Draw lot lines
Instead of...
If we all had OSRD... nutrients, impervious, phosphorus

If we continue to follow growth patterns, in 2060:

These allow for nearly the same amount of development, but 2/3 of it is clustered development.
Site-specific solutions via Low Impact Development

LID is an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product.

- EPA
What does it look like?

Pinehills – Plymouth, MA

The Pinehills is a 3,174 acre New England village style development in Plymouth, MA that preserved over 2,000 acres. The remaining third of the property is peppered with a variety of homes including townhomes, condos, and single family – all of which are densely developed but in a quaint style that retains New England’s classic character by preserving the natural landscape and mature trees surrounding the homes.

Developers also preserved Old Sandwich Road, the oldest unpaved public way in continuous use in the country, and instead created new, narrow roadways that follow the contour of the existing land. They incorporated numerous LID and green infrastructure elements into the built areas, including bioswales and rain gardens to handle on-site stormwater management. Additionally, The Pinehills incorporated 10 miles of walking trails that residents use to reach the mixed-use town center.

By working with the land, the developers not only saved money on clearing, grading, and piping, but also created over $1 billion in new assessed property value for the town of Plymouth since 2001 while residents enjoy increased aesthetics, community health, and historic charm.
What does it look like?
Cottages on Greene –
East Greenwich, RI

Walkable, affordable neighborhoods were sparse in East Greenwich and the community had one of the highest housing values in the state, with little developable land available. However, a group of developers took a creative approach and transformed a derelict .85 acre parcel into 15 mixed affordable and market rate homes less than half a mile from the waterfront.

These 2-bedroom, 1,000 ft² “cottages” require minimal homeowner maintenance. They are organized around a series of courts that incorporate bioswales, rain gardens, and pervious pavement in the parking lot—features that together manage stormwater on site. By incorporating small bridges across retention ponds, developers brought attention to these LID features. By reducing traditional piping and catch basins, developers also saved nearly 17% on their site design (see chart to the right for details).
## Options & benefits of LID

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Reduces Stormwater Runoff</th>
<th>Reduces Water Treatment Needs</th>
<th>Improves Water Quality</th>
<th>Reduces Grey Infrastructure Needs</th>
<th>Reduces Flooding</th>
<th>Increases Available Water Supply</th>
<th>Reduces Groundwater Recharge</th>
<th>Reduces Salt Use</th>
<th>Reduces Energy Use</th>
<th>Improves Air Quality</th>
<th>Reduces Atmospheric CO$_2$</th>
<th>Reduces Urban Heat Island</th>
<th>Improves Community Livability</th>
<th>Improves Aesthetics</th>
<th>Increases Recreational Opportunity</th>
<th>Reduces Noise Pollution</th>
<th>Improves Community Cohesion</th>
<th>Improves Urban Agriculture</th>
<th>Improves Habitat</th>
<th>Cultivates Public Education Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice</td>
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<td>Green Roofs</td>
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<td>Tree Planting</td>
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<td>Bioretention &amp; Infiltration</td>
<td><img src="yes.png" alt="Yes" /></td>
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<td>Permeable Pavement</td>
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<td>Water Harvesting</td>
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</table>

Source: Center for Neighborhood Technology's The Value of Green Infrastructure
Examples of GI & LID and how to get there

**Conserve** the natural green infrastructure already providing free ecosystem services

**Integrate** LID and green infrastructure design into development

**Restore** the resiliency of urban landscapes through LID in redevelopment
Conserve the natural green infrastructure already providing free ecosystem services.

Integrate LID and green infrastructure designs into current development projects.

Restore the resiliency of urban landscapes through LID in redevelopment.

- Local wetlands bylaw
- OSRD; small lot size
- Narrow roadways
- Preservation of existing mature vegetation
Conserve the natural green infrastructure already providing free ecosystem services
Integrate LID and green infrastructure designs into current development projects
Restore the resiliency of urban landscapes through LID in redevelopment

- Narrow, curbless roads
- Minimum site disturbance; preservation of trees
- Allow curb cuts for bioretention
Conserve the natural green infrastructure already providing free ecosystem services
Integrate LID and green infrastructure designs into current development projects
Restore the resiliency of urban landscapes through LID in redevelopment
Climate smart is budget smart
Reduced clearing & grading costs

- A 20-unit development with two-acre lots requires 40 acres to be cleared and graded
- OSRD offers the same amount of housing but preserve 50% of land – and $200,000+

The more land you save, the more money you save.
Road Diets

Narrowing just 2 miles of road by 4 feet/lane saves

$500,000

Plus savings on repair, salting, plowing…

Not building the road through a sprawling development in the first place? Savings grow to the millions.
Charles River Natural Valley Storage Area
US Army Corps of Engineers

Background
• 1972 study identified development pressure, recommended conservation to reduce flooding

Project
• 8,095 acres purchased/protected in the mid-upper Charles River watershed

Cost
• $8,300,000

Benefits
• $11,932,000 in flood protection 1977-2016
• Recreation
• Habitat
• Cleaner water & air

Enhanced Safety | Avoided Costs | Environmental Services
• Quabbin & Wachusett Reservoirs serve 2.5 million

• Over 20 years, Massachusetts Water Resources Authority spent $130M to protect 22,000 acres of watershed lands

• Avoided ratepayer cost of $250M on a filtration plant and $4M/yr in operations
Return on Investment Studies Northeast US Scientific Reports

- In Hurricane Sandy, wetlands reduced $625,000,000 in direct flooding damages in New Jersey
- In New England, wetlands reduce storm damage by approximately 16%

https://www.nature.com/articles/s41598-017-09269-z
Return on Investment Studies in MA
Trust for Public Land

• Outdoor recreation generates:
  • $10 billion in consumer spending
  • $739 million in state and local tax revenue
  • 90,000 jobs
  • $3.5 billion in annual wages and salaries
• Agriculture, forestry, commercial fishing, and related activities generate:
  • $13 billion in output
  • 147,000 MA Jobs
• Conservation Projects Return $4 : $1 spent
The power of a bylaw: Westford

• Adopted a Conservation Design bylaw in 1978
• Requires developers to submit both conservation and conventional & Planning Board chooses preferred
• Over 48 developments protected over 1,700 acres of land
The power of a bylaw: Westford

• Preserved local habitat
• Protected water resources
• Created 13 miles of hiking trails & public recreation
• Town didn’t have to purchase the land themselves, saving millions of dollars
Multiple benefits of OSRD

**Environmental**
- Water quality, habitat protected
- Improved community resilience

**Social**
- Increased recreational opportunities
- Maintain forested, rural character
- Maintain look of established community

**Economic**
- Developers spend less on clearing/grading
- Homes sell faster and for 10-30% more
- Community spends less on road maintenance
- Community receives open space for free
If you forget everything I just said... it’s right here.
If you forget everything I just said… it’s right here.

massaudubon.org/lidfactsheets
<table>
<thead>
<tr>
<th>MA Open Space Residential Design Best Practices Factors</th>
<th>Conventional</th>
<th>Better</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permit Type</td>
<td>Special Permit</td>
<td>By Right</td>
<td>Mandatory</td>
</tr>
<tr>
<td>Land area to which the zoning is applicable</td>
<td>Only a small amount of developable land</td>
<td>Land of particular environmental sensitivity</td>
<td>All developable land zoned residential</td>
</tr>
<tr>
<td>Minimum Open Space</td>
<td>50-65%</td>
<td>65-75%</td>
<td>≥ 75%</td>
</tr>
<tr>
<td>Yield Calculation</td>
<td>Full plan with full percolation tests</td>
<td>Sketch plan with selected percolation test(s)</td>
<td>By formula</td>
</tr>
<tr>
<td>Minimum parcel size</td>
<td>≥ 10 acres</td>
<td>5-10 acres</td>
<td>None</td>
</tr>
<tr>
<td>Review Process</td>
<td>No detailed analysis of site characteristics in relation to design</td>
<td>Cluster layout</td>
<td>Flexible “OSRD” 4 Step</td>
</tr>
<tr>
<td>Ownership of Open Space</td>
<td>Appropriate to the resources present. For example, agricultural land by the farmer, watershed land by a water dept. or district, habitat land by the conservation commission,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensional Standards; area, frontage, etc.</td>
<td>Specified, &lt; than for standard subdivision</td>
<td>Formulaic reduction with specified minimums</td>
<td>None set or small minimums</td>
</tr>
<tr>
<td>Quality of open space conserved: Specificity of local priorities for natural, cultural, and historic resource conservation</td>
<td>No indication of local conservation priorities, or language that refers only to regulated resource areas.</td>
<td>Lack of specificity regarding local conservation priorities; no map of priority locations</td>
<td>Local priorities clearly and unambiguously stated and mapped for use in site design.</td>
</tr>
<tr>
<td>Contiguity of open space; relationship to</td>
<td>No contiguity requirement</td>
<td>Contiguity required within</td>
<td>Contiguity required; adjacent</td>
</tr>
</tbody>
</table>