What is Urbanization

- The change of land use from agricultural or natural to industrial or residential*
- One of the main drivers to amphibian decline globally**

*Canessa, et al 2013
**Scheffers, et al. 2013

How Does it Affect Amphibians

- Changes the hydrology of the stream or pond
- Increases pollution
- Destroys critical habitat

*Canessa, et al 2013
Changes in Hydrology
- Higher levels of impervious surfaces
- Leads to increases in frequency and flashiness of floods
- Especially detrimental to aquatic stages or species

How Does it Kill Them?
- Washes away egg masses
- Washes away plant material that could harbor eggs, protecting them from predation
- Interferes with breeding activities, especially for male anurans that call from the water

Increased Pollution

American Society of Landscape Architects
Sources of Pollution

- Nonpoint source pollution
  - Runoff from roadways
  - Litter from people

- Point source pollution
  - Pollution from factories
  - Sewage overflow (Third creek)

Heavy Metal Pollution

- Automobiles and roadways are now a major source*
- Strongly affects amphibians due to their permeable skin
- Relevant levels are known to kill in all stages
- Lower levels are known to have other detrimental effects
  - Reduced growth rates
  - Delayed metamorphosis
  - Reduce species richness

Species Richness

Table 1. Concentrations (mg/kg dry weight) in sediments of eight metals measured in 38 study sites along the Merri Creek catchment.

<table>
<thead>
<tr>
<th>Metal</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean ± SE</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>1.44</td>
<td>13.54</td>
<td>0.64 ± 0.04</td>
<td>48</td>
<td>&gt;33</td>
</tr>
<tr>
<td>Chromium</td>
<td>1.42</td>
<td>15.00</td>
<td>0.55 ± 0.03</td>
<td>25</td>
<td>&gt;25</td>
</tr>
<tr>
<td>Copper</td>
<td>0.90</td>
<td>15.00</td>
<td>0.20 ± 0.04</td>
<td>&gt;25</td>
<td>&gt;25</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.32</td>
<td>40.00</td>
<td>8.78 ± 2.80</td>
<td>&gt;50</td>
<td>&gt;50</td>
</tr>
<tr>
<td>Lead</td>
<td>0.17</td>
<td>120.00</td>
<td>50.00 ± 25.00</td>
<td>&gt;25</td>
<td>&gt;25</td>
</tr>
<tr>
<td>Cadmium</td>
<td>1.30</td>
<td>60.00</td>
<td>25.00 ± 5.00</td>
<td>&gt;25</td>
<td>&gt;25</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.30</td>
<td>0.90</td>
<td>0.25 ± 0.05</td>
<td>&gt;0.5</td>
<td>&gt;0.5</td>
</tr>
</tbody>
</table>

Table 2. Heavy metal pollution index scores at each sample site and average pollution index scores across all sites.

<table>
<thead>
<tr>
<th>Species</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean ± SE</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chester</td>
<td>1</td>
<td>11</td>
<td>8.8 ± 1.0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Croc peninsularis</td>
<td>1</td>
<td>11</td>
<td>8.3 ± 1.3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Echomus</td>
<td>1</td>
<td>11</td>
<td>8.9 ± 1.6</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fatichordax</td>
<td>1</td>
<td>11</td>
<td>9.5 ± 1.7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Geot erpentulus</td>
<td>1</td>
<td>11</td>
<td>8.4 ± 1.5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lomax languens</td>
<td>1</td>
<td>11</td>
<td>8.3 ± 1.6</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Tercor targent</td>
<td>1</td>
<td>11</td>
<td>8.5 ± 1.4</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

*Fairfax County, Virginia

References:
Destruction of Critical Habitat

- Filling in wetlands
- Removal of necessary vegetation
- Destruction of movement corridors
- Destroys metapopulations

http://quokka.wikispaces.com/Causes+of+Endangerment


Why is Urbanization the Biggest Issue?

http://www.worldometers.info/world-population/

Canessa, S, and K.M. Parris. 2013. Multi-scale, direct and indirect effects of the urban stream syndrome on amphibian communities in streams. EUSCONET 6. e05026.


References
Questions??

http://www.birdsandblooms.com/blog/toad-in-the-window/