LANDSCAPE MICROCLIMATE DESIGN
HORTICULTURE 401

Harvard University - Arnold Arboretum
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Arbutis flowering on February 2nd - hilltop, Western Massachusetts

Whole Systems Design

Question		Course section
I.	**What** are microclimates?	*Definitions*
II.	**Why** care about microclimates?	*The Problem*
III.	**How** do I identify them?	*Analysis*
IV.	**How** do I develop them?	*Design Strategies*

I. Definitions

Climate = Weather patterns over time

Microclimate = Discrete area within a larger area of differing climate.
"Intentional climates"

II. The Problem

Energy Use
Comfort
Productivity

Define the optimal climate for a site

Optimized microclimates can result in the following:

- Lower energy needs for buildings
- Longer growing seasons
- Higher yields from plants and animals
- More enjoyable, healthier human habitats.

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III. Analysis

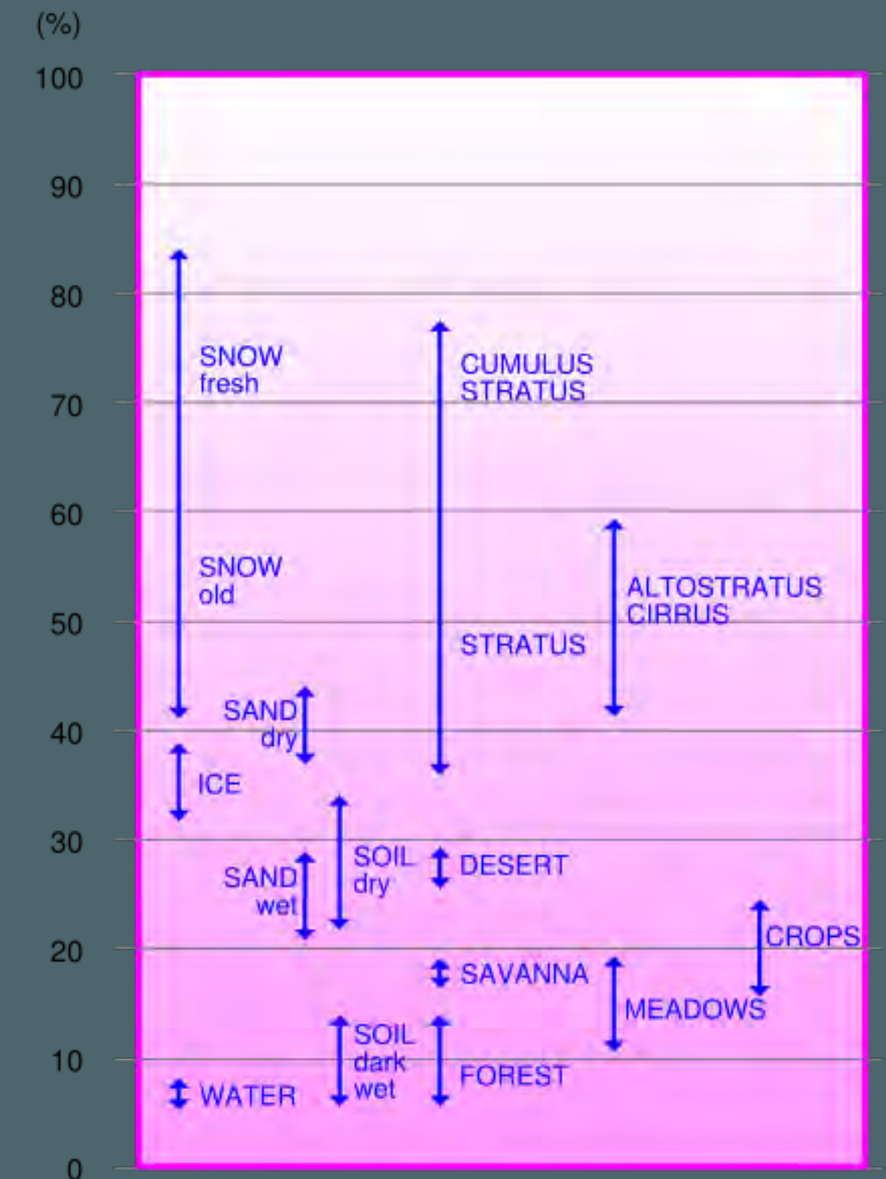
Main climate forces

Sun - Wind - Moisture

Component of space Influence on space

- Heat access/solar aspect* capture
- Color/reflectivity capture
- Cover/radiative loss prevention retention
- Mass retention
- Form capture
- Relative position to air currents capture & retention

*Exception = active source of heat such as a hot air vent or geothermal source



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Observation starting points:
Dawn/dusk/midday observations
Seasonal (especially swing seasons) observations
Snow and frost patterns
Photographing across day and season
Marks/flagging on the ground for sun/shadow lines
IR thermometer
Time and experience

Examples of intentional microclimates
Termite mounds
Beehives

Microclimate creating landscape features
Hills – fields – trees – cliffs – boulders – gullies – ridges – groundwater – ponds – lakes – roads – buildings – lawns – roofs – courtyards – inner corners

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IV. Design Strategies

1. SITING – THE FIRST STEP

Primary factors: aspect, slope, relative elevation, groundwater, bedrock, etc.

2. SITE DESIGN – THE SECOND STEP

Secondary factors: thermal mass, vegetation, color, forms, etc.

Design of warm microclimates checklist:

1. **Site outside of cold hollows**
2. **Face-southerly**
   a. South – southwest = warmest
   b. Consider orographic affects
3. **Slope**
   a. The further poleward the steeper the slope
   b. Vertical surface vs. horizontal planes
4. **Forms**

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   a. **Bowl – solar arc/sun trap**
   b. Concentrate sun's wave energy
5. **Minimize radiative losses – cover**
   a. Nighttime most critical
6. **Wind-shelter**
   a. Buffer and deflect, create eddies
   b. Still = key for human comfort in cold climate
7. **High-mass**
   a. Stone and water = primary materials
8. **High absorption (low albedo)**
   a. Color
9. **When is your microclimate?**
   a. Design for a particular time of day and year
   b. Offer a range of periods

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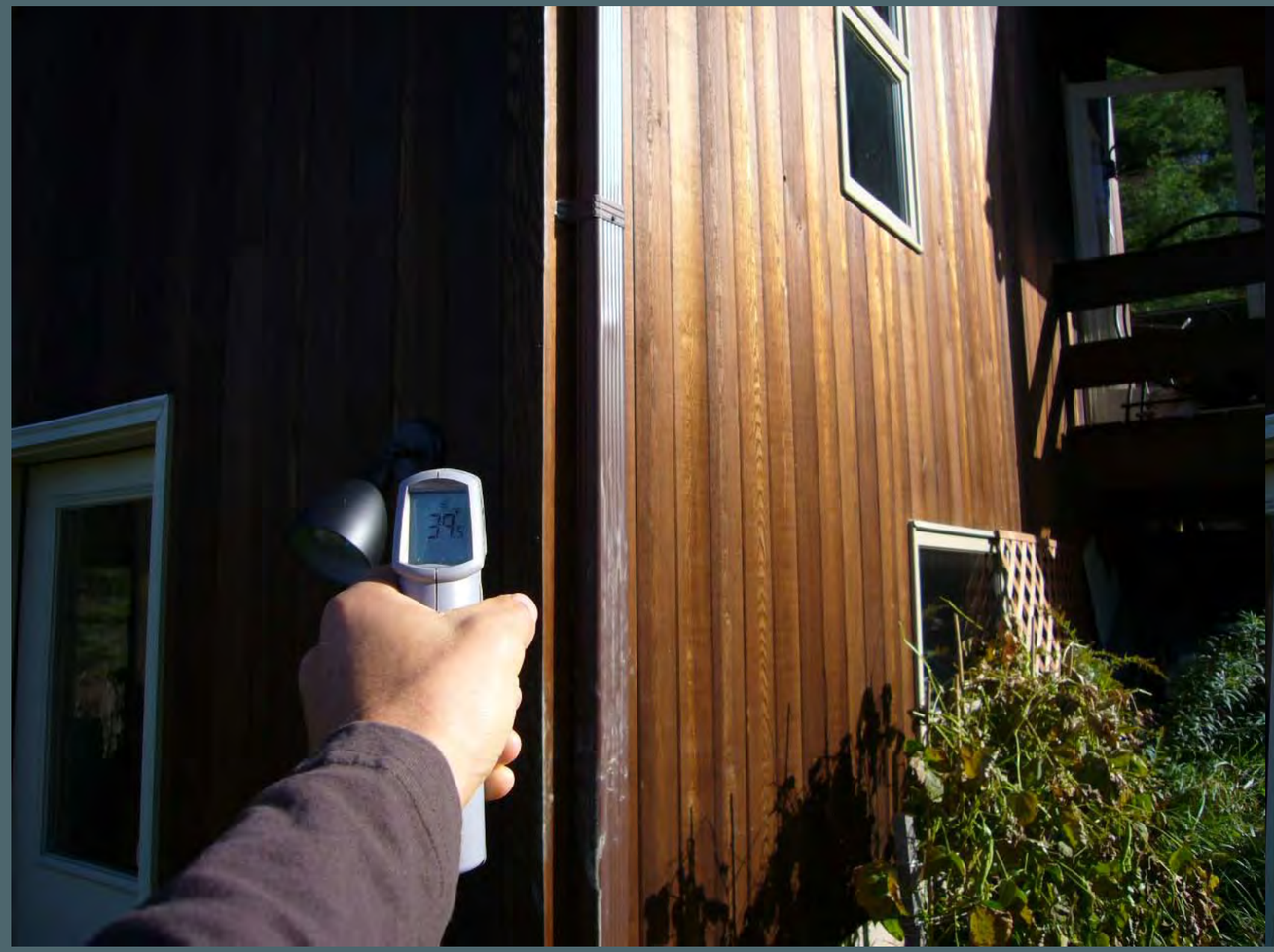

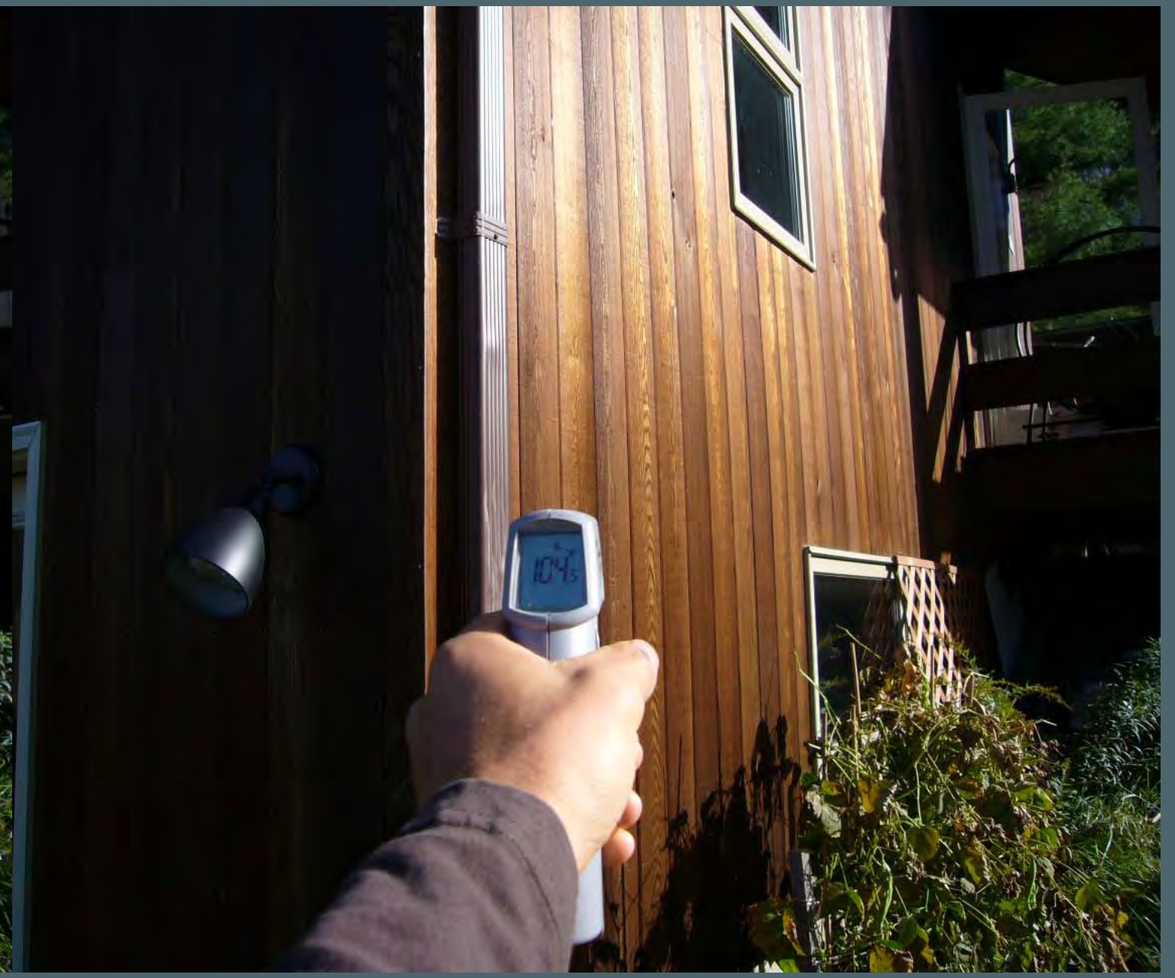

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