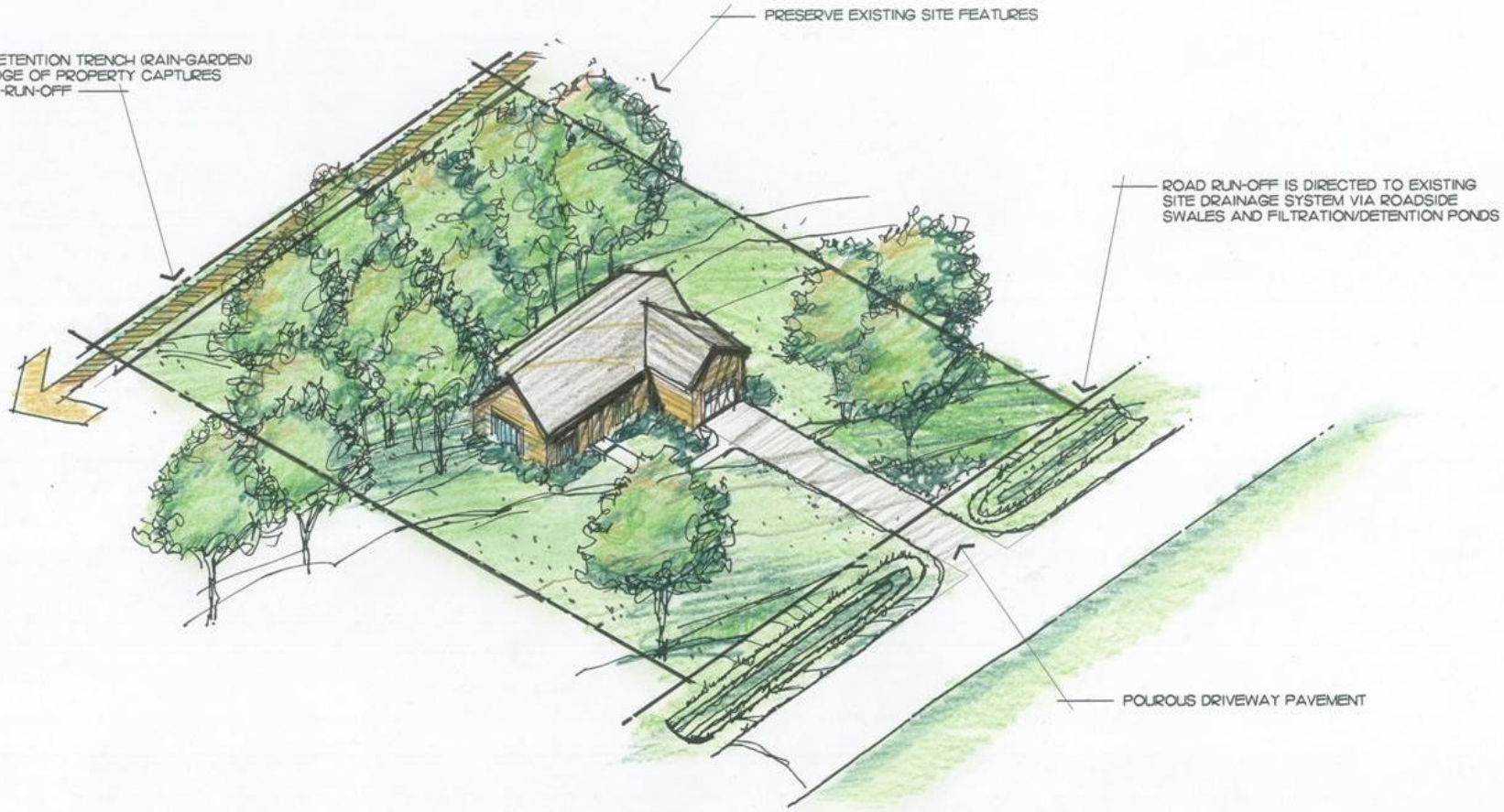


CONVENTIONAL PLAN

LOW IMPACT DEVELOPMENT PLANNING

LOW IMPACT DEVELOPMENT PLAN

LOW IMPACT DEVELOPMENT PLANNING



LOW IMPACT DEVELOPMENT LOT DESIGN

LOW IMPACT DEVELOPMENT PLANNING

ProgressiveAE

LSL

Four Townships Water Resources Council, Inc.

Conventional vs. Low Impact Development

	Conventional Layout	LID Layout	% Change
Impervious Surface:			
Road Area:	93,706 s.f.	97,952 s.f.	
Roof Area:	60,800 s.f.	0 *	
Total Area:	154,506 s.f.	97,952 s.f.	↓ 36.6%

* No roof top run-off is calculated since it is conveyed to infiltration trenches at the rear of the properties.

Stormwater Management Infrastructure:			
Storm Sewer Pipe:	3,753 l.f.	1,486 l.f.	↓ 60.4%
Drainage Structures:	39	13	↓ 66.7%
Open Space Preservation:	6.7%	32.7%	↑ Nearly five times more

Comparisons

	Conventional Layout	LID Layout
Grading	$255,400	$188,600
Clearing	10,000	2,000
Roads	281,010	195,900
Storm Sewer Pipe	174,510	55,730
Drainage Structures	78,000	26,000
SWM Ponds	17,000	---------
Bioretention/Micro	--------	12,600
Total	**$815,920**	**$480,830**
Unit Cost	**$21,470**	**$12,330**
Lot Yield	**38**	**39**

Estimated Construction Cost Comparison

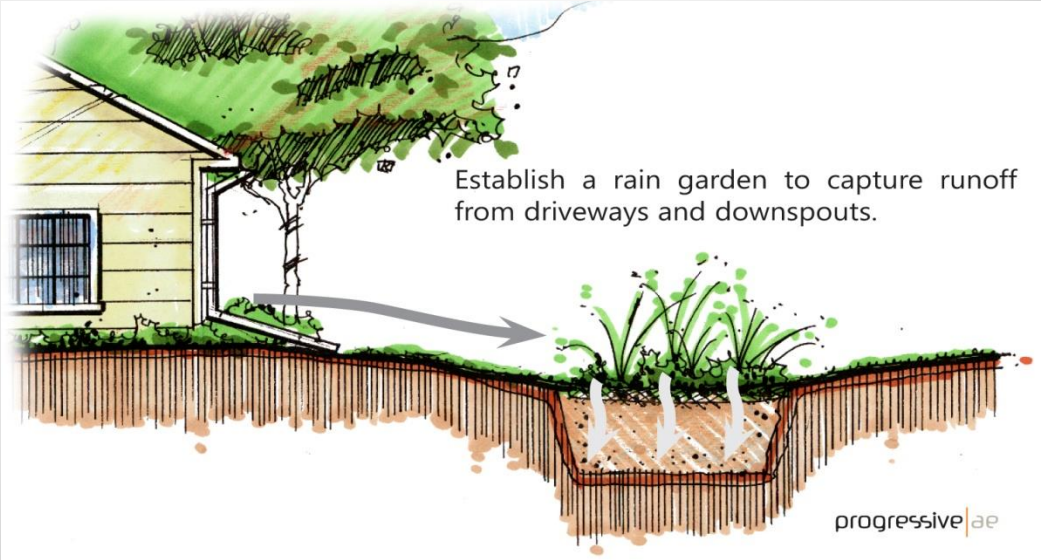
- Reduced land clearing and grading costs
- Reduced infrastructure costs
- Increased lot yields
- Increased lot marketability
- Preserves hydrology and protects natural resources
- A “win” for the developer, the buyer, the community, and the environment

Potential Benefits of LID

- Development regulations must be properly integrated into a community's planning and zoning documents
- Master Plan provides basis and rationale for decision-making, justification for action
- Seek assistance from a professional community planner or municipal attorney

Closing Thoughts

- www.houghtonlakeboard.org
- www.michiganlakeinfo.com



For More Information…

Questions?