

# Water Quality Associated with Urban Runoff: Sources, Emerging Issues and Management Approaches

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## Today's Talk

- Take home messages from 20 yrs of SCCWRP stormwater research
  - Wet weather = storm
  - Dry weather = non-storm
- Emerging issues
- Thoughts on management approaches




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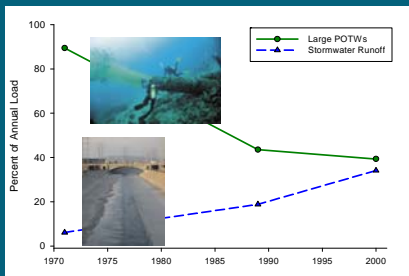
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## Increased Focus on Stormwater, As Point Sources Are Reduced

Annual Load Total Combined Metals to the SCB



Year	Large POTWs (%)	Stormwater Runoff (%)
1970	~90	~5
1980	~55	~10
1990	~45	~20
2000	~40	~35

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## Challenges of Managing Storm Water

- Difficult to understand and predict all the factors that influence storm water
  - Highly variable
  - Many sources and influencing factors
- Effective management requires tools to increase our understanding
  - Monitoring
  - Source characterization and identification
  - Model development
  - BMP siting and design

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## Potential Sources

- Anthropogenic
  - Land uses
  - Aerial deposition
    - Mobil sources
- Natural
  - Background



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## Main Messages on Wet Weather Runoff

- Main sources vary by constituent
  - Metals → industrial
  - PAHs → aerial deposition
  - Bacteria → recreation and agriculture
  - Nutrients → agriculture and residential
- Natural areas contribute low background levels, but may be substantial for some constituents
  - Atmospheric sources may play role
- Important to understand factors driving variability
  - Affects strategy for managing stormwater as a resource

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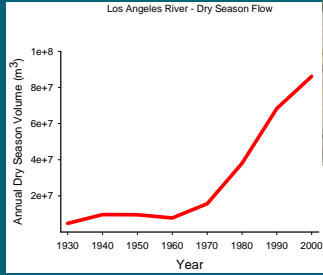
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## What About Dry Weather Runoff?



- Region has on average 345 dry days per year

Source: USGS

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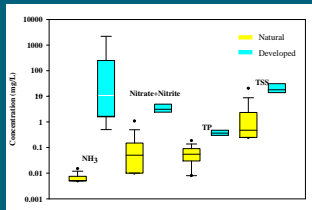
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## Main Messages on Dry Weather Runoff

- Can be as major load, particularly during dry years
- Less successful in linking to specific land uses
- Again, natural loadings can be substantial for some constituents



Dry Weather Concentrations of Nutrients— Natural Versus Developed

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## Emerging Management Issues

- Biological quality of streams
- Hydromodification
- Contaminants of emerging concern
- Recycled water
- Nutrient overenrichment

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## Effects of Watershed Urbanization Go Beyond Water Quality

- Water quality/toxicity
- Physical structure
- Habitat condition
- Water quantity/hydrodynamics




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## Increased Focus on Biological Endpoints in Assessing Effects of Urban Runoff

- SWRCB working on development of biocriteria for streams, eventually estuaries
- Benthic invertebrates first, but over time, other lines of evidence may be included
  - Stream algae
  - Overall habitat condition




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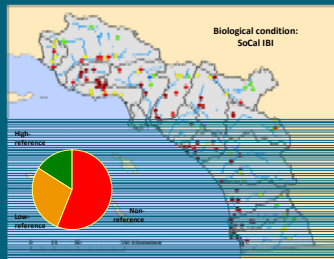
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## Early Messages From Stream Bioassessment

- Large percentage of stream miles with measureable effects in region
- Lowest invertebrate IBI scores near urban and ag lands
- Nutrients, physical habitat disturbance are top stressors




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## Effect of Increased Impervious Cover- Hydromodification



- Infrastructure damage
- Instream habitat loss
- Coastal erosion

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## SCCWRP is Developing Modeling Tools To Support Management of Hydromodification

1. Which streams are at the greatest risk of effects of hydromodification? ➡ *Screening Tool*
2. What are the anticipated effects in terms of increased erosion, sedimentation, or habitat loss, associated with increases in impervious cover? ➡ *Modeling Tools*
3. What are some potential management measures that could be implemented to offset hydromodification effects? ➡ *Management Tools*

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## What Can We Do?

*Adverse effects of hydromodification and urban runoff must be addressed at watershed scale*

### General Concepts

- Minimize runoff
- Maximize infiltration
- Avoid building in floodplains
- Education

### Approaches

- Better Site Planning
- On-site control of runoff
- Biotechnical stream stabilization
- Stream restoration

*These General Principles Will Improve Physical and Biological Condition and Ameliorate Water Quality*

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**THANK YOU**



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