

Being Prepared for Climate Change

A Workbook for Developing Risk-Based Adaptation Plans

Actions That Could Reduce Water Temperature, Appendix F



Cover photograph: Waquoit Bay National Estuarine Research Reserve. From: National Oceanic and Atmospheric Administration/Department of Commerce, photographer Rick Crawford

This booklet is a reprinting of material from the EPA publication *Being Prepared for Climate Change: A Workbook for Developing Risk-Based Adaptation Plans* (EPA 842-K-14-002, August 2014).

The full workbook is available through the Climate Ready Estuaries website, www.epa.gov/cre.



www.epa.gov/cre



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If warmer water is determined to be a stressor that leads to unwanted risks, then a number of actions could potentially be effective at mitigating those risks.

TABLE F-1. ACTIONS THAT LOWER WATER TEMPERATURE AND CONTROL URBAN STORMWATER

Action	Water temperature benefits	Other benefits that might come from this action
Planting trees	<ul style="list-style-type: none"> Shades the ground and keeps it cooler 	<ul style="list-style-type: none"> Controls runoff and promotes infiltration
Constructing narrow streets	<ul style="list-style-type: none"> Results in less heat-holding asphalt and concrete 	<ul style="list-style-type: none"> Yields less runoff
Building swales and rain gardens	<ul style="list-style-type: none"> Gets water underground and maintains aquifers 	<ul style="list-style-type: none"> Keeps runoff out of waterways
Using rain barrels and cisterns	<ul style="list-style-type: none"> Reduces the need for stream diversions and demand on aquifers for irrigation water 	<ul style="list-style-type: none"> Keeps stormwater on a lot
Paving with permeable materials	<ul style="list-style-type: none"> Keeps runoff from moving over heated roadways and parking lots 	<ul style="list-style-type: none"> Promotes infiltration where the rain falls
Installing green roofs	<ul style="list-style-type: none"> Lowers temperatures compared to conventional roofs; reduces energy use and waste heat 	<ul style="list-style-type: none"> Traps stormwater on site

TABLE F-2. ACTIONS THAT LOWER WATER TEMPERATURE AND RESTORE WATERSHED STRUCTURE AND FUNCTION

Action	Water temperature benefits	Other benefits that might come from this action
In-stream measures		
Removing unneeded dams and impoundments	<ul style="list-style-type: none"> Keeps impounded waters from heating up 	<ul style="list-style-type: none"> Restores natural hydrology Returns to natural sediment transport and geomorphology Reestablishes natural disturbance
Releasing cold water from upstream impoundments	<ul style="list-style-type: none"> Strategically lowers water temperature 	<ul style="list-style-type: none"> Constructs biotic refugia or habitat Builds biological communities
Controlling stream bank erosion	<ul style="list-style-type: none"> Keeps channels from getting wider and shallower and warming more easily 	<ul style="list-style-type: none"> Returns to natural sediment transport and geomorphology Raises water quality
Creating deep pools or artificial logjams	<ul style="list-style-type: none"> Provides shade or deep water that limits direct heating from sunlight 	<ul style="list-style-type: none"> Constructs biotic refugia or habitat Builds biological communities
Groundwater measures		
Controlling groundwater withdrawal	<ul style="list-style-type: none"> Maintains groundwater sources that supply base flow to streams 	<ul style="list-style-type: none"> Creates habitat and hydrologic connectivity Restores natural hydrology
Promoting stormwater infiltration	<ul style="list-style-type: none"> Gets water into aquifers and away from exposure to the sun Recharges groundwater that supplies baseflow that regulates stream temperature 	<ul style="list-style-type: none"> Restores natural hydrology Returns to natural sediment transport and geomorphology Reestablishes natural disturbance
Removing unneeded channelization	<ul style="list-style-type: none"> Restores natural groundwater exchange Restores connection to floodplains which promotes floodwater infiltration into aquifers 	<ul style="list-style-type: none"> Restores natural hydrology Returns to natural sediment transport and geomorphology Reestablishes natural disturbance
Land use measures		
Planting forest and floodplain habitat	<ul style="list-style-type: none"> Shades watershed lands, surface waters and streambeds Reduces runoff and promotes groundwater infiltration 	<ul style="list-style-type: none"> Creates habitat and hydrologic connectivity Rebuilds native vegetation and corridor networks Raises water quality
Keeping livestock out of streams	<ul style="list-style-type: none"> Reduces bank erosion 	<ul style="list-style-type: none"> Returns to natural sediment transport and geomorphology Raises water quality
Controlling soil erosion in the watershed	<ul style="list-style-type: none"> Keeps sediment from clogging streambeds and interfering with groundwater exchange Keeps heat-trapping particles out of waterways 	<ul style="list-style-type: none"> Returns to natural sediment transport and geomorphology Raises water quality
Controlling stormwater runoff	<ul style="list-style-type: none"> Reduces high peak flows that contribute to erosion and channel changes 	<ul style="list-style-type: none"> Restores natural hydrology Returns to natural sediment transport and geomorphology Reestablishes natural disturbance Raises water quality

References

For more information please see the following resources:

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Website links verified in July 2014