D RESILIENT ECOSYSTEMS

WHAT IS AT RISK?

The **Alewife area** is an intersect of **natural ecosystems** and includes elements such as the Alewife Brook and Alewife Brook Reservation. The number of days **over 90°F** are projected to nearly **triple by 2030**, from present 11 days per year to around 31 days per year. Parts of the Alewife area that lack vegetation will experience **heat vulnerability** exacerbated by the **urban heat island** (UHI) effect.

TEMPERATURE PROJECTIONS

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

1971 - 2000
(Baseline)

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

2015 - 2044
(2030)

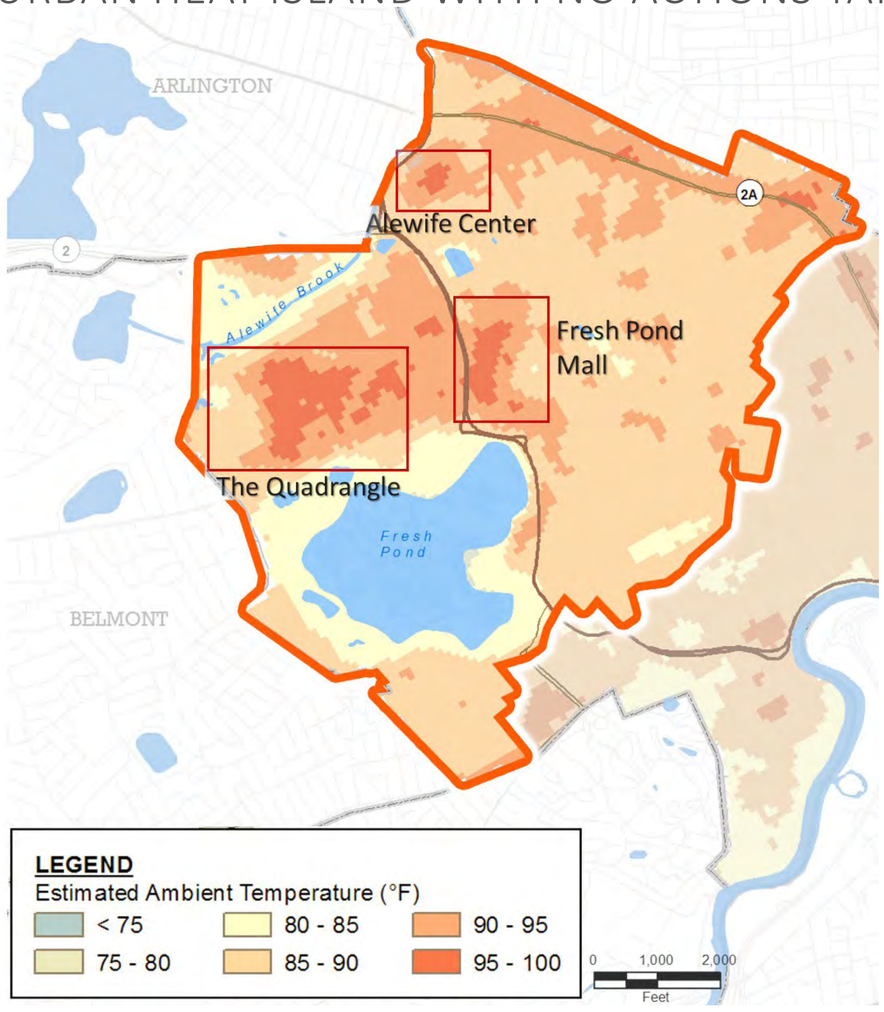
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

2055 - 2084
(2070)

Above 90°F - Low Scenario Above 90°F - High Scenario Above 100°F - Low Scenario High 100°F - High Scenario

[SOURCE: CCVA PART 1, 2015]

2030 URBAN HEAT ISLAND WITH NO ACTIONS TAKEN

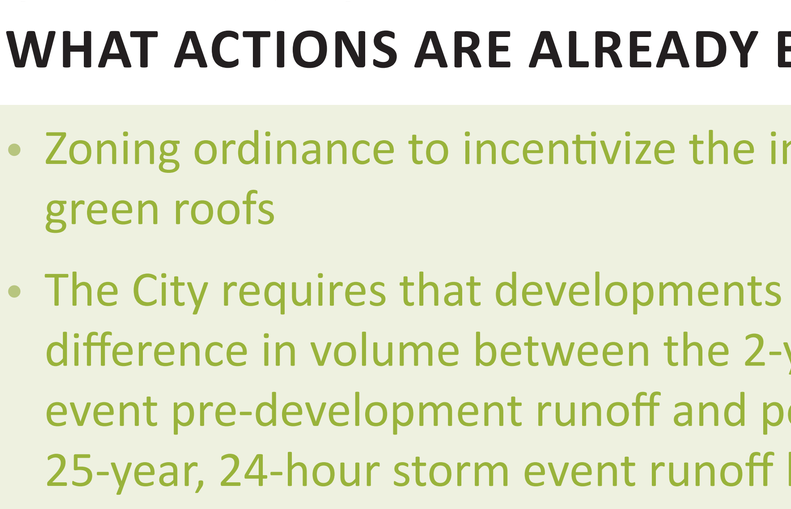


[SOURCE: CCVA PART 1, 2015]

WHAT ACTIONS ARE ALREADY BEING TAKEN?

- Zoning ordinance to incentivize the implementation of green roofs
- The City requires that developments store the difference in volume between the 2-year, 24-hour storm event pre-development runoff and post-development 25-year, 24-hour storm event runoff hydrograph
- Porous pavement and infiltrating catch basins have been installed in some streets in Cambridge
- The City provides free access to public pools and waterplay areas during heat waves
- The City is developing a comprehensive Urban Forest Master Plan
- The Department of Public Works has developed and maintains a comprehensive tree inventory of public street and park trees

WHAT ARE OTHER CITIES DOING?



D4

[SOURCE: RIVERS IN SYNERGY, PITTSBURG, PA]

PARK DESIGNED FOR STORMWATER STORAGE- PITTSBURG, PENNSYLVANIA

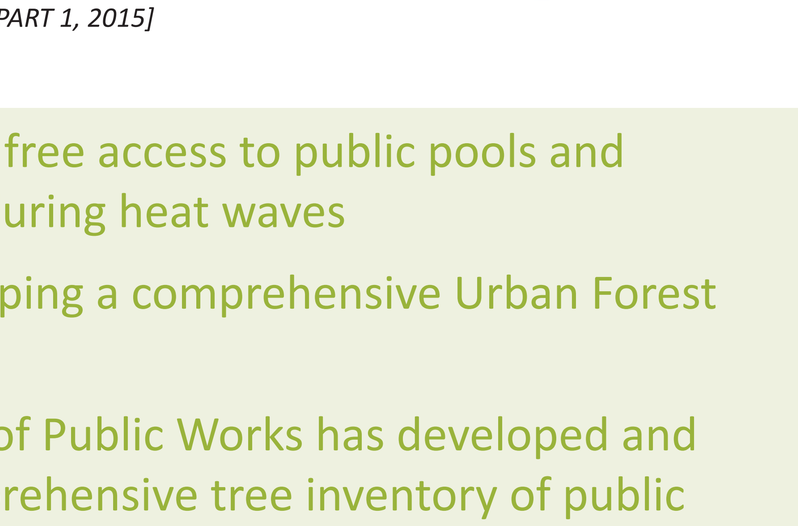
The City of Pittsburgh has included elements of green infrastructure in every major park improvement in the past 15 years. This natural landscape allows stormwater to be retained, cleansed, and infiltrated before it reaches the river.

D2

[SOURCE: CONSERVATION DESIGN FORUM]

CHICAGO GREEN ROOF IMPROVEMENT FUND- CHICAGO, ILLINOIS

The Program, awards $5,000 grants for green roof projects on residential and small commercial projects. The city of Chicago currently requires all new, near-flat roofs meet the U.S. EPA ENERGY STAR cool roof standards as part of the Chicago Energy Conservation Code.



D3

[SOURCE: ENVIRONMENTAL SERVICES, CITY OF PORTLAND]

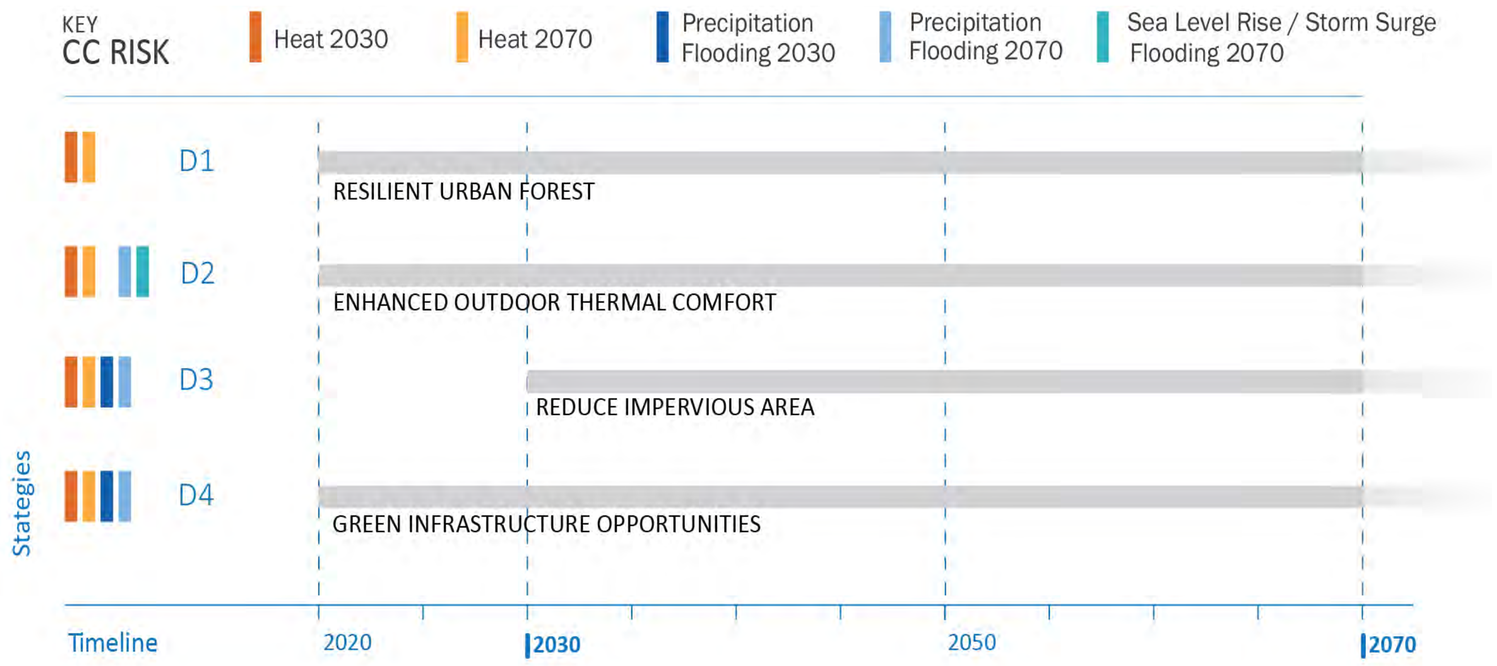
GREEN STREETS PROGRAM - PORTLAND, OREGON

In 2007, Portland City Council approved a policy to incorporate the use of green street elements. Under this policy, all development funded by the City of Portland must incorporate green street facilities, or 1% of their construction cost will go to a Green Street Fund.

D RESILIENT ECOSYSTEMS

TIMELINE

To prepare resilient infrastructure for climate change, there are 4 strategies the City is focusing on. These focus on **mitigating** the **Urban Heat-Island** (UHI) effect to protect vulnerable populations from the negative health impacts of extreme heat, **improve water quality**, and **reduce flooding impacts** from smaller storm events.



ADD YOUR STICKERS TO THE TABLE BELOW

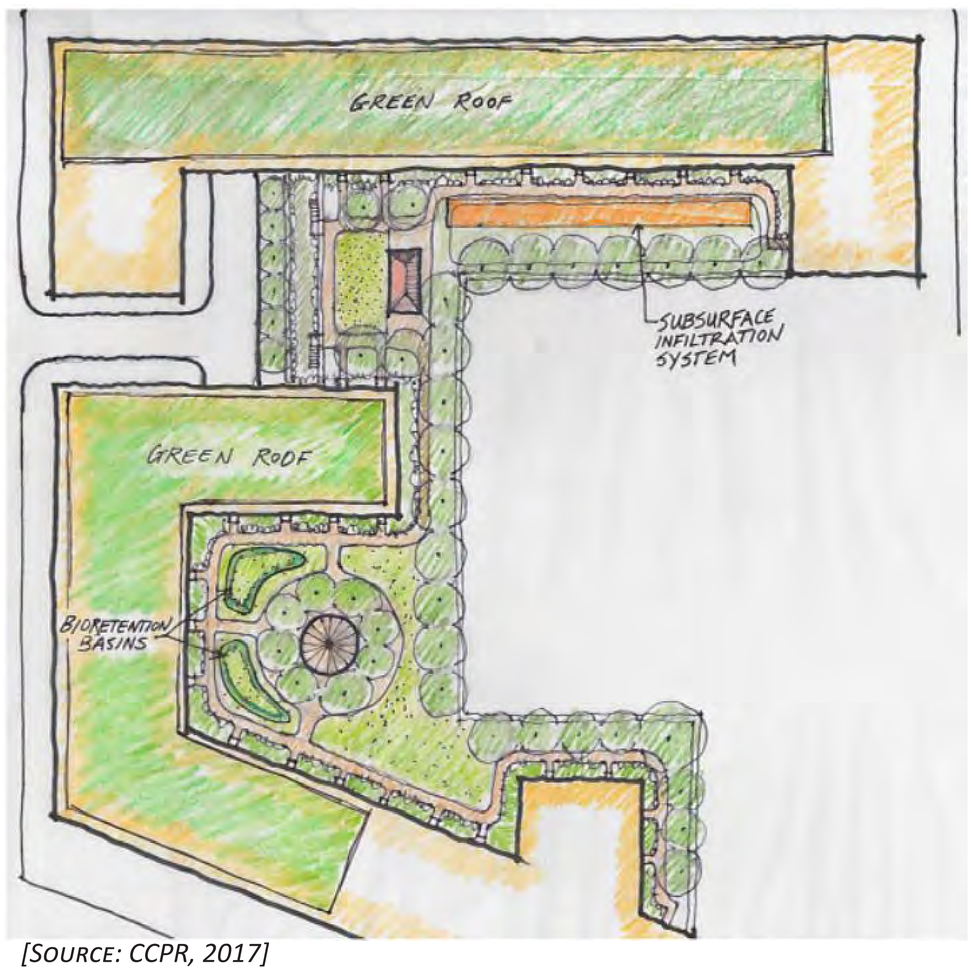
Which strategy is most important for your household (or work) in terms of resiliency?

Which strategy is most important for the Alewife Neighborhood in terms of resiliency?

STRATEGY	TITLE	DESCRIPTION	YOUR VOTE
D1	**RESILIENT URBAN FOREST**	Reduce the urban heat island effect by increasing the urban forest canopy, developing a comprehensive urban forest management plan, and continuing urban forest maintenance efforts.	
D2	**ENHANCED OUTDOOR THERMAL COMFORT**	Develop “cool corridors” aligned with bike and pedestrian routes and MBTA bus stops to enhance outdoor thermal comfort for transit users.	
D3	**REDUCE IMPERVIOUS AREA**	Reduce impervious area of upstream parcels to limit flooding at downstream parcels. Evaluate the implementation of a combination of grey and green infrastructure in parcels upstream of flood-prone areas to reduce runoff from impervious areas.	
D4	**GREEN INFRASTRUCTURE OPPORTUNITIES**	Implement Green Infrastructure (GI) to improve water quality and reduce flooding impacts from smaller rainfall events and mitigate urban heat islands (UHI)	

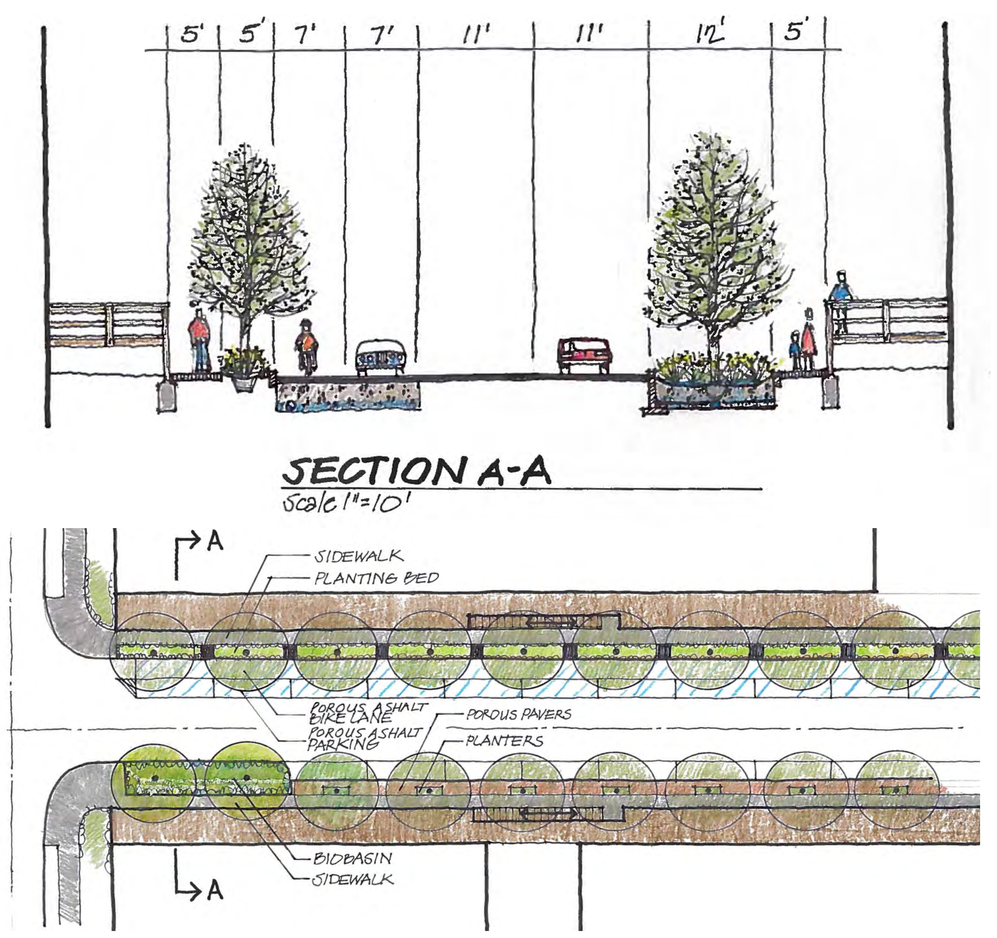
CONCEPTUAL DESIGN OF GREEN INFRASTRUCTURE

RESIDENTIAL PARCEL



[SOURCE: CCPR, 2017]

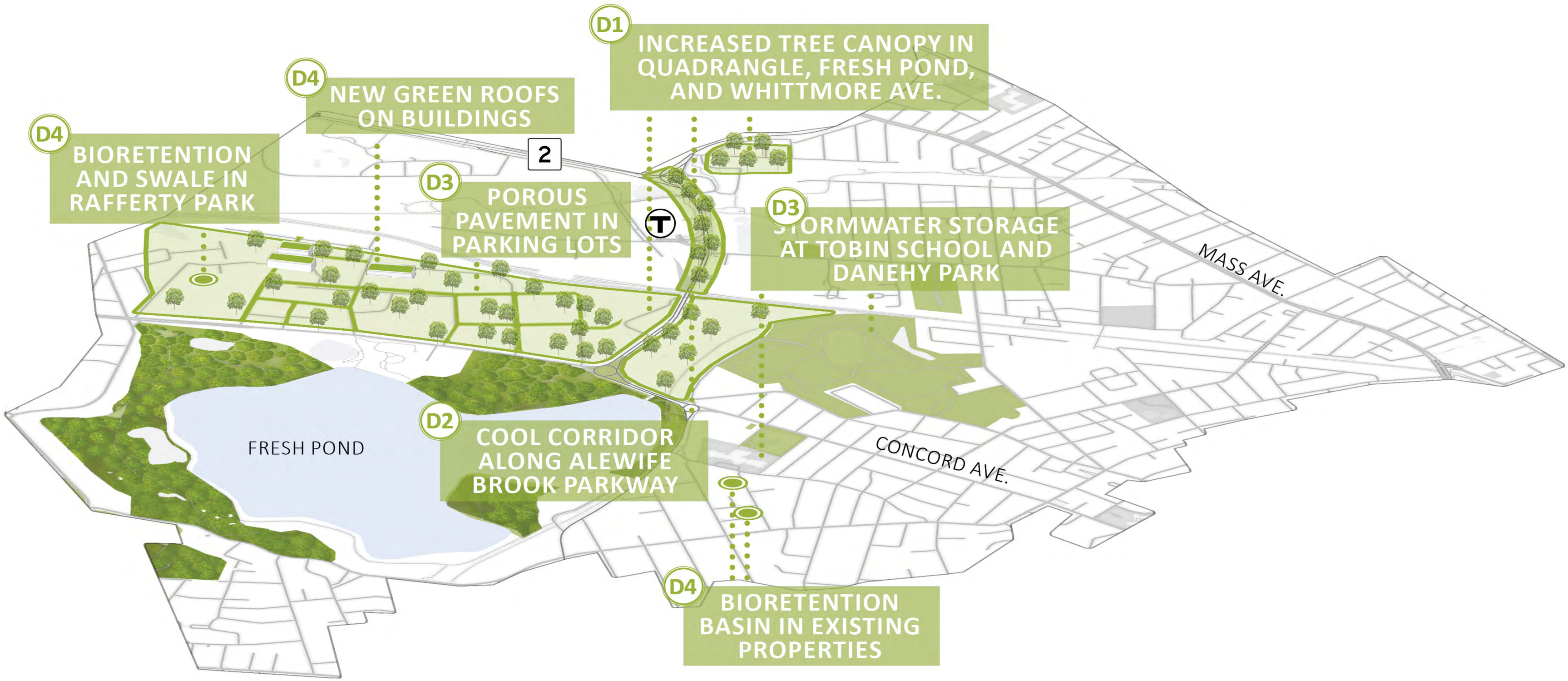
PUBLIC RIGHT-OF-WAY



[SOURCE: CCPR, 2017]

RESILIENT ECOSYSTEMS

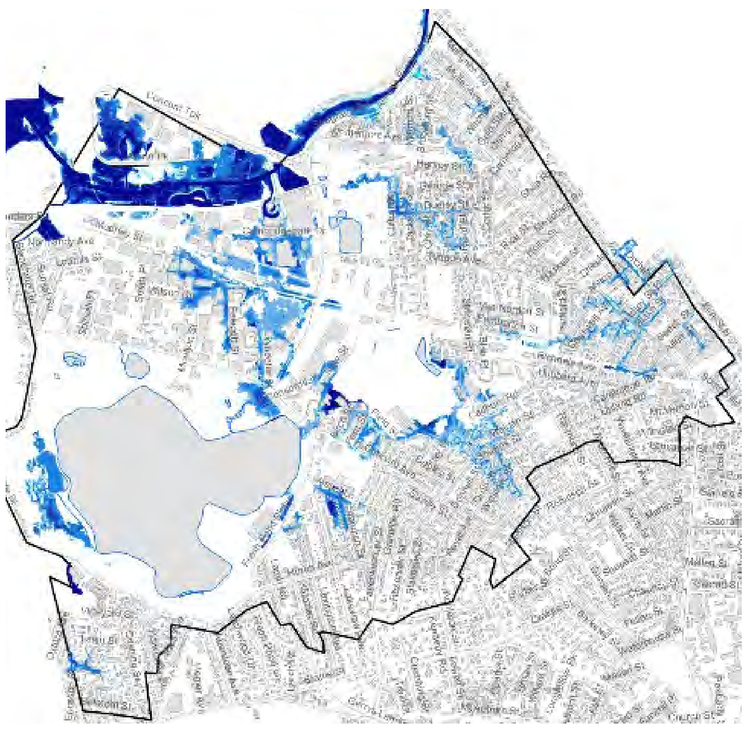
MAPPING THE POTENTIAL LOCATIONS OF RESILIENT INFRASTRUCTURE STRATEGIES



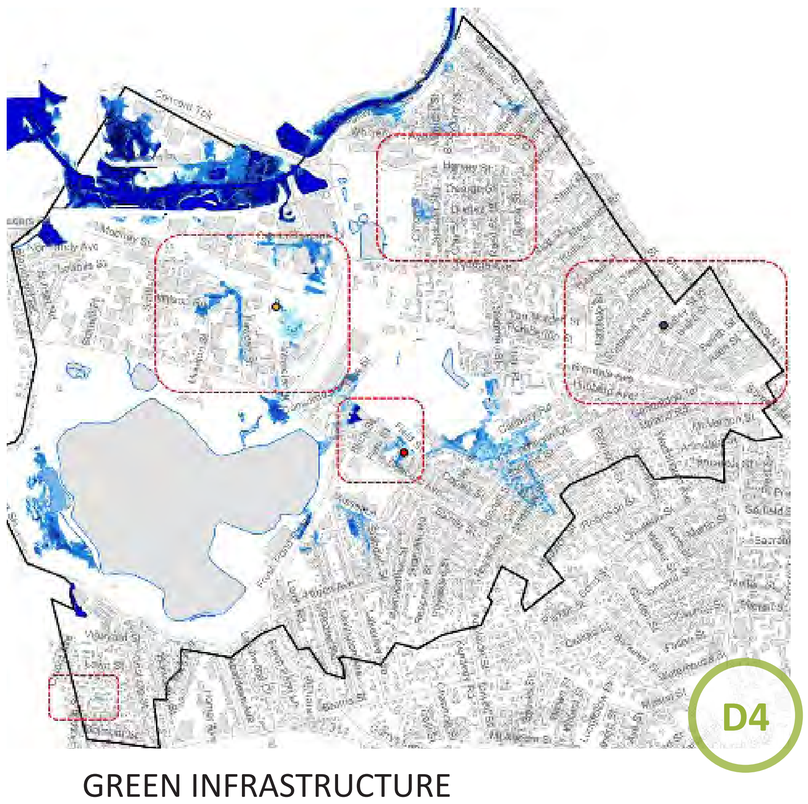
[Source: CCPR 2017]

RESILIENT ECOSYSTEMS

10-YEAR FLOODING IN 2070



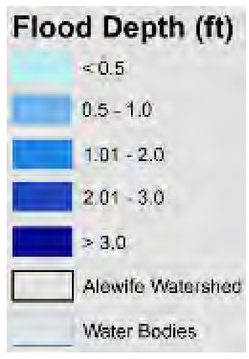
AS-IS INFRASTRUCTURE



GREEN INFRASTRUCTURE

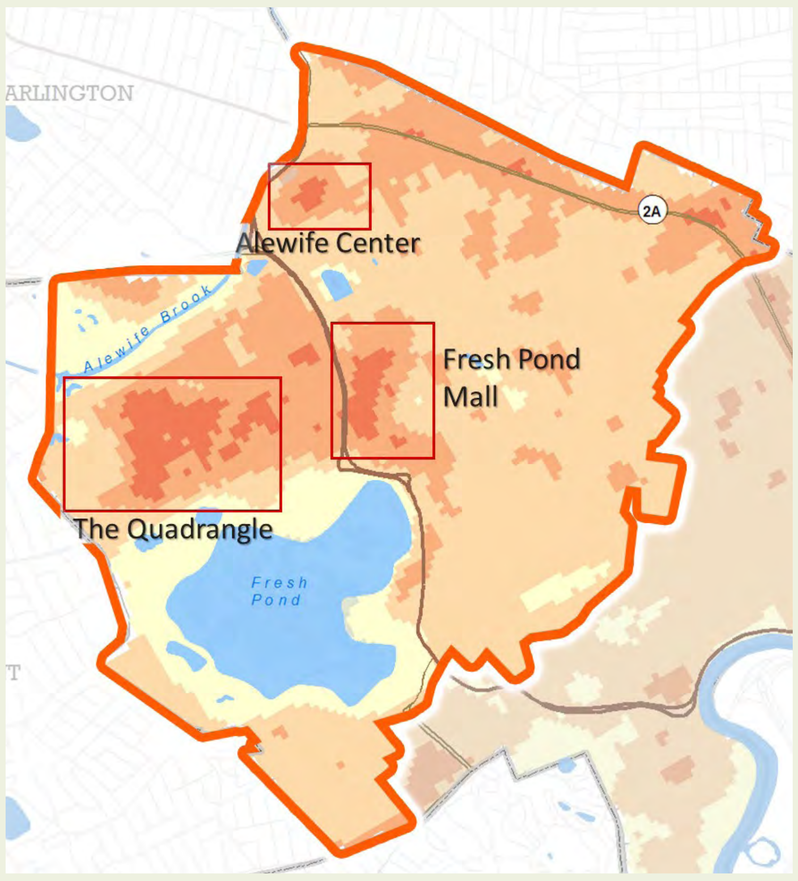
GREEN INFRASTRUCTURE TO MITIGATE FLOODING

Flood volume for the 10-year 24-hour storm in the Alewife area is projected to increase from approximately 13 MG in the present to 33 MG by 2070. Implementation of the green infrastructure solutions at the Maximum Extent Practicable (MEP) scale in the Alewife area can reduce flooding extent by 37% to approximately 21 MG of flood volume.

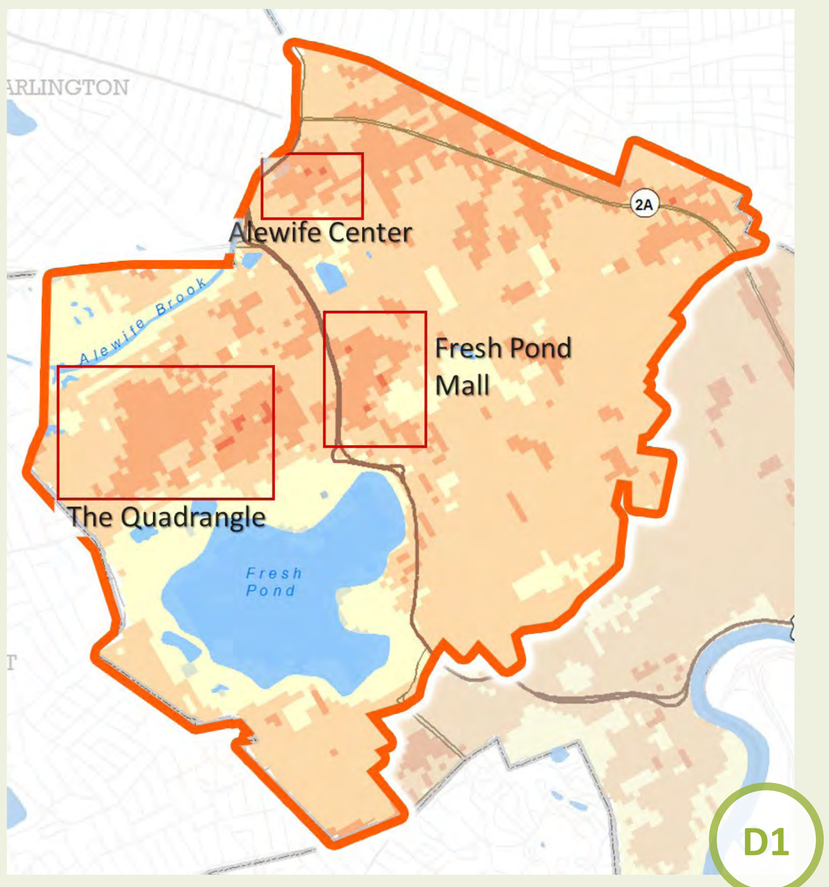


[SOURCE: CCPR, 2017]

URBAN HEAT ISLAND (UHI)



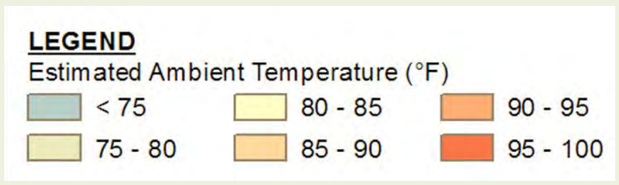
EXISTING TREE CANOPY



40% INCREASE IN TREE CANOPY

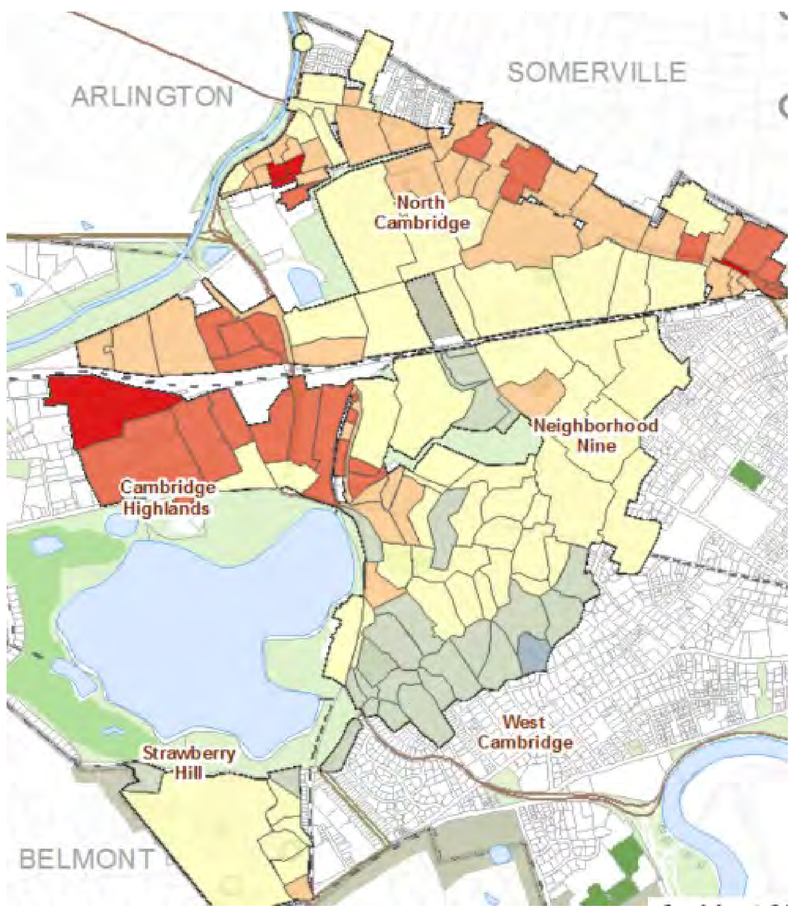
INCREASED TREE CANOPY

A 1% tree canopy increase relates to 0.12°F of cooling. 40% increase of in tree canopy in areas with less than 15% tree canopy can reduce some of the high UHI zones, such as in the Quadrangle area where the temperature can be reduced by 3°F.

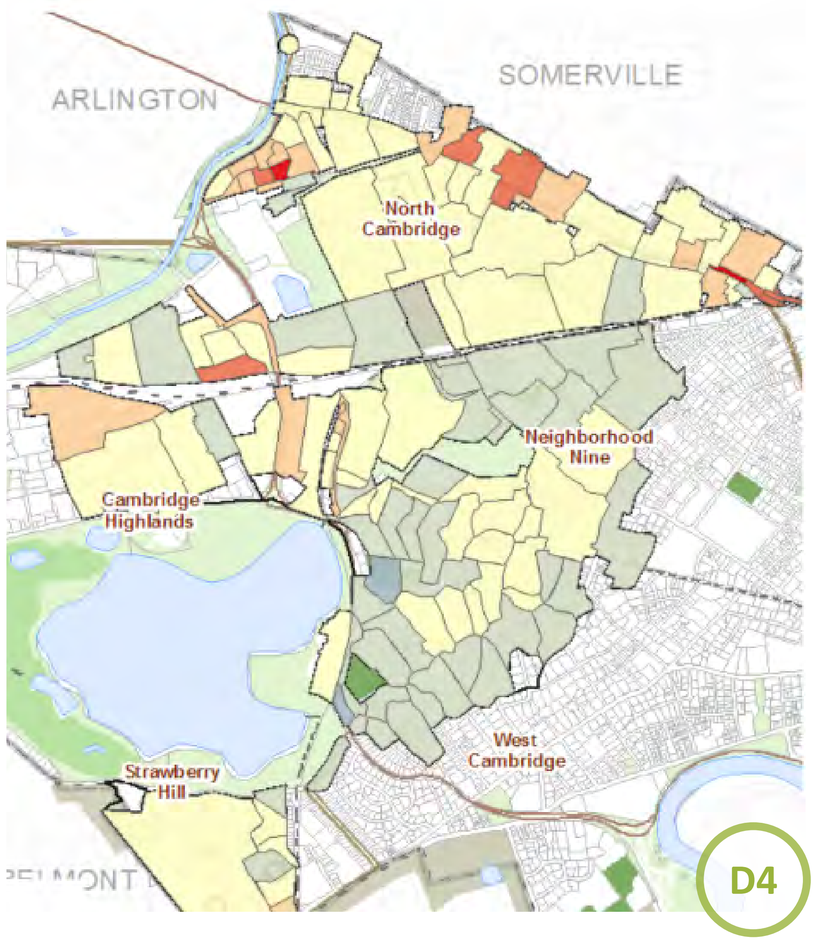


[SOURCE: CCPR, 2017]

UHI PER CATCHMENT AREA



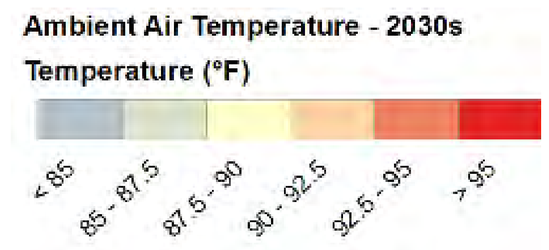
AS-IS INFRASTRUCTURE



GREEN INFRASTRUCTURE

GREEN INFRASTRUCTURE TO MITIGATE URBAN HEAT ISLAND EFFECT

Green Infrastructure such as biodentention basin, porous pavement and green roofs may reduce ambient temperature by 0.1°F - 6°F, with an average temperature decrease of 1.7°F.



[SOURCE: CCPR, 2017]