

DOWNTOWN PHOENIX URBAN FORM PROJECT



NACAA Fall Meeting

October 22, 2008

Dean Brennan, FAICP

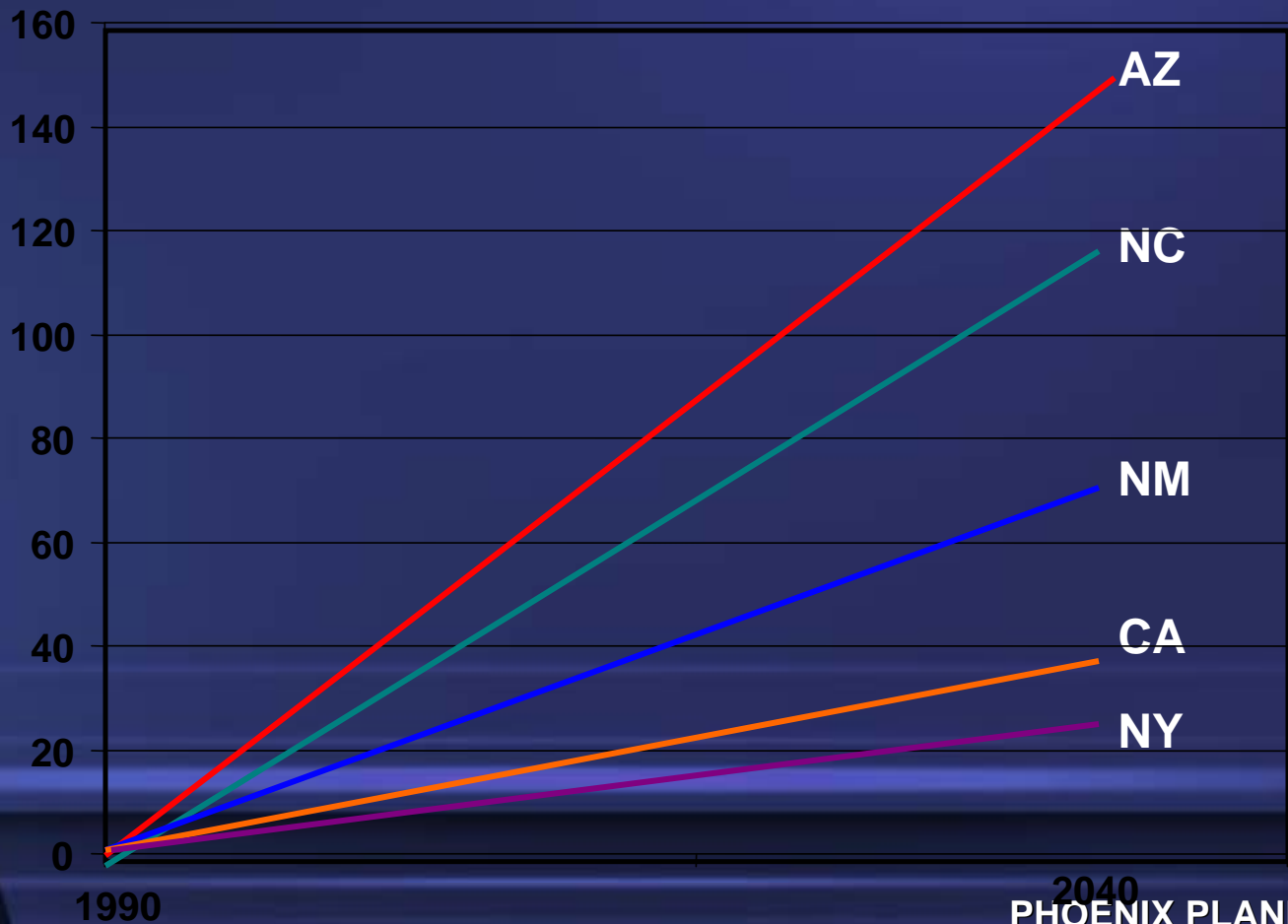
Principal Planner

PHOENIX PLANNING
DEPARTMENT



ARIZONA GHG GROWTH RATE 1990 - 2040

Percent



Source: AZ Climate Change Action Plan



PREDICTED IMPACTS

WESTERN U.S. AND CANADA

- Temperatures
 - Increase in summer temperatures (IPCC)
 - 3.6 to 9.0° F in the next 30 - 60 years
- Water Supply
 - Prolonged drought
 - Decreased snowfall
 - Early snow melt

Source: AZ Climate Change Action Plan



PREDICTED IMPACTS: 2099

WESTERN U.S. AND CANADA

- Colorado River Basin
 - 15% less run-off to Colorado River
 - 40% decrease in River basin storage
 - 44 to 55% less hydroelectric power
 - Increase in wildfires
 - 15 to 30% loss of forested area



PHOENIX SUSTAINABILITY & CLIMATE CHANGE

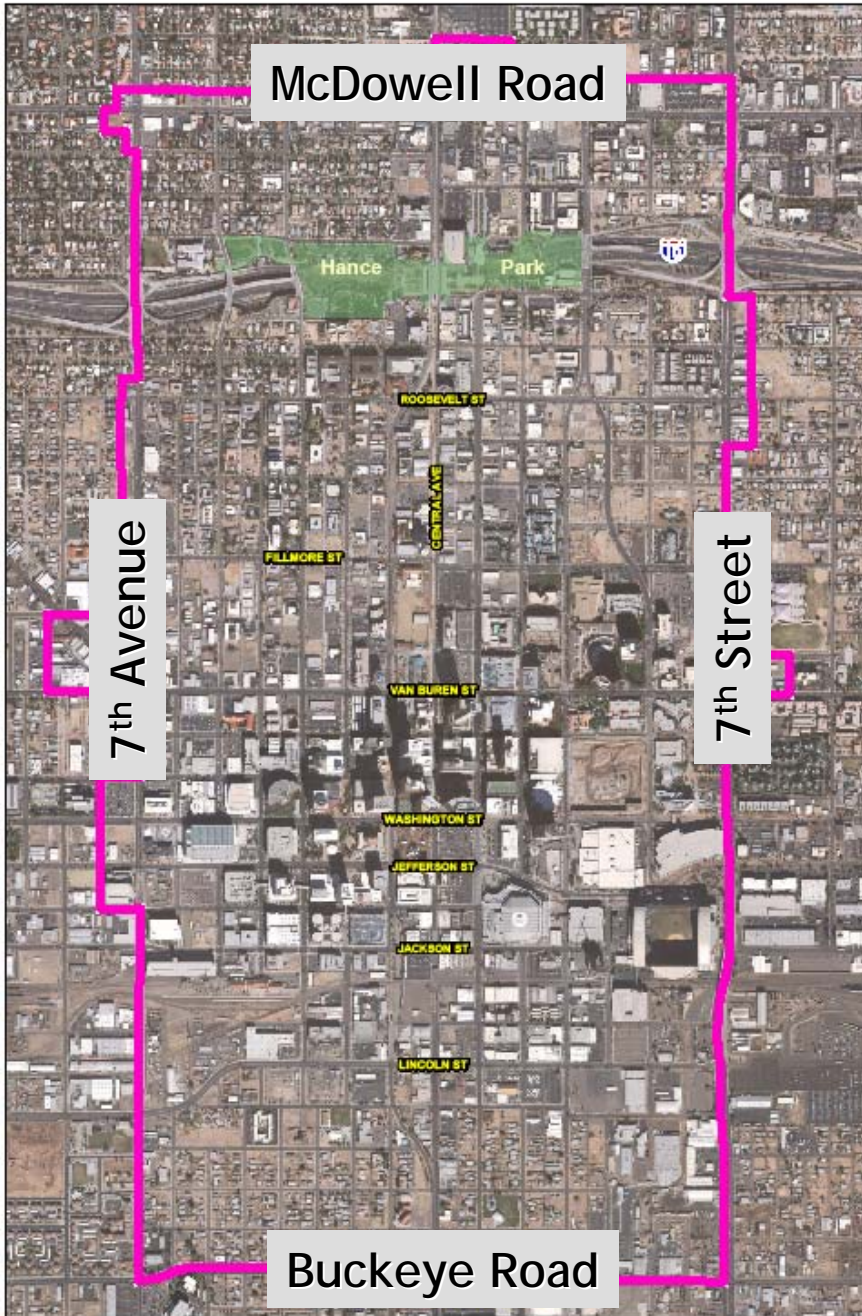
- Council Sustainability Subcommittee
- Energy Conservation
- Green Buildings & Energy Codes
- Renewable Energy Projects
- Alternative Fuel Fleet



CLIMATE CHANGE ADAPTATION

- Heat Island Task Force
- Downtown Urban Form
- Open Space Preservation
- Water Conservation





DOWNTOWN URBAN FORM PROJECT

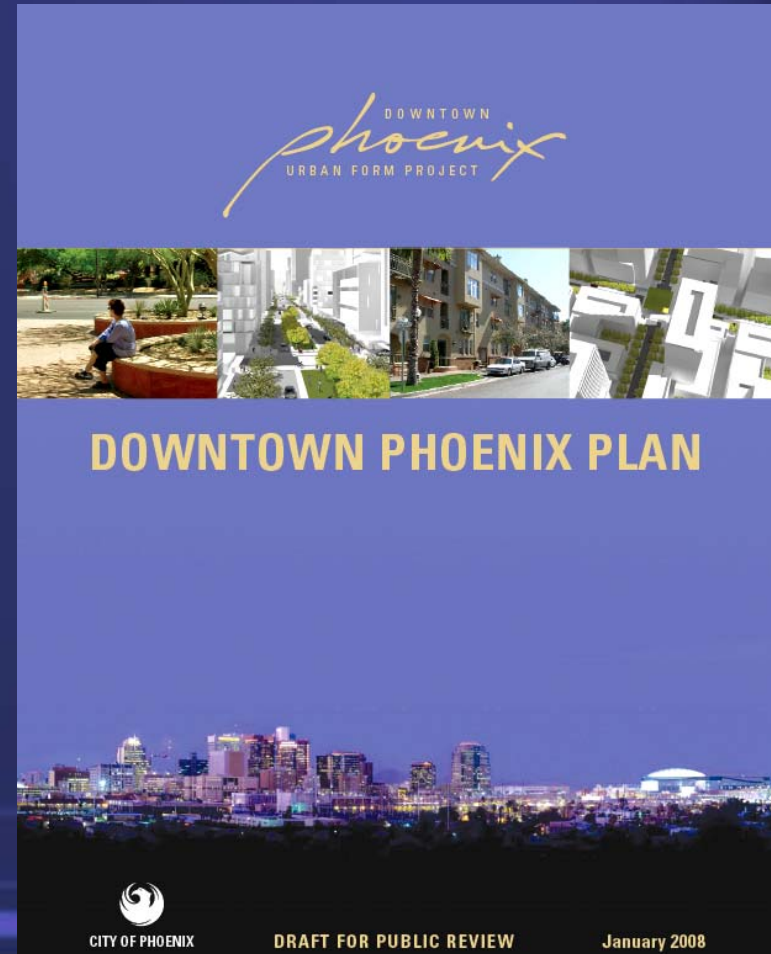
*Approximately 350 square
blocks or 2 square miles*



DOWNTOWN PHOENIX PLAN

CHAPTERS

1. Implementing the Downtown Strategic Vision
 2. The Connected Oasis: “The Big Idea”
 3. Downtown Character Areas
 4. Sustainable Development in a Desert Environment
 5. Circulation and Parking
 6. Zoning and Urban Form
 7. Implementation
- Appendix



CHAPTER 2: THE CONNECTED OASIS – “THE BIG IDEA”

GREEN STREET NETWORK



WHAT'S MISSING?



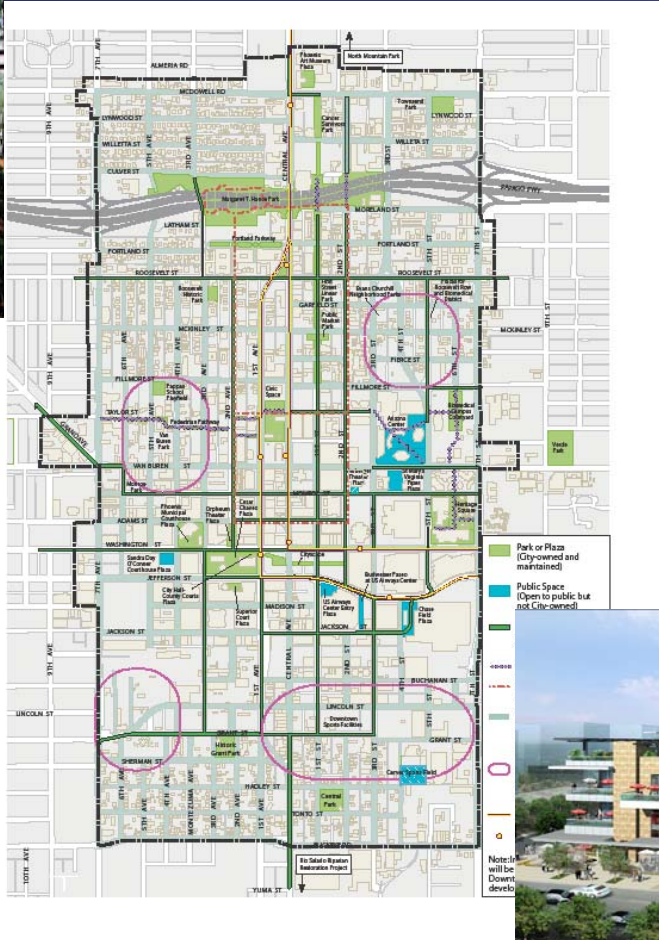
Shade!



Is There a Difference?



WHAT IS THE CONNECTED OASIS?

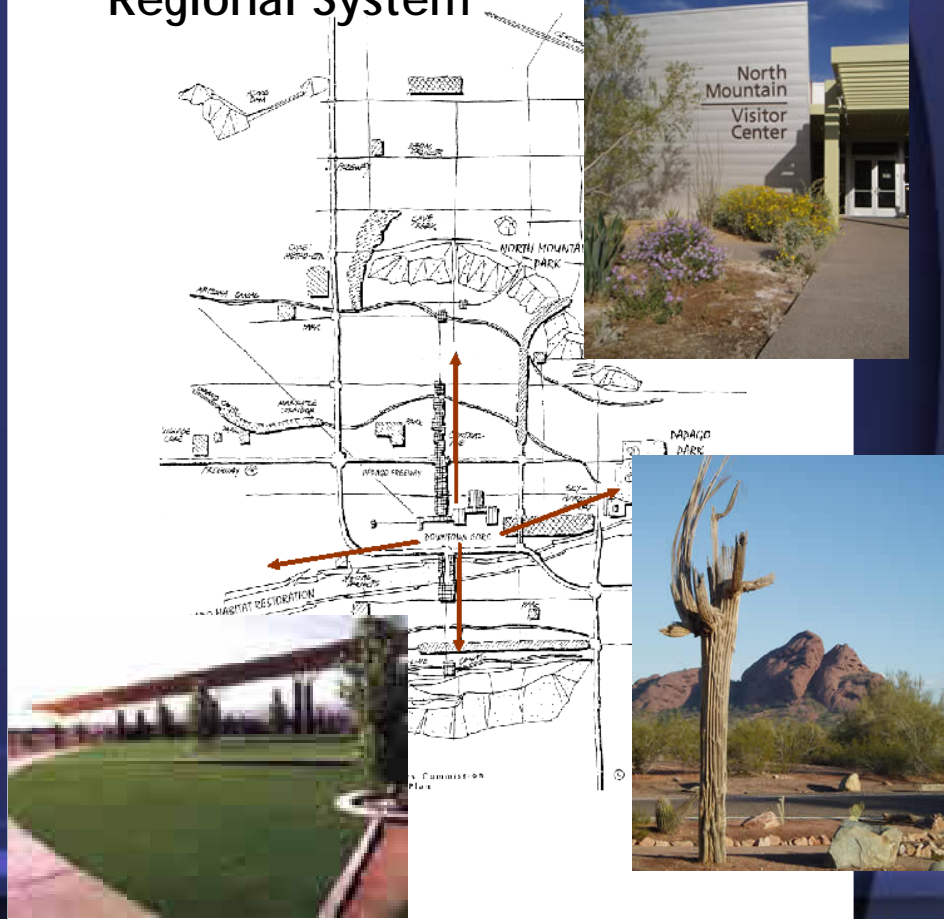


THE CONNECTED OASIS

Pedestrian Corridors



Regional System



Phx**SCAPE** PROGRAM (**S**hade & **C**omfort **A**ctivates the **P**edestrian **E**nvironment)

PEDESTRIAN SHADE



Wells Fargo Through Block

- Promotes convective air flow
- Planting for localized cooling
- Centrally located fountain induces air movement
- Dark shade not desirable in winter



Renaissance Plaza

- Pocket park at northeast corner
- Tree planting for shade and cooling
- Eroded corner for shade a air movement



PhxSCAPE PROGRAM

(Shade & Comfort Activates the Pedestrian Environment)

RETROFIT SHADE

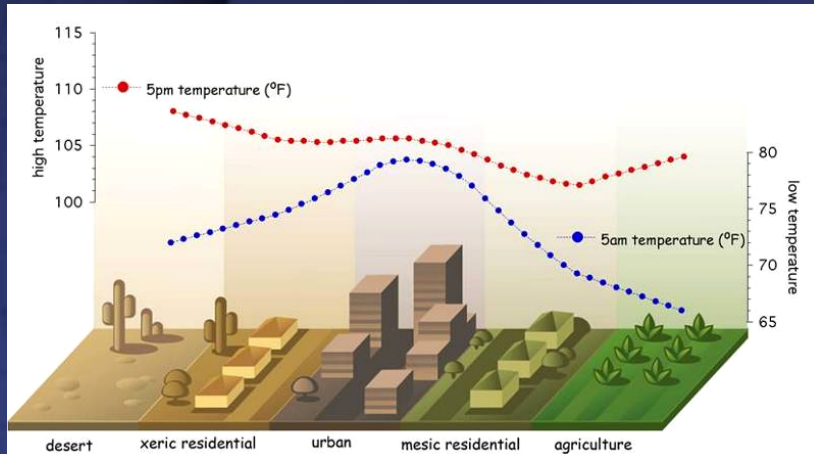


PhxSCAPE PROGRAM (Shade & Comfort Activates the Pedestrian Environment)

RETROFIT SHADE



CHAPTER 4: SUSTAINABLE DEVELOPMENT IN A DESERT CLIMATE



Definition

- The difference in temperature between densely populated urban areas and the surrounding countryside

Causes

- The prevalence of dark and dense building materials in the environment such as those use for roadways and buildings
- The presence of cars and other mechanical equipment that inject heat into the environment





GREEN STREETS



OUTDOOR SURFACE TEMPERATURES

Renaissance Plaza, June 15, 2007 at 1:30
PM Db 104.4 °F, Globe Temperature
108.4 °F

106°F - Trees in Sun

127°F - Granite Facade

105°F - Glass/Aluminum Storefront

133°F - Decomposed Granite Planting Bed
in Sun

106°F - Plants in Sun

135°F - Exposed Aggregate Conc. in Sun

121°F - Exposed Aggregate Conc. in Shade

121°F - Granite pavers in Sun

111°F - Granite pavers in Shade



DOWNTOWN BUILDING SHADE AND MASSING



Renaissance Plaza

- Pocket park at northeast corner
- Tree planting for shade and cooling
- Eroded corner for shade and air movement



101 First Avenue (at Adams)

- Overhang for protection from sun
- Tree planting at corner
- Ample area for pedestrian movement to avoid sunlight
- Space for air movement



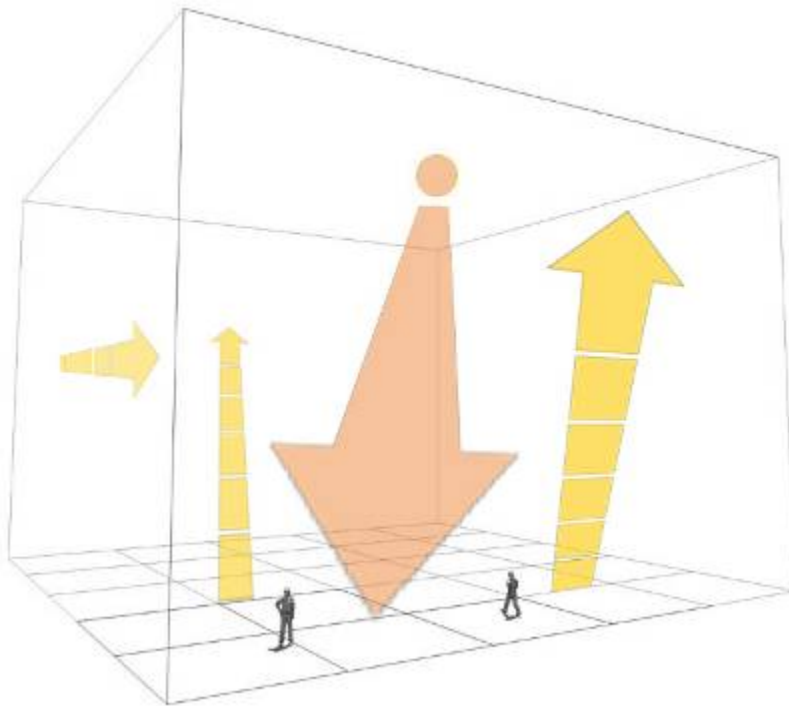


Design Strategies

Thermal Comfort

- THE HEAT EXPERIENCED BY A PERSON IN THE URBAN ENVIRONMENT IS A COMBINATION OF AIR TEMPERATURE AND THE HEAT RADIATING FROM SURROUNDING SURFACES.

- THE AIR TEMPERATURE IN THIS CASE WAS 110 DEGREES. WHEN COMBINED WITH THE HEAT OF THE SURROUNDING SURFACES THE *EFFECTIVE TEMPERATURE* FOR A PERSON ON THE SIDEWALK WAS 132 DEGREES.



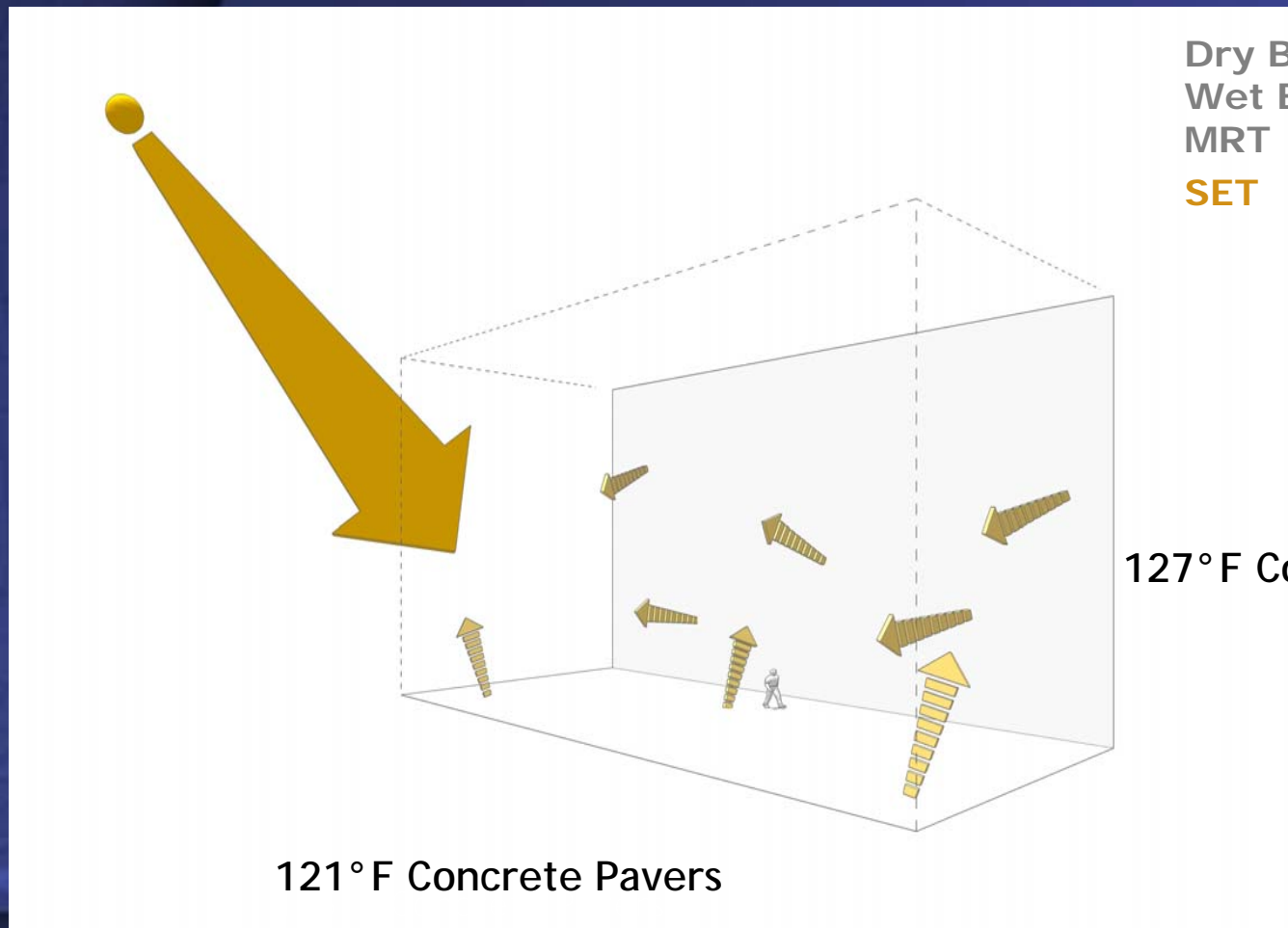
ambientTEMP:	110.0°F
avgRH:	30.0%
windSPEED (mph):	<u>15mph</u>
eff. TEMP:	132.0°F

The model represents typical conditions in downtown Phoenix on June 23 at 1:30 PM



THERMAL COMFORT DESIGN STRATEGIES

Base Case - No Strategies Employed

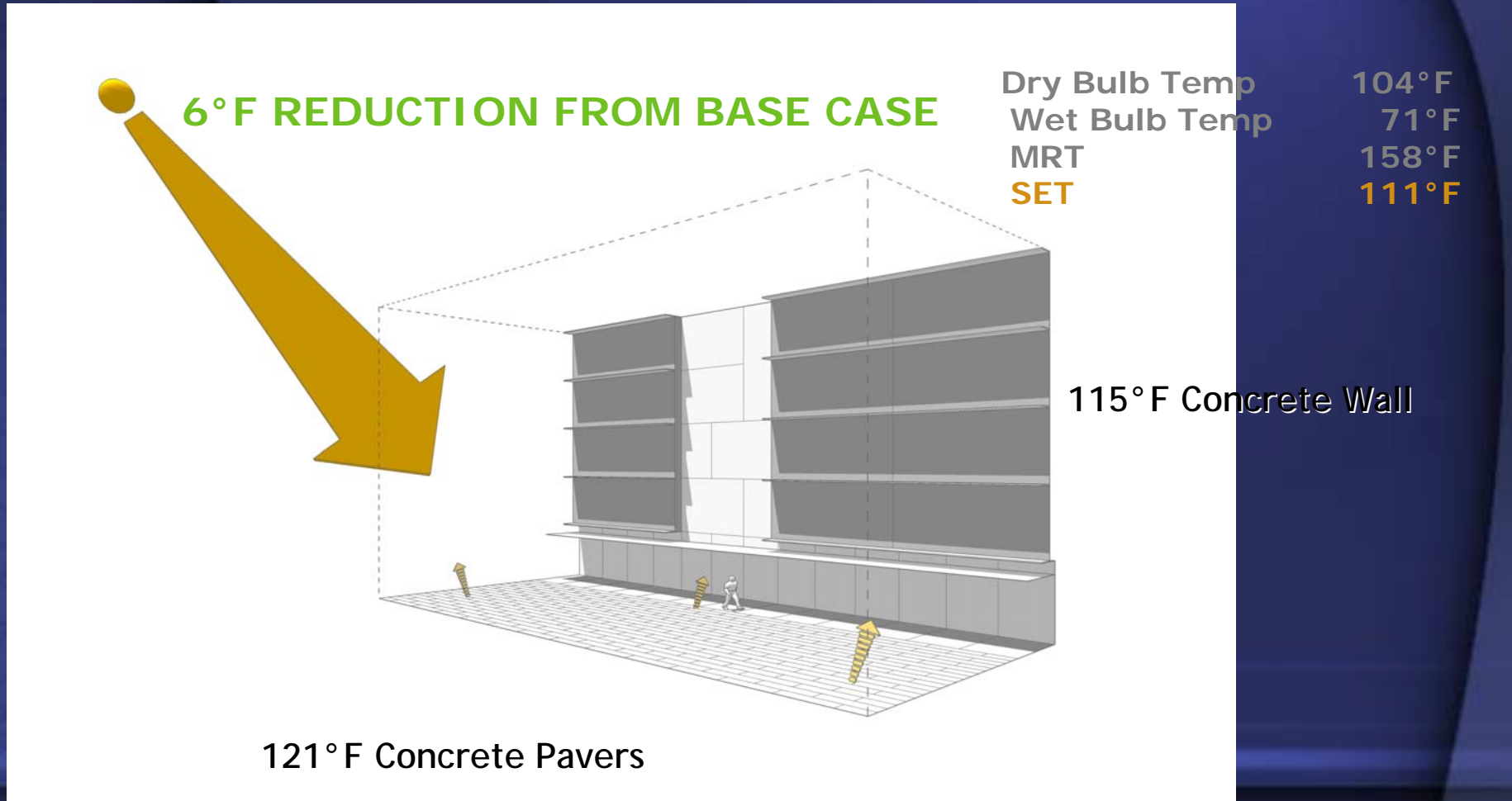


Dry Bulb Temp	104°F
Wet Bulb Temp	71°F
MRT	177°F
SET	117°F



THERMAL COMFORT DESIGN STRATEGIES

Pedestrian Shade Canopy and Building Shades



THERMAL COMFORT DESIGN STRATEGIES

Urban Forestry

13°F REDUCTION FROM BASE CASE

Dry Bulb Temp	104°F
Wet Bulb Temp	71°F
MRT	136°F
SET	104°F

110°F Concrete Wall

116°F Concrete Pavers



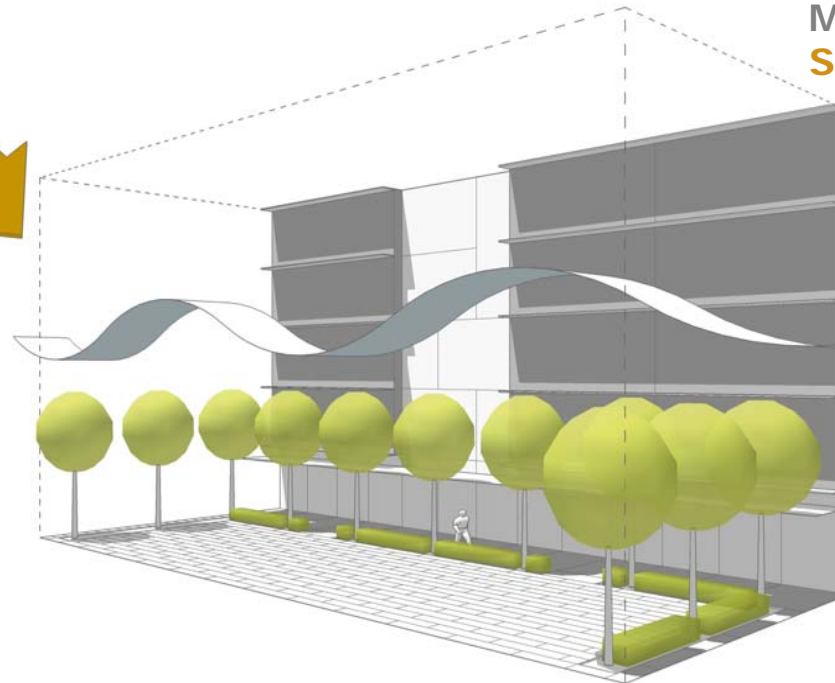
THERMAL COMFORT DESIGN STRATEGIES

4mph Convective Air Flow

17°F REDUCTION FROM BASE CASE



Dry Bulb Temp	104°F
Wet Bulb Temp	71°F
MRT	129°F
SET	100°F



109°F Concrete Wall

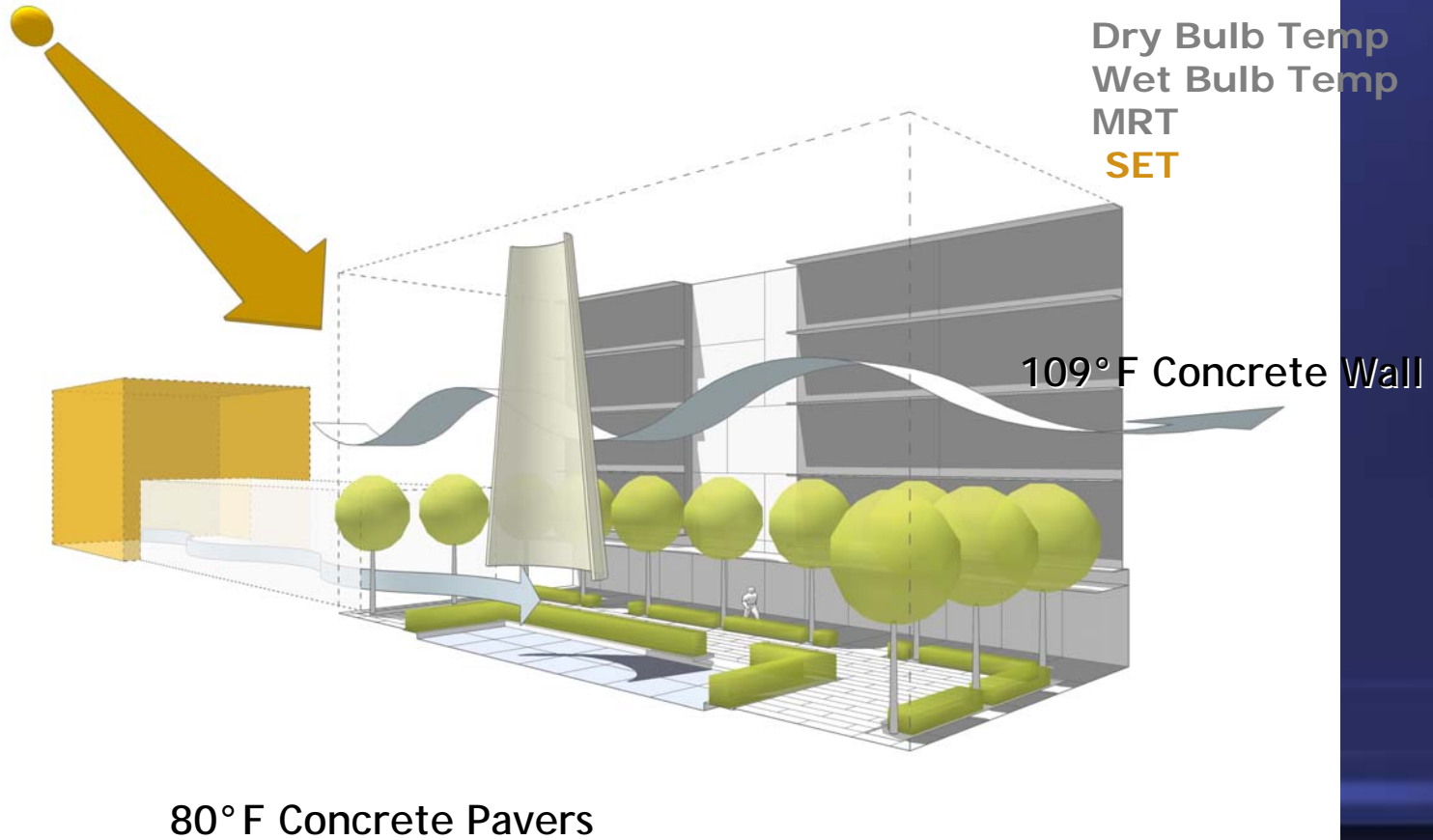
116°F Concrete Pavers



THERMAL COMFORT DESIGN STRATEGIES

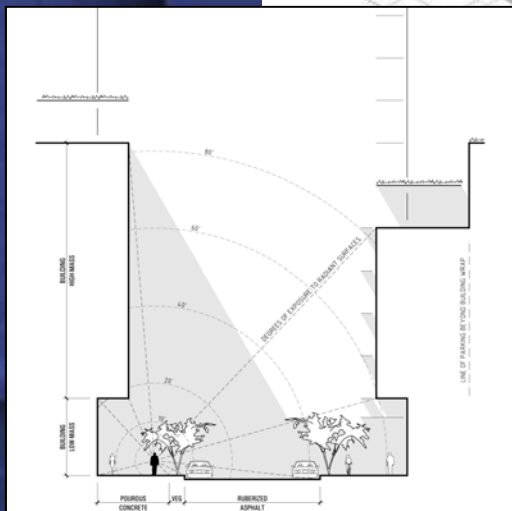
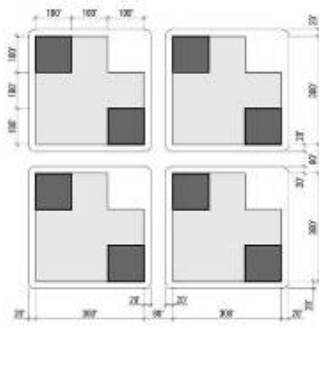
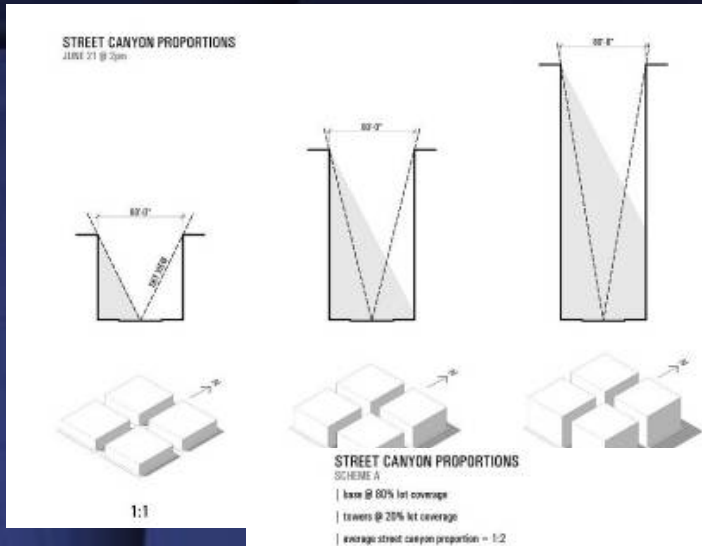
Water and Summary of Design Responses

22°F REDUCTION FROM BASE CASE



Design Strategies

Building Form



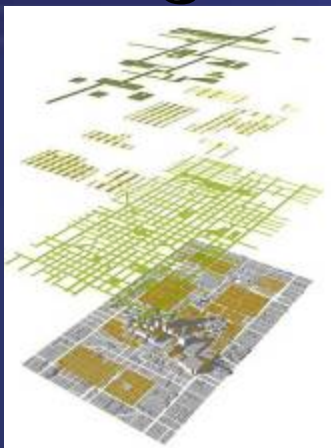
RESEARCH SHOWS THAT NARROWER STREET CANYONS ARE THE MOST EFFECTIVE WAY TO INCREASE THERMAL COMFORT AT THE STREET LEVEL IN HOT, ARID CLIMATES. HOWEVER, THE INCREASED MASS OF BUILDINGS INCREASES THE URBAN HEAT ISLAND EFFECT. THE CHALLENGE IS TO FIND A BALANCE BETWEEN THE TWO CONDITIONS.

• INCREASED HEIGHT OF STREET CANYONS PROMOTE SHADE ON STREETS. THE NARROWER PROPORTIONS ALSO REDUCE THE AMOUNT OF SKY "SEEN" BY THE MATERIAL SURFACES, REDUCING THE POSSIBILITY OF NIGHT TIME COOLING.

• FIND A BALANCE BETWEEN NARROW AND WIDE SPACES – COMBINE TOWERS WITH CONTINUOUS STREET WALLS – RESERVE 20% OF LOT COVERAGE FOR SHADED OPEN SPACES.



Street Shading Strategies for Heat Mitigation



Connected Oasis diagram showing green streets and open space system of parks and connectors

Low mass paving and building materials such as crumb rubber asphalt and permeable concrete decrease the UHI and provide additional daytime cooling.

STREET LEVEL SHADING IN THE FORM OF TREE PLANTING AND ARCHITECTURAL CANOPIES ARE REQUIRED TO REDUCE HEAT BUILD UP ON STREET EXPOSED TO SUNLIGHT. A COMPREHENSIVE SYSTEM OF STREET SHADING IS ONE OF THE KEY COMPONENTS OF THE “CONNECTED OASIS,” THE PROPOSED OPEN SPACE FRAMEWORK PLAN OF THE URBAN FORM PROJECT. THREE POSSIBLE SHADING STRATEGIES ARE SHOWN.

- THE FIRST EMPHASIZES TREE PLANTING AND IS APPROPRIATE FOR RESIDENTIAL AREAS.
- THE SECOND INCLUDES AN ARCHITECTURAL CANOPY OVER THE RIGHT-OF-WAY AND IS APPROPRIATE FOR COMMERCIAL AREAS.
- THE THIRD SHOWS A “RETROFIT” CANOPY FOR EXISTING STREETS UNSUITABLE FOR PLANTING.



DOWNTOWN BUILDING SHADE AND MASSING



Renaissance Plaza

- Pocket park at northeast corner
- Tree planting for shade and cooling
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101 Building

- Overhang for protection from sun
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- Ample area for pedestrian movement to avoid sunlight
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CHAPTER 6: ZONING AND URBAN FORM STANDARDS



DOWNTOWN PHOENIX PLAN

Form-Based Code



CITY OF PHOENIX

DRAFT FOR PUBLIC REVIEW

January 2008

PHOENIX PLANNING
DEPARTMENT



Well-intentioned policy statement: Infill and develop in existing urbanized areas. Build affordable multi-family housing near transportation corridors.



TYPICAL STREET VIEW



QUESTIONS?

