HEALING THE URBAN-RURAL DIVIDE THROUGH
GREEN INFRASTRUCTURE

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LAST YEAR, ESRI – THE WORLD’S LEADING GEOGRAPHICAL INFORMATION SYSTEMS COMPANY – AND THE NATIONAL GEOGRAPHIC SOCIETY RELEASED A GREEN INFRASTRUCTURE FOR THE U.S. INITIATIVE (1). THIS EFFORT IDENTIFIES THE NATION’S REMAINING NATURAL AREAS, PROVIDING A POTENTIAL BLUEPRINT FOR LAND PROTECTION AND CONSERVATION. THE INITIATIVE ALSO RECOGNIZES THAT THESE NATURAL ASSETS – “GREEN INFRASTRUCTURE” – PROVIDE COMMUNITIES WITH INVALUABLE ECOSYSTEM SERVICES THAT CLEAN OUR AIR, FILTER OUR WATER, MITIGATE NATURAL DISASTERS, AND IMPROVE OUR QUALITY OF LIFE. AS THE U.S. SEEMS POISED TO LAUNCH MAJOR INVESTMENTS IN “GREY INFRASTRUCTURE” SUCH AS STORMWATER MANAGEMENT SYSTEMS, ROADWAY CURBS AND GUTTERS, AND WATER FILTRATION PLANTS, AND AS THE NATION DEALS WITH DEEP DIVISIONS BETWEEN URBAN AND RURAL COMMUNITIES, THIS INITIATIVE OFFERS AN INNOVATIVE ALTERNATIVE: GREEN INFRASTRUCTURE HAS MANY OF THE SAME, DESIRED OUTCOMES OF GRAY INFRASTRUCTURE AT A FRACTION OF THE COST, WHILE ALSO ENHANCING BOTH RURAL AND URBAN ECONOMIES.

SOME COMMUNITIES HAVE BEGUN TO PURSUE INNOVATIVE STRATEGIES TO REDUCE THEIR INFRASTRUCTURE COSTS. IN 2013, THE WASHINGTON D.C. DEPARTMENT OF ENERGY & ENVIRONMENT LAUNCHED THE STORMWATER RETENTION CREDIT TRADING PROGRAM TO OFFSET THE COSTLY EXPANSION AND MAINTENANCE OF THEIR GREY STORMWATER INFRASTRUCTURE. THE DISTRICT CHARGES AN ANNUAL IN-LIEU FEE BASED ON THE GALLONS OF STORMWATER RUNOFF FROM A PROPERTY, PROMOTING GREEN INFRASTRUCTURE BY CREATING AN INCENTIVE-BASED CREDITS-AND-TRADING SYSTEM RELATED TO STORMWATER GENERATION AND RETENTION. THE PROGRAM INCENTIVIZES NEW DEVELOPMENTS TO OVER-PERFORM ON THEIR STORMWATER RETENTION REQUIREMENTS AND THEN ALLOWS THEM TO SELL STORMWATER RETENTION CREDITS (SRC) TO OLDER DEVELOPMENTS THAT CANNOT RETAIN ALL OF THEIR STORMWATER ONSITE. THE PROGRAM MANDATES THAT EACH PROPERTY OWNER MITIGATE AT LEAST HALF OF THIS RUNOFF ONSITE IF TECHNICALLY FEASIBLE AND ACCOUNT FOR THE OTHER HALF BY EITHER PAYING THE IN-LIEU FEE OF \$3.58/GALLON/YEAR OR PURCHASING LOWER COST SRCS FROM ANOTHER SITE AT APPROXIMATELY \$2.00/GALLON/YEAR TO HELP OFFSET COSTS TO THE GREY STORMWATER INFRASTRUCTURE SYSTEM. ONE SRC CORRESPONDS TO THE RETENTION OF 1 GALLON OF STORMWATER FOR 1 YEAR.

WE THINK THAT WASHINGTON D.C.’S STORMWATER RETENTION CREDIT TRADING PROGRAM OFFERS A VIABLE WAY TO INCENTIVIZE THE INSTALLATION OF GREEN INFRASTRUCTURE IN COMMUNITIES LARGE AND SMALL, ACROSS THE U.S. TO TEST THAT ASSUMPTION, WE HAVE APPLIED THE IDEA OF TRADING STORMWATER RETENTION CREDITS TO A TYPICAL SMALL TOWN – IN THIS CASE, STILLWATER, MINNESOTA – TO DEMONSTRATE THE PROGRAM’S BROAD RELEVANCE. (2) MINNESOTA’S LEGISLATURE HAS HAD HEATED DEBATES OVER A BILL, NOW LAW, THAT REQUIRES THE INSTALLATION OF LANDSCAPE BUFFER STRIPS AROUND MAJOR BODIES OF WATER, PITCHING ENVIRONMENTALISTS WANTING TO PROTECT WATER QUALITY IN THE STATE AGAINST FARMERS ARGUING THAT THE LAW PUTS AN UNDUE BURDEN ON THEM BY TAKING LAND OUT OF PRODUCTION WITH NO COMPENSATION. BOTH SIDES HAVE A POINT AND WE SEE IN THE WASHINGTON D.C. PROGRAM AN OPPORTUNITY TO BOTH PROTECT WATER QUALITY AND COMPENSATE FARMERS AND OTHER PROPERTY OWNERS FOR INSTALLING BUFFER STRIPS.

IN ANY COMMUNITY WITH AGRICULTURAL LAND NEAR URBAN OR SUBURBAN AREAS WITH A LOT OF IMPERVIOUS SURFACES SUCH AS PARKING LOTS OR LARGE, FLAT ROOFS, RURAL PROPERTY OWNERS COULD SELL STORMWATER RETENTION CREDITS TO URBAN LANDOWNERS TO OFFSET STORMWATER IMPACTS DOWNSTREAM. THE SALE OF THOSE CREDITS WOULD RELIEVE COMMERCIAL LANDOWNERS IN CITIES AND SUBURBS FROM HAVING TO HANDLE ALL OF THEIR STORMWATER ON SITE. AT THE SAME TIME, IT WOULD PAY FARMERS TO TAKE LAND OUT OF AGRICULTURAL PRODUCTION AND CONVERT PORTIONS OF IT BACK TO GREEN INFRASTRUCTURE IN THE FORM OF VEGETATED BUFFER STRIPS AROUND SURFACE WATER, FORESTED HABITAT CORRIDORS, AND REGENERATED WETLANDS AMONG OTHER OPTIONS.

LIKE MANY AMERICAN COMMUNITIES, STILLWATER HAS A RELATIVELY SMALL URBAN CORE ORIENTED TOWARD A RIVER. COMMERCIAL DEVELOPMENT ALONG MAJOR HIGHWAYS, AND A RING OF SPRAWLING LOW-DENSITY SUBURBAN DEVELOPMENT SURROUNDED BY AGRICULTURAL LAND. THE NATIONAL LAND COVER DATASET ALSO SHOWS THAT STILLWATER HAS THE GREATEST AMOUNT OF IMPERVIOUS SURFACE IN ITS COMMERCIAL AREAS, DOWNTOWN DISTRICT, INDUSTRIAL ZONES, AND ROAD AND HIGHWAY RIGHT-OF-WAYS. FOR PURPOSES OF THIS STUDY, WE HAVE EXCLUDED RESIDENTIAL AREAS, WITH THEIR IMPERVIOUS DRIVEWAYS, OR THE DOWNTOWN, WITH ITS OLDER BUILDINGS, AND HAVE FOCUSED JUST ON THE HIGHWAY ORIENTED COMMERCIAL AREA AT EDGE OF TOWN.

IN STILLWATER, THAT COMMERCIAL AREA COVERS 237 ACRES, WITH 64% OF THAT ACREAGE COMPRISING IMPERVIOUS SURFACES, THAT ONE ZONE WOULD GENERATE APPROXIMATELY 5 MILLION GALLONS OF STORMWATER RUNOFF DURING A 1.1 INCH STORMWATER EVENT, WHICH HAS A 90 PERCENT LIKELIHOOD OF OCCURRING IN ANY GIVEN YEAR. USING A SIMILAR IN-LIEU FEE SCHEDULE AS THE D.C. STORMWATER PROGRAM AND ASSUMING HALF OF THIS STORMWATER GETS CAPTURED ONSITE, WE DETERMINED THAT A \$0.50/ GALLON/YEAR FEE, CONSIDERABLY SMALLER THAN WHAT D.C. CHARGES, WOULD GENERATE APPROXIMATELY \$1.2 MILLION OR .5 MILLION IN SRC CREDITS. WITH THE VALUE OF ONE ACRE OF FARMLAND SET TO 500 SRCS OR \$1000/ACRE/YEAR, THIS CREATES A POSITIVE CASH FLOW TO FARMERS WHOSE LAND IN PRODUCTION GENERATES, ON AVERAGE, JUST \$79/ACRE/YEAR. (3) IN STILLWATER, THIS TRANSLATES TO 4,706 ACRES OF POTENTIAL LAND CONVERSION TO GREEN INFRASTRUCTURE IN A WATERSHED THAT HAS 99 LAKES AND 24 MILES OF STREAMS. IMPLEMENTING 100-FOOT BUFFER ZONES AROUND THESE WATER BODIES TOTALS 2,264 ACRES, LEAVING 2,441 ACRES OF LAND AVAILABLE FOR CONVERSION TO GREEN INFRASTRUCTURE IN OTHER PORTIONS OF THE LANDSCAPE, SUCH AS ALONG RURAL ROADS IN ORDER TO HANDLE RUN-OFF FROM FARM FIELDS.

THIS EXAMPLE SHOWS HOW GREEN INFRASTRUCTURE OFFERS AN ECONOMICALLY VIABLE, POLITICALLY EQUITABLE AND ENVIRONMENTALLY RESPONSIBLE WAY OF DEALING WITH OUR NATION’S LANDSCAPE. A STORMWATER RETENTION CREDIT TRADING PROGRAM REPRESENTS A COST-EFFECTIVE SOLUTION TO DEALING WITH AMERICA’S AGING INFRASTRUCTURE, WHILE PROTECTING LOCAL WATERSHEDS, LOWERING COSTS FOR URBAN AND SUBURBAN PROPERTY OWNERS, AND INCREASING PAYMENTS TO FARMERS TO PROTECT OUR WATERWAYS AND TO PROVIDE HABITAT CORRIDORS FOR OTHER SPECIES – A WIN-WIN-WIN FOR EVERYONE INVOLVED.

SOURCES
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HTTPS://DOEE.DC.GOV/SRC
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EXISTING CONDITIONS _STILLWATER, MINNESOTA

GREEN INFRASTRUCTURE CALCULATIONS

STORMWATER RUNOFF IN STILLWATER, MINNESOTA	
TOTAL COMMERCIAL AREA	237.0 ACRES
SWVY (GAL) IN COMMERCIAL AREA	4,705,593.2 GAL
$(1.1 \text{ IN}) \times (95\% \text{ IMPERVIOUS}) \times \text{AREA} = 7.48/12$	
OFFV = SWRV/2	2,352,796.6 GAL
ILF (IN-LIEU-FEE) (\$0.5/GAL)	1,176,398.3 \$ IN SRC
STORMWATER CREDIT (SRC)	
SRC VALUE	0.2 \$
SRC/ILF RATIO	0.4 %
POTENTIAL SRC BUYER QUANTITY	470,559.3 \$
POTENTIAL SRC BUYER QUANTITY	2,352,796.6 SRC
RURAL STORMWATER CREDIT	
AVERAGE FARM OWNER REVENUE	79 \$/ACRE/YR
VALUE OF ACRE OF FARM LAND	500 SRC/YR
POTENTIAL FARM LAND CONVERSION TO BUFFER	4,705.59 ACRES
GREEN INFRASTRUCTURE STRATEGY (100 FT BUFFER)	
LAKE BUFFER	1,694.0 ACRES
STREAM BUFFER	570.2 ACRES
POTENTIAL FARM LAND CONVERSION TO BUFFER	2,264.2 ACRES
LAND AVAILABLE FOR CONVERSION TO BUFFER	
IN URBAN STREETS, SUBURBAN HOMES, RURAL ROADS AND TRAILS, AND HABITAT CORRIDORS (ASSUMING 100FT LAKE & STREAM BUFFER)	
	2,441.4 ACRES

REGIONAL STRATEGY _PLAN

RURAL STRATEGY

RURAL STRATEGY _PLAN

SUBURB STRATEGY

SUBURB STRATEGY _PLAN

URBAN STRATEGY

URBAN STRATEGY _PLAN