

Urban Ecology & City of Sammamish's Urban Forest

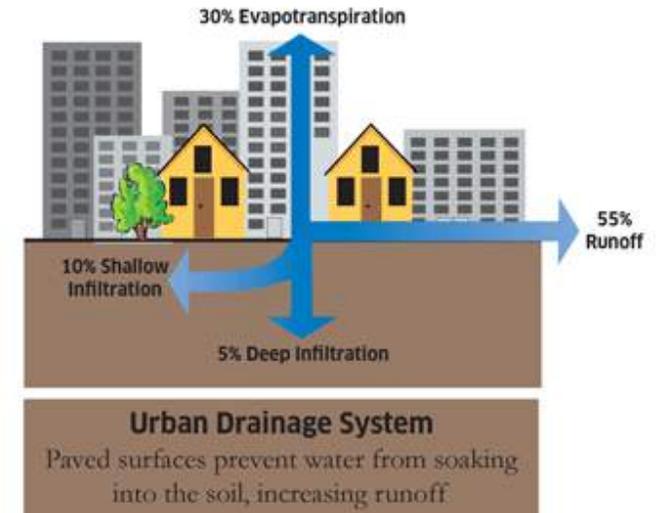
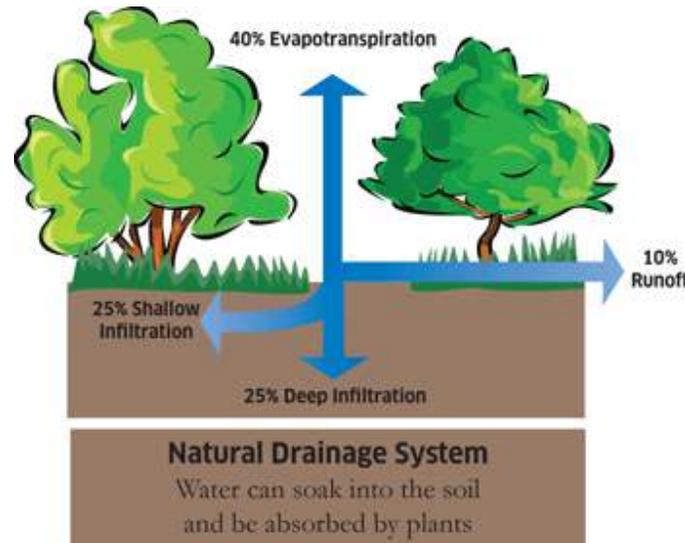
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Urban Ecology—what is it?

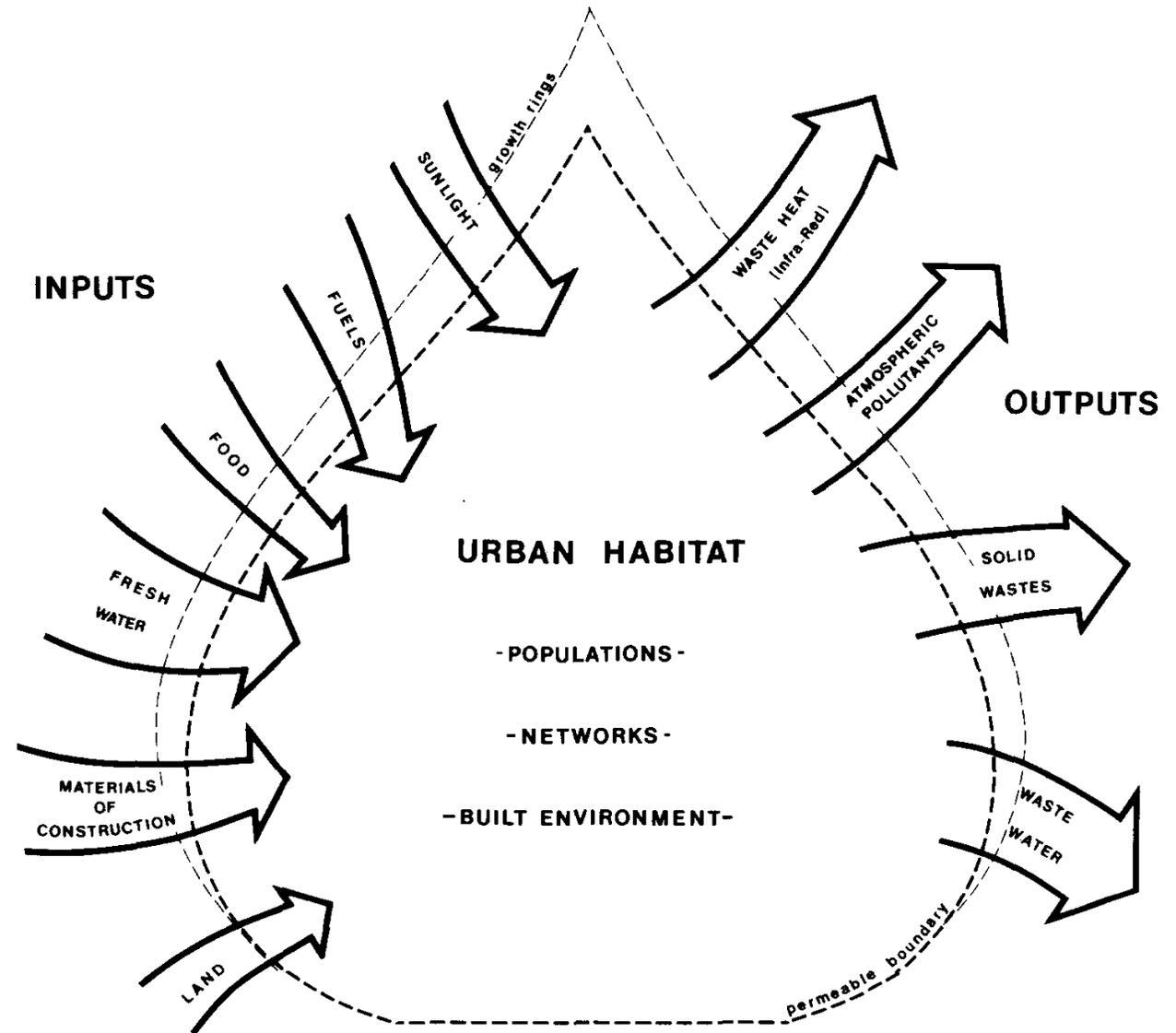
- Study of the **relationships of organisms** to one another and their abiotic (non-living) surroundings **in urban areas**.
- “Urban areas” = Built up areas where humans drive ecosystem function e.g.:
 - nutrient cycling (fertilization)
 - water cycling (watering lawns)
 - Plant succession (ornamental plantings)



Aquarius Systems

Urban Ecology: what is it?

- Urban ecosystems are coupled social-ecological systems.
- Humans are NOT separate from 'natural' systems
- 'Wild' ecosystems also impacted by humans but less so (e.g. climate change, economic forces driving logging)
- Urban ecosystems use a coupled framework because social systems are complex enough that it is easier to think of them as two interrelated systems.



R. L. Meier, Designing a sustainable urban ecosystem, *Futures* 16, 351–371 (1984).

Urban Ecology—Important Q's

What are the drivers operating within the system?

What is the structure of relationships between organisms?

What do these things mean for humans or other organisms?

What do urban ecologists see when looking at the urban environment?

- Humans as drivers of ecosystem function (e.g. disturbance, succession)
- Development
 - Soil disruption
 - Approach determines ecological impact
 - Design determines ecological structure
- Management
 - Maintaining a state?
 - Allowing movement?



What do urban ecologists see when looking at the urban environment?



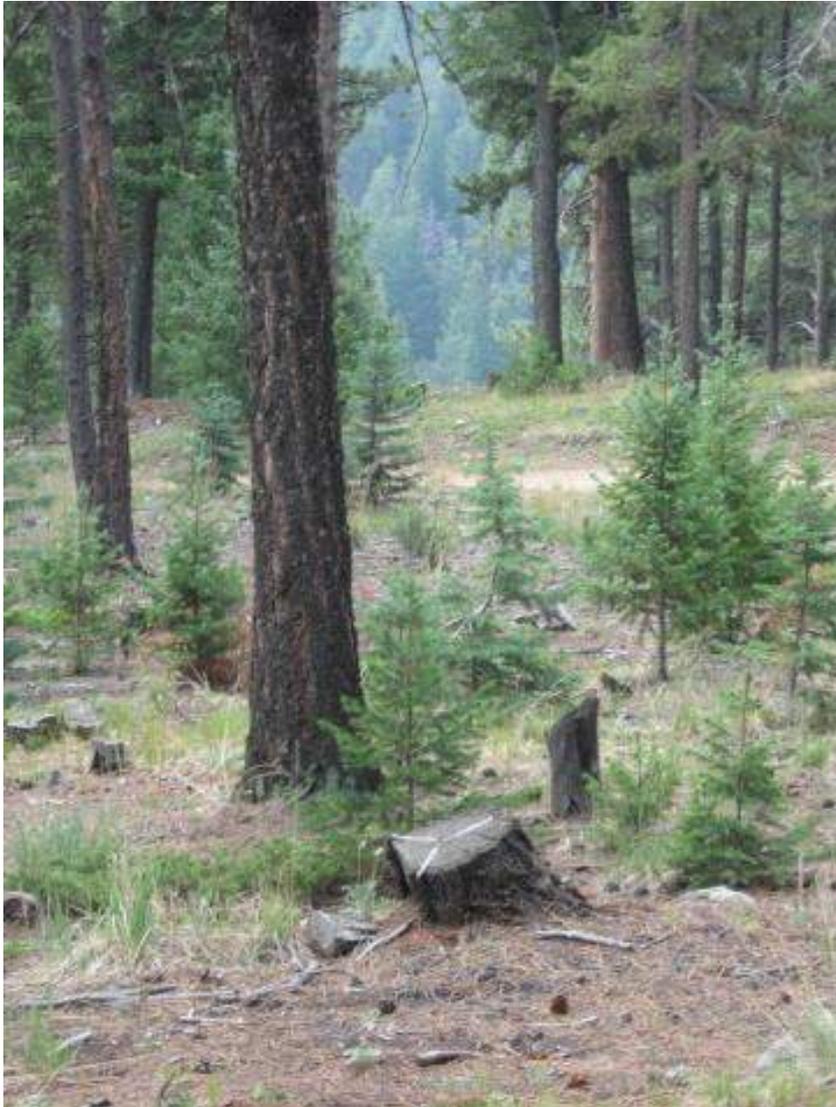
- Habitat matrix
 - Remnant forest stands
 - Wetlands
 - Residential communities (grass, ornamental trees & shrubs)
- Corridors + corridor disruption
 - Who is using the corridor?
 - Does this correspond to intent?
- Most obviously, Human Uses

What do urban ecologists see when looking at the urban environment?

- Changes in species composition
 - Large native conifers being replaced with ornamental (fruit) trees.
 - Invasive opportunist species
- Existing pathogens (e.g. LRR) in conflict with humans (parallels with wolves & livestock conflict)
- New pathogens introduced—human vectors + migration (climate change)



<http://emeraldashborer.info/>



Bureau of Land Management

...but there are things we DON'T see.

Processes common in historic Puget Sound Lowlands forests:

- Fire based succession
- Stand regeneration
- Multi aged stand patterns
- Traditional native management

Future impacts of climate change (have predictions, but not all impacts have happened/are apparent)

Q's so far?

Sammamish's Urban Forests



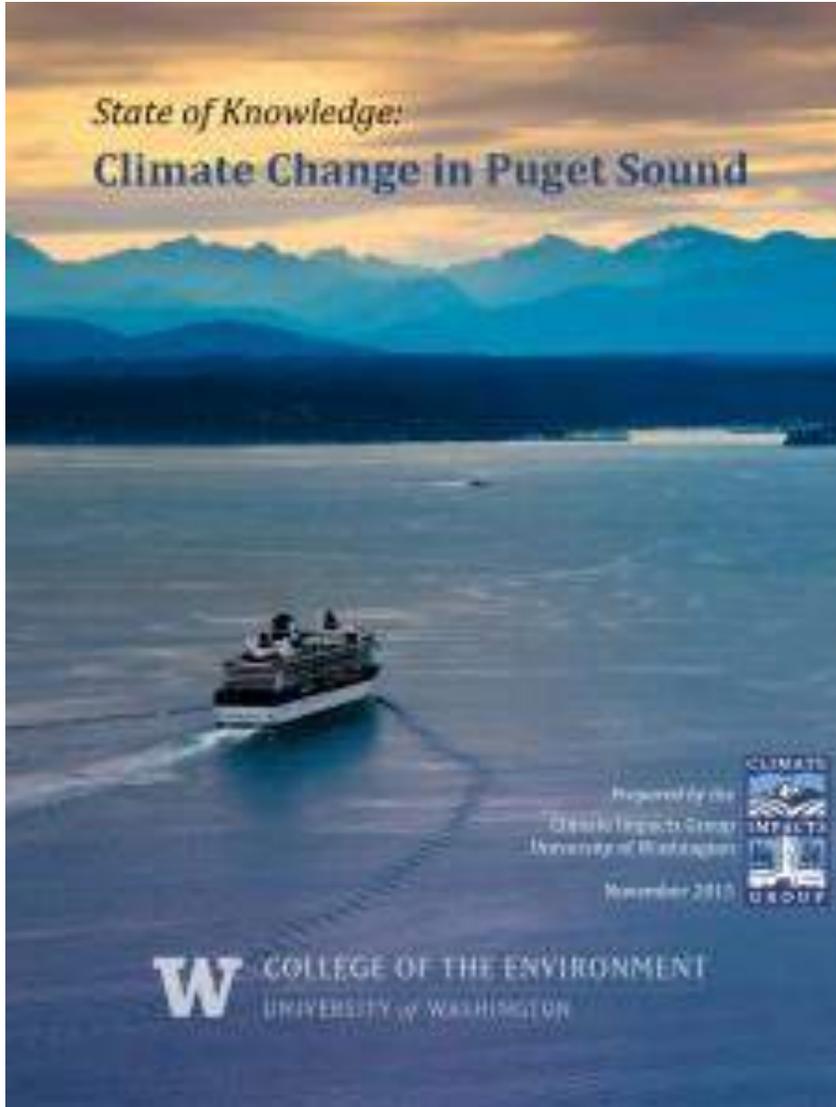
Key Challenges: Development

Historically: Fire is most important disturbance, with disease, wind.

- Patchy mosaic of different aged stands of trees, meadows.

Now: Development is the most important **disturbance**.

- Changes site hydrology (how water flows)
- Alters soil structure and community.
- Damage to remaining trees.
- Little to no regeneration of native conifers.



Key Challenges: Climate Change

Near term: dominated by natural variability.

Long term:

- Strong yearly warming (3.3-10.8 °F) particularly in summer.
- Precipitation patterns slightly exaggerated (20% less summer rain, 10% more winter rain in larger events).
- Significant as summer already dry—water stress for trees!

Key Challenges: Pathogens & Pests

Laminated Root Rot

- Root-to-root transmission
- Douglas fir susceptible, hardwoods resistant

Armillaria

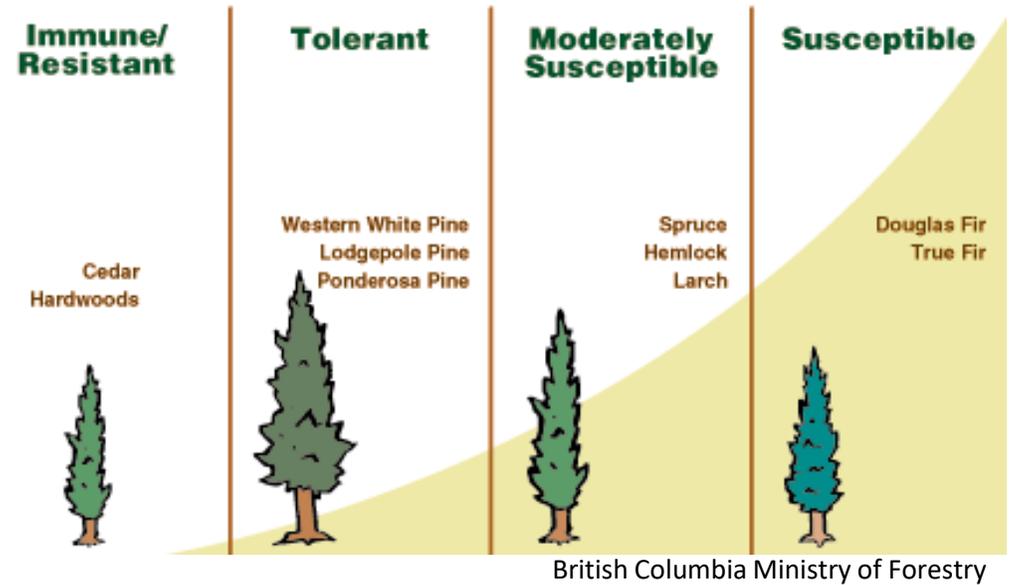
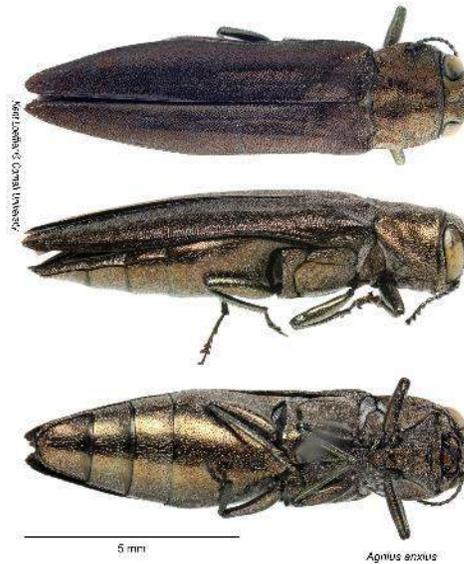
- Most common US root rot
- MANY species impacted

Heterobasidion

- Infects western hemlock

Insect pests

- Bronze birch borer
- Tent caterpillar



Key Challenges: Interactions

Increased tree mortality risk

- Water stress
- Development stress

Potential for new pests

- Oregon worried about Emerald Ash Borer, Asian long-horned beetle
- What's the next Dutch Elm Disease?

Interactions make ecosystem approach critical!





What does the future look like?

There will be challenges...

And how Sammamish responds will shape the future of the urban forest

- Values
 - Me vs. we
 - Short- vs long-term
- Actions
 - Framework: Ecosystem vs. individual issues
 - Planning: UFMP (including our work)
 - City code (e.g. tree protection)
 - Enforcement

What role do individuals and governments have?

Citizens

Be an informed land steward: learn the broader ecosystem impacts of managing property.

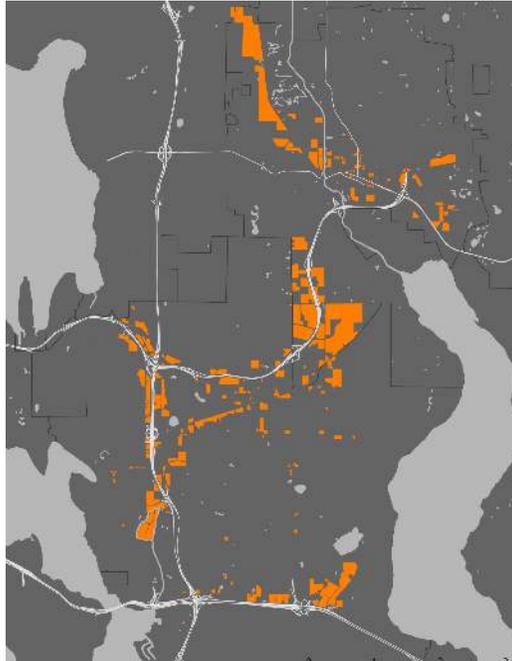
Be an informed voter: educate yourself on the ecological issues and their science.

Participate in rational discourse.

Governments

Promote land management at the city scale to be in line with citizen's values.

Create policy using best-available science.



What examples of urban design promote the urban forest?

Area of active research!

- KD dissertation + colleagues
- Need follow up study

Developers interested in ecologically sustainable development methods—let's talk!



What examples of urban design promote the urban forest?

Design @ development:

- Soil disturbance
 - Inhibit: clear and grade entire site
 - Promote: only building footprint, build up not out, reduce impervious surface
- Better: redevelop on disturbed soils
 - Previous building footprints, previous roads, etc.
 - Impervious > Agriculture >>> Remnant forest

Policy:

- Tree protection (e.g. 2015 revisions)
- Ecosystem approach (UFMP + our involvement)
- Adjust parking guidelines.
- How much to limit private property?



What examples of urban design promote the urban forest?

Landscaping Design:

- Inhibit:
 - Thin bands of trees—susceptible to windthrow and worse habitat etc.
 - Planting 'stick' trees
- Promote:
 - Preserve older trees while planting new ones
 - Encourage succession of large conifers
 - Avoid cutting trees—design houses/buildings/pavement

Policy:

- Tree protection, UFMP, etc.
- Property owner education!





Questions?

Contact us!

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