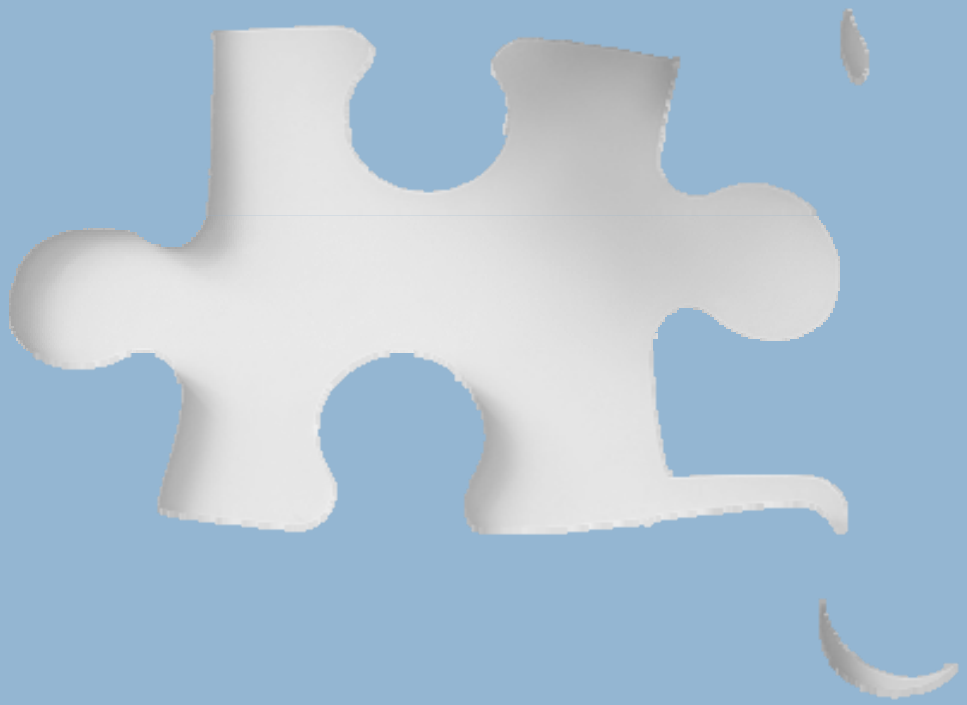
Runoff Volume
a Cup or a Bowl?

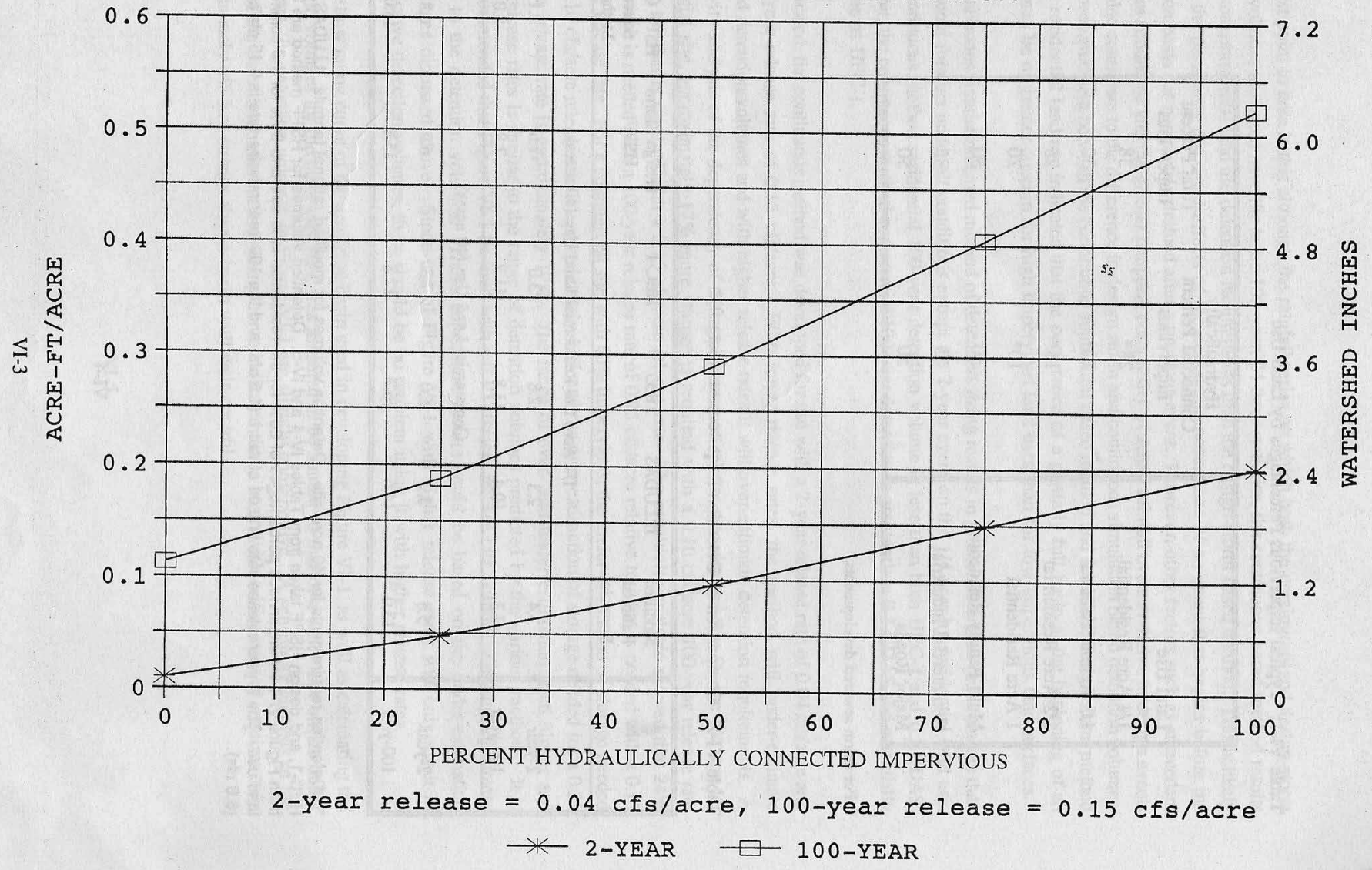


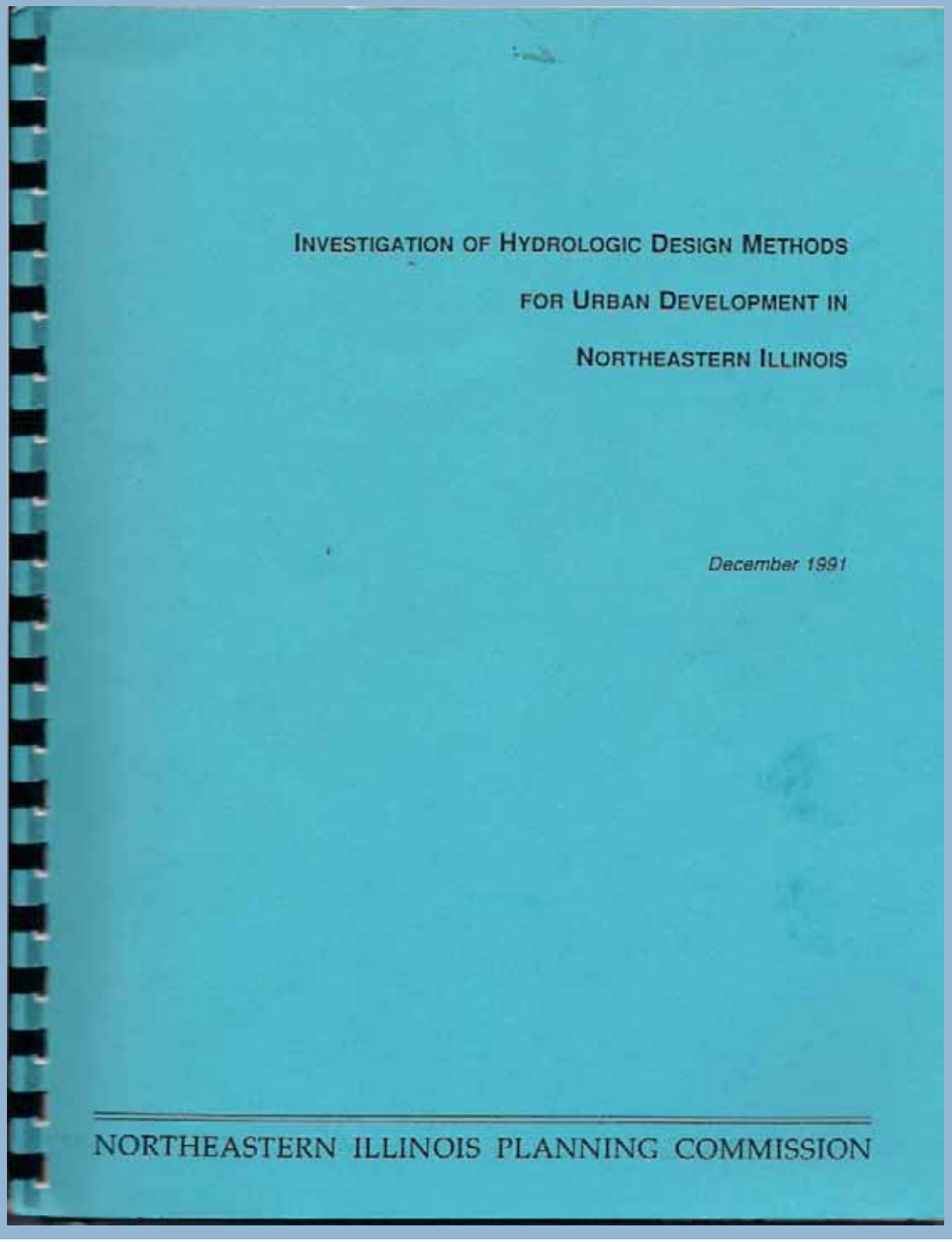
Joy Corona, PE, CFM
Bleck Engineering

Figure VI-1

DETENTION VOLUME VS PERCENT IMPERVIOUS

2-YEAR AND 100-YEAR UNIT AREA DETENTION





Thomas H. Price

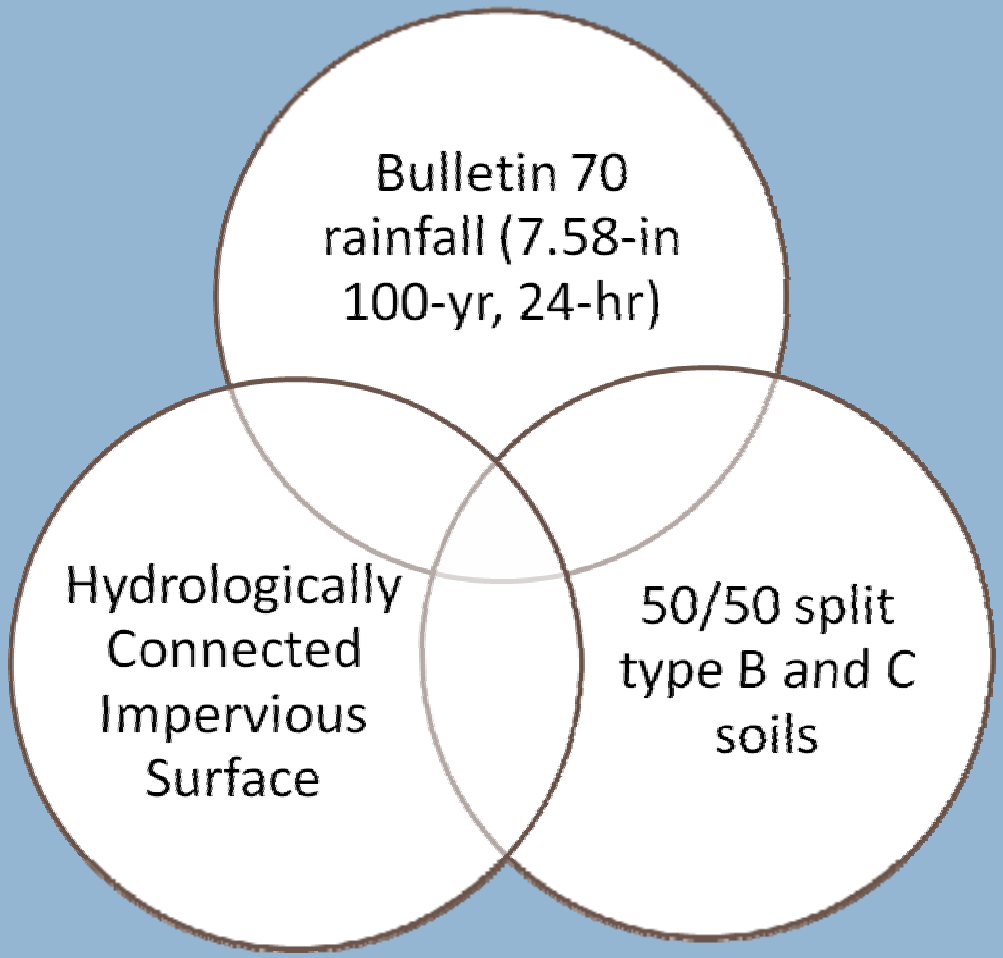
Dennis W. Dreher

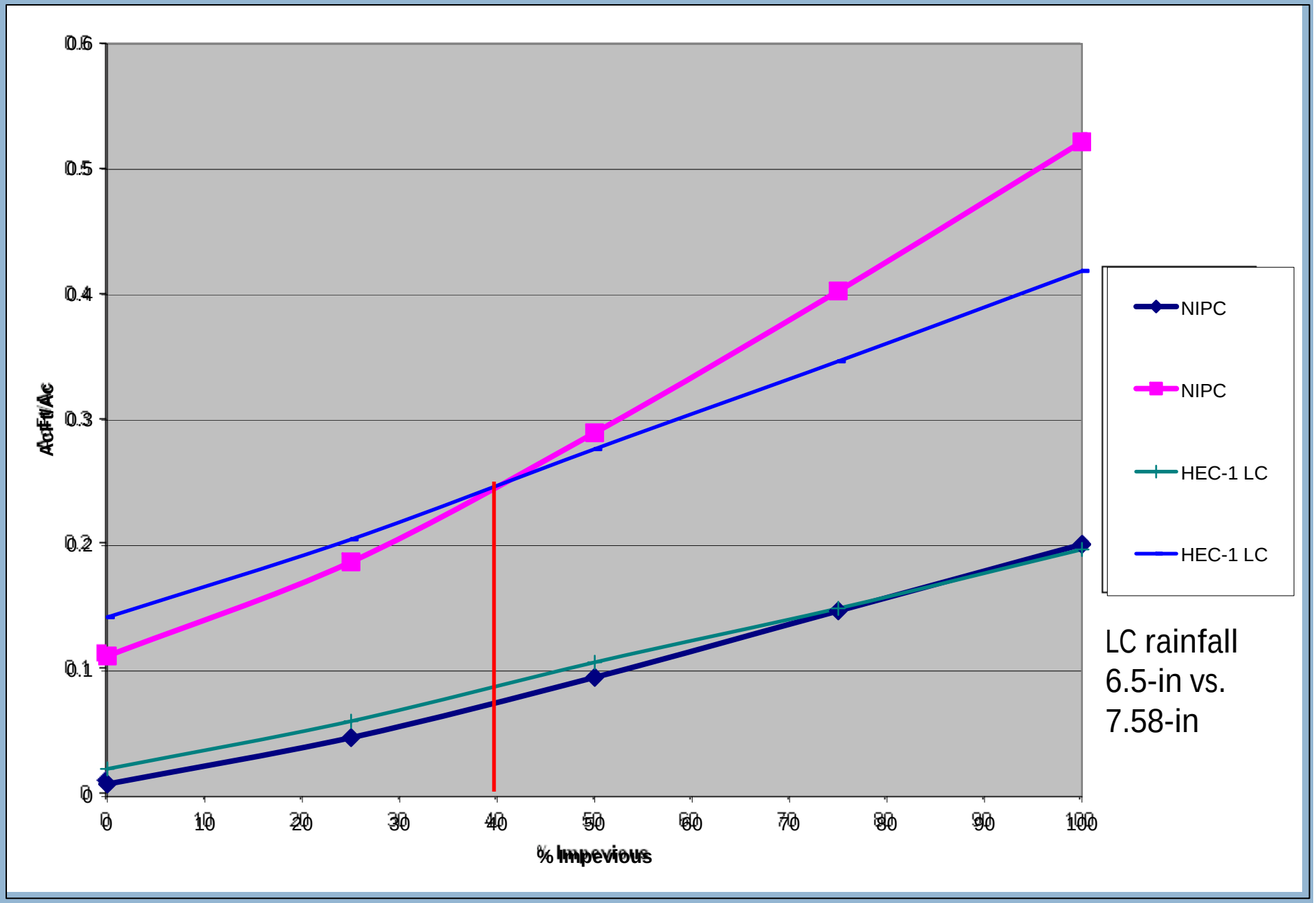
1991 NIPC Study

To compare and assess common hydrologic methods used in drainage and detention design, investigating impact of :

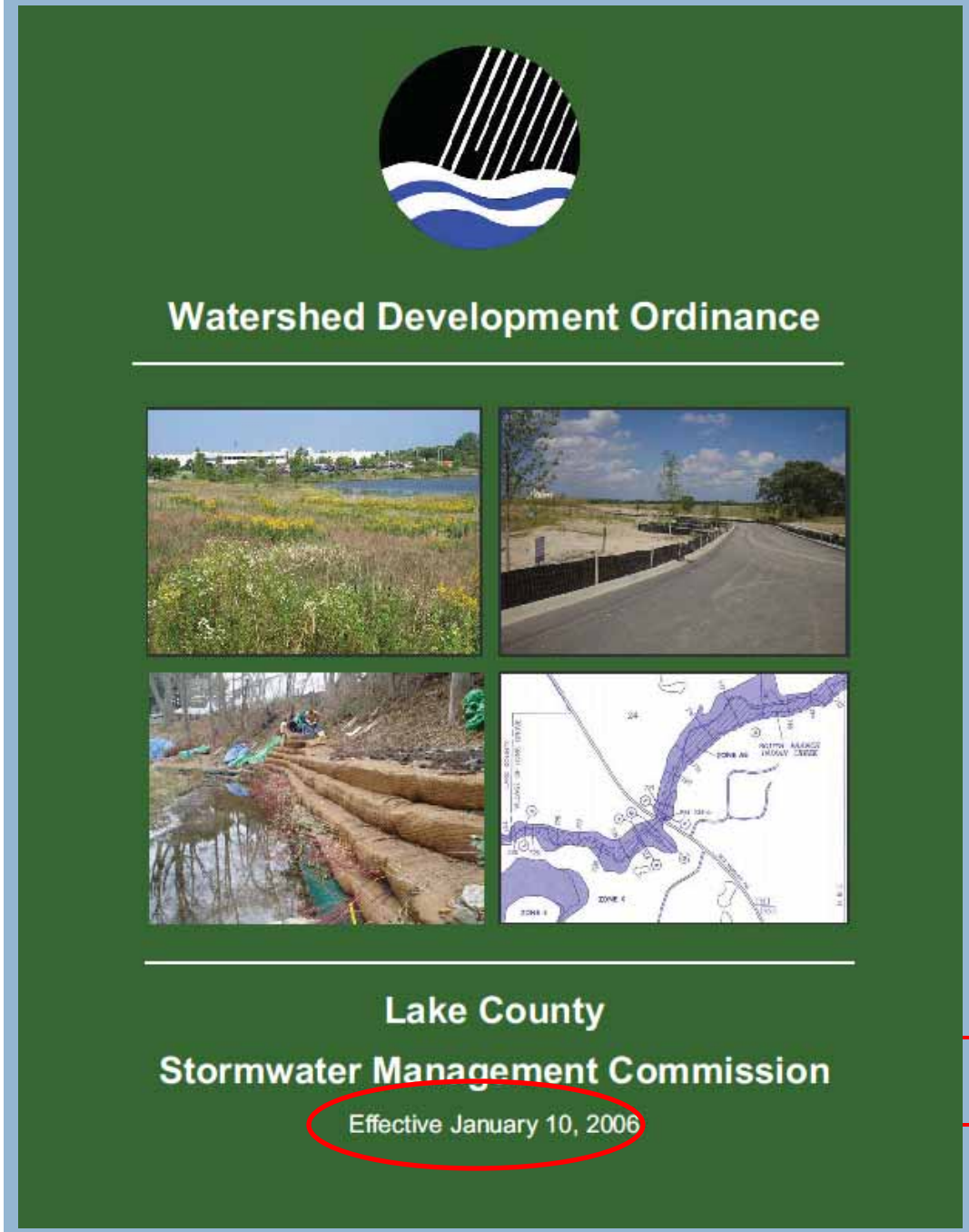
- design rainfall amounts,
- storm distributions on peak flows,
- and detention volumes

Graph Parameters





LC rainfall 6.5-in vs. 7.58-in



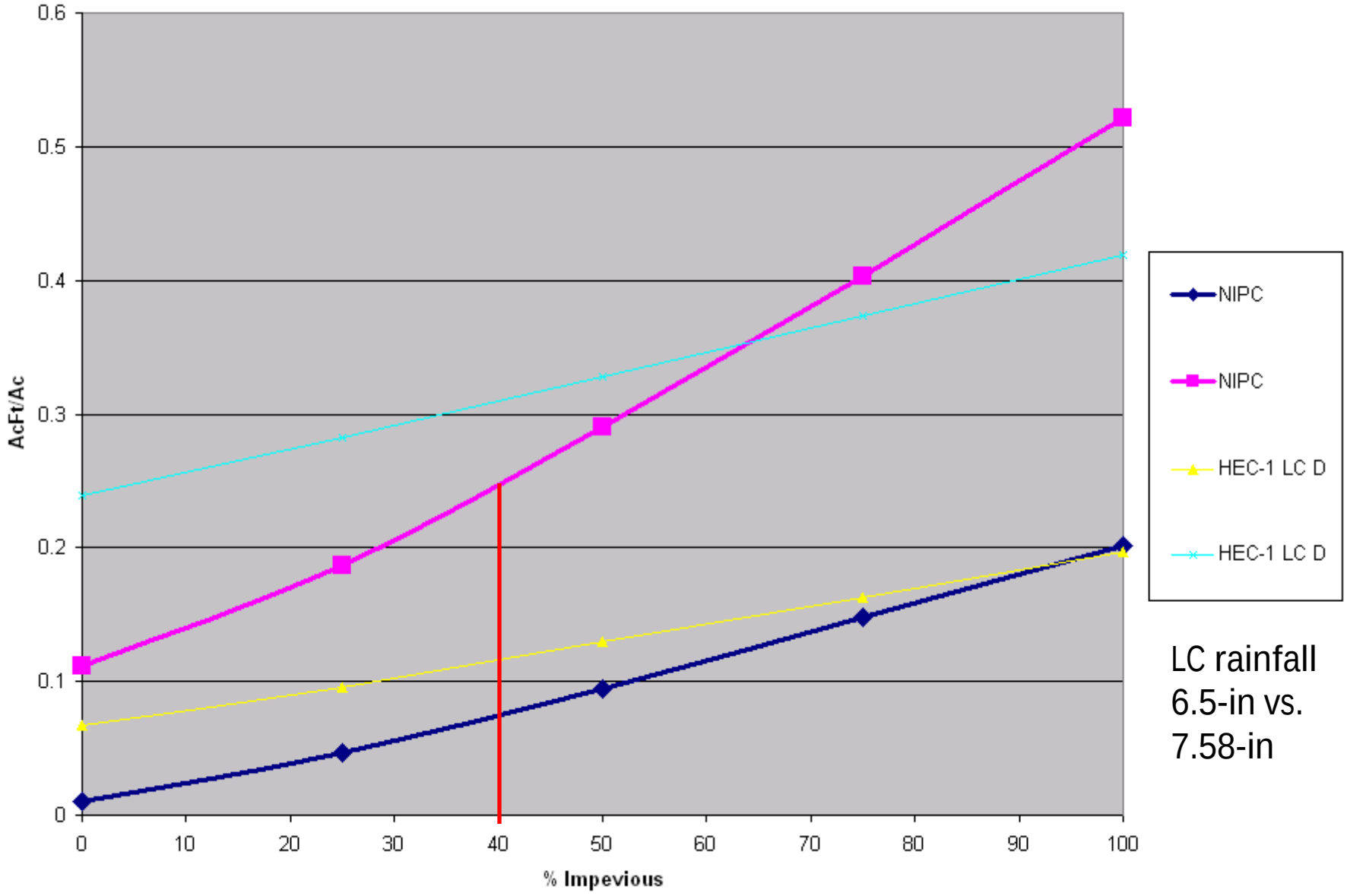
For determination of soil runoff characteristics, areas of the *development* that are *hydrologically disturbed* and compacted shall be changed to that soil types' highest runoff potential/soil group classification.

Table 2-2a Runoff curve numbers for urban areas [1/]

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area [2/]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3/]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4/]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82

68

Pg 2-5 TR55 Documentation



LC rainfall 6.5-in vs. 7.58-in

Questions 20-yrs later...
Cups or

Bowls???

Investigation of Hydrologic Design Methods for Urban Development in Northeastern Illinois

December 1991

Northeastern Illinois Planning Commission

Report Findings

HEC-1 (et.al) conservatively estimate detention requirements

- CN over-predicting runoff volumes from pervious areas

Assumption that all volume available at the start of the storm invalid

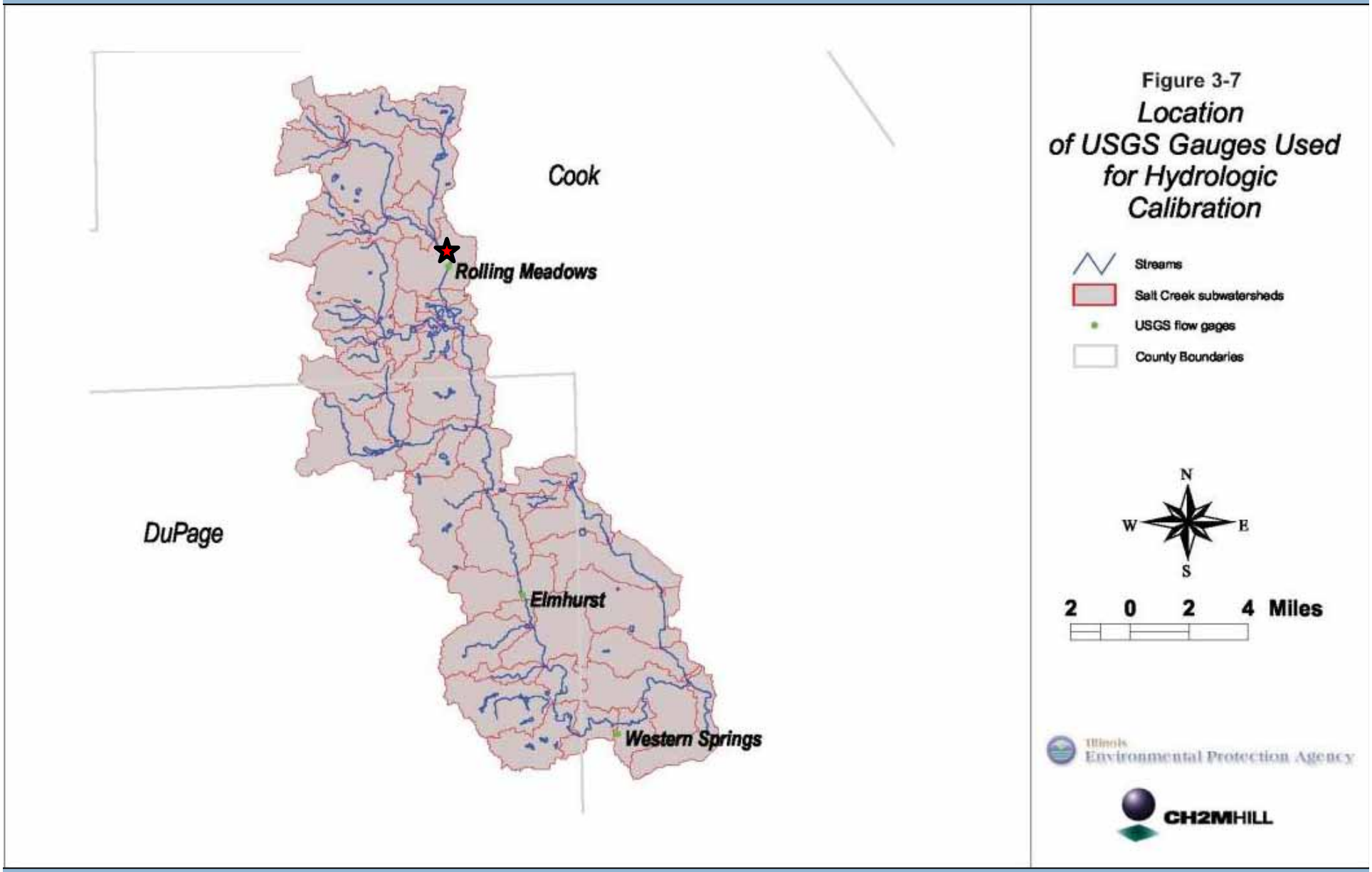
Determined HSPF (continuous simulation model) most appropriate

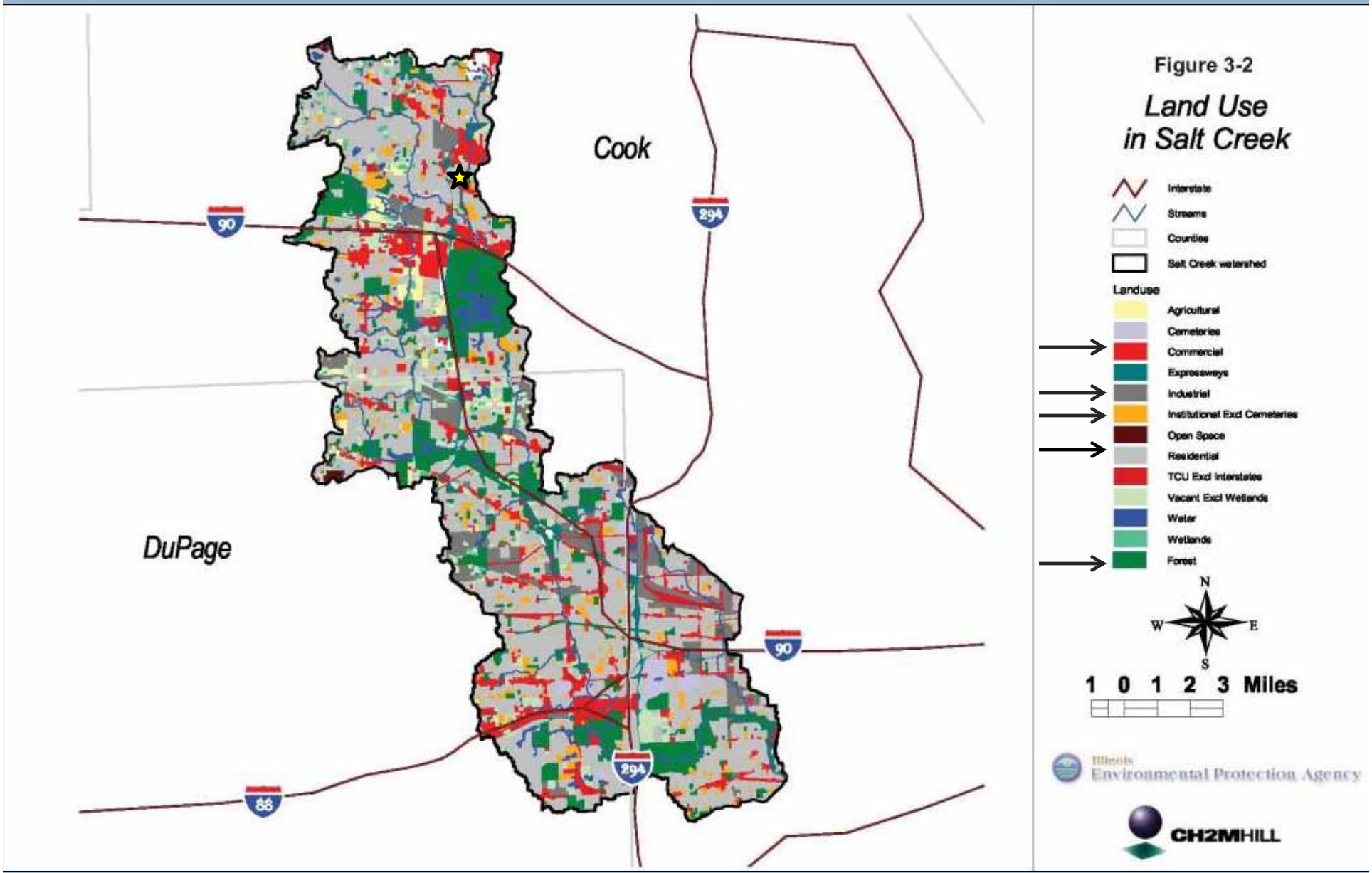
HSPF MODEL CALIBRATION

5 land cover types (parameters)	• 3 types grassland (<.5%, .5% - 4%, >4% slopes) • lowland/forest • hydrologically connected impervious
3 regional stream flow gages	• Rolling Meadows (upper Salt Creek) - calibrated • Western Springs (Salt Creek) - verified • Sawmill Creek (used for verification) - tested
Based on hourly precipitation records	• Calibrated for water year 1979-1987 • 5 gages (Argonne, McHenry, Midway, O'Hare, Wheaton)

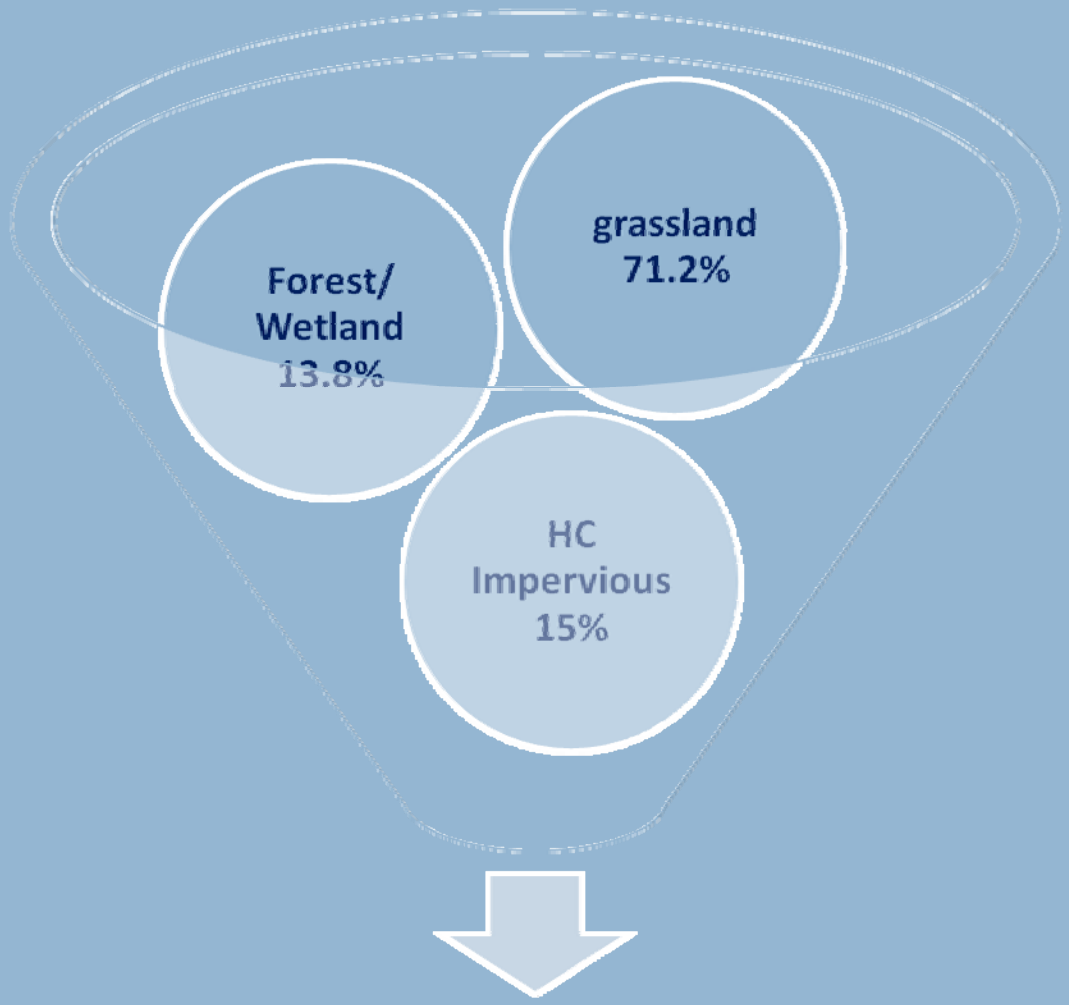
HSPF Unit Area Detention Volumes

3 land cover types (parameters)	• grassland • lowland/forest • hydrologically connected impervious
40 years of runoff	• Continuously simulate flow through detention basins • Varying percent imperviousness
3 NOAA hourly rainfall gages	• O'Hare, McHenry, Midway • Average of 3 gages = 7.47-in vs. 7.58-in
Regional Average Detention Volumes	• 2-yr and 100-yr volumes for each gage determined • Average values used to create figure

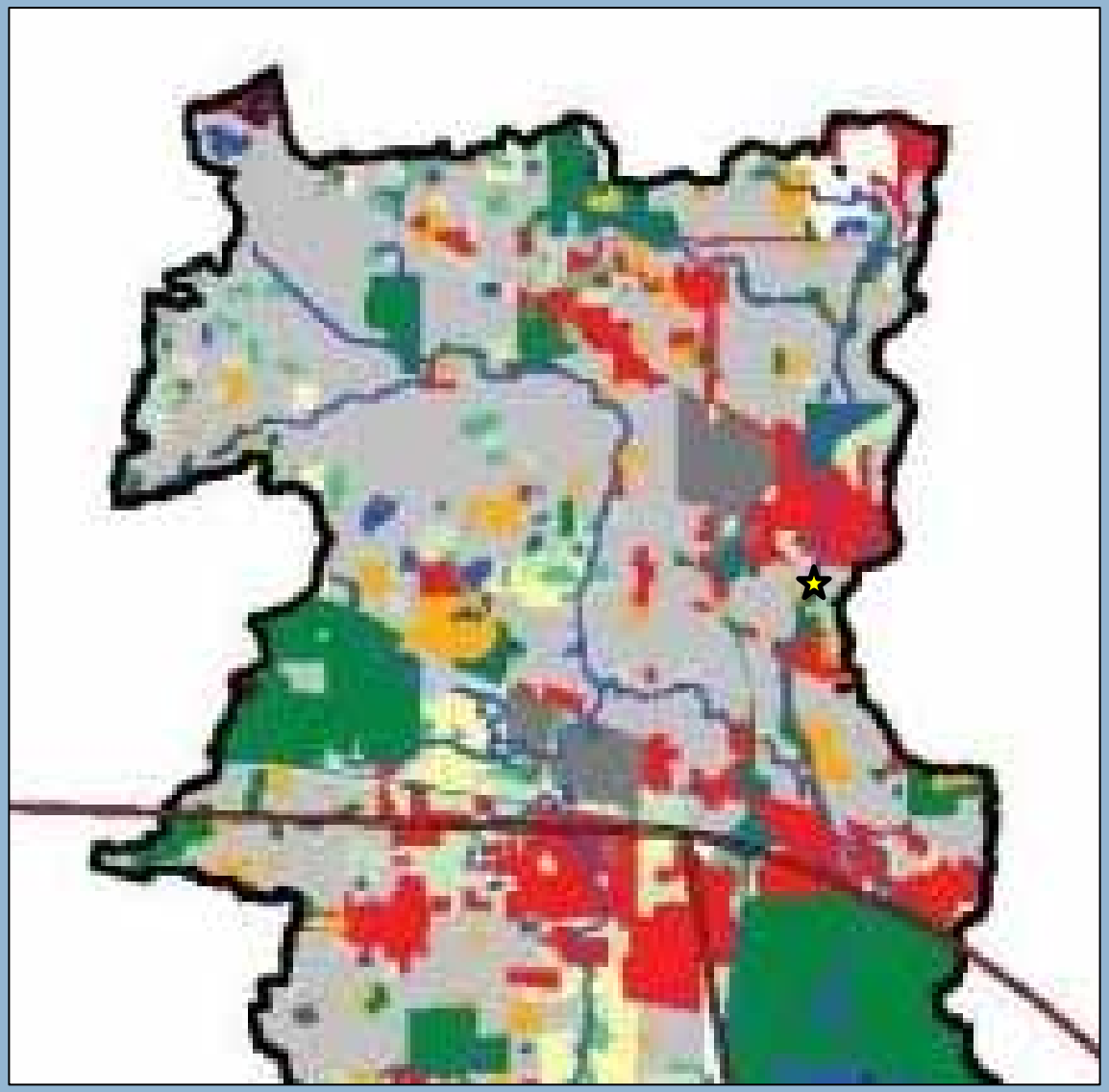

Cook
Rolling Meadows
DuPage
Elmhurst
Western Springs
Figure 3-7
Location of USGS Gauges Used for Hydrologic Calibration
Streams
Salt Creek subwatersheds
USGS flow gages
County Boundaries
N
W
E
S
2 0 2 4 Miles
Illinois Environmental Protection Agency
CH2MHILL


Cook
DuPage
90
294
88
Figure 3-2
Land Use
in Salt Creek
Interstate
Streams
Counties
Salt Creek watershed
Landuse
Agricultural
Cemeteries
Commercial
Expressways
Industrial
Institutional Excl Cemeteries
Open Space
Residential
TCU Excl Interstates
Vacant Excl Wetlands
Water
Wetlands
Forest
N
W
E
S
1 0 1 2 3 Miles
Illinois
Environmental Protection Agency
CH2MHILL

Existing Land Cover (at HSPF calibration)



Land Use Reasonable Today?



- 71.2 % grassland
- 13.8 % Forest / Wetland
- 15% HC Impervious

Comparison Results

¼ Ac Res. (40-ac)	HEC-1*	HSPF
2-yr	3.0 ✔	1.6
100-yr	11.2 ✔	7.8

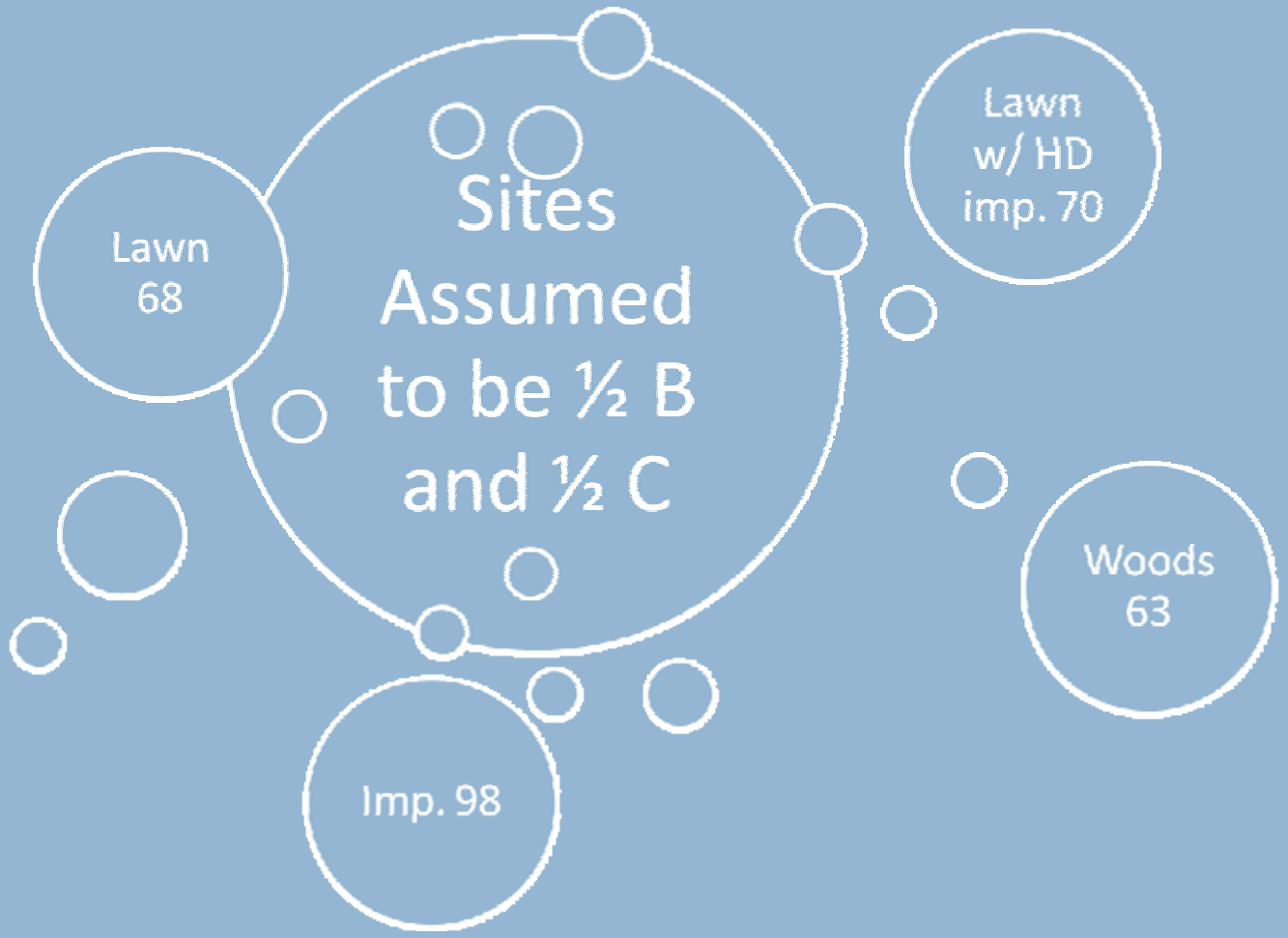
28% HC impervious, CN 69 (10% HD impervious, 57% Lawn, 5% trees/landscape), Tc 50-min

Commercial (40-ac)	HEC-1*	HSPF
2-yr	7.3 ✔	6.0
100-yr	17.8 ✔ (17.6)	15.8

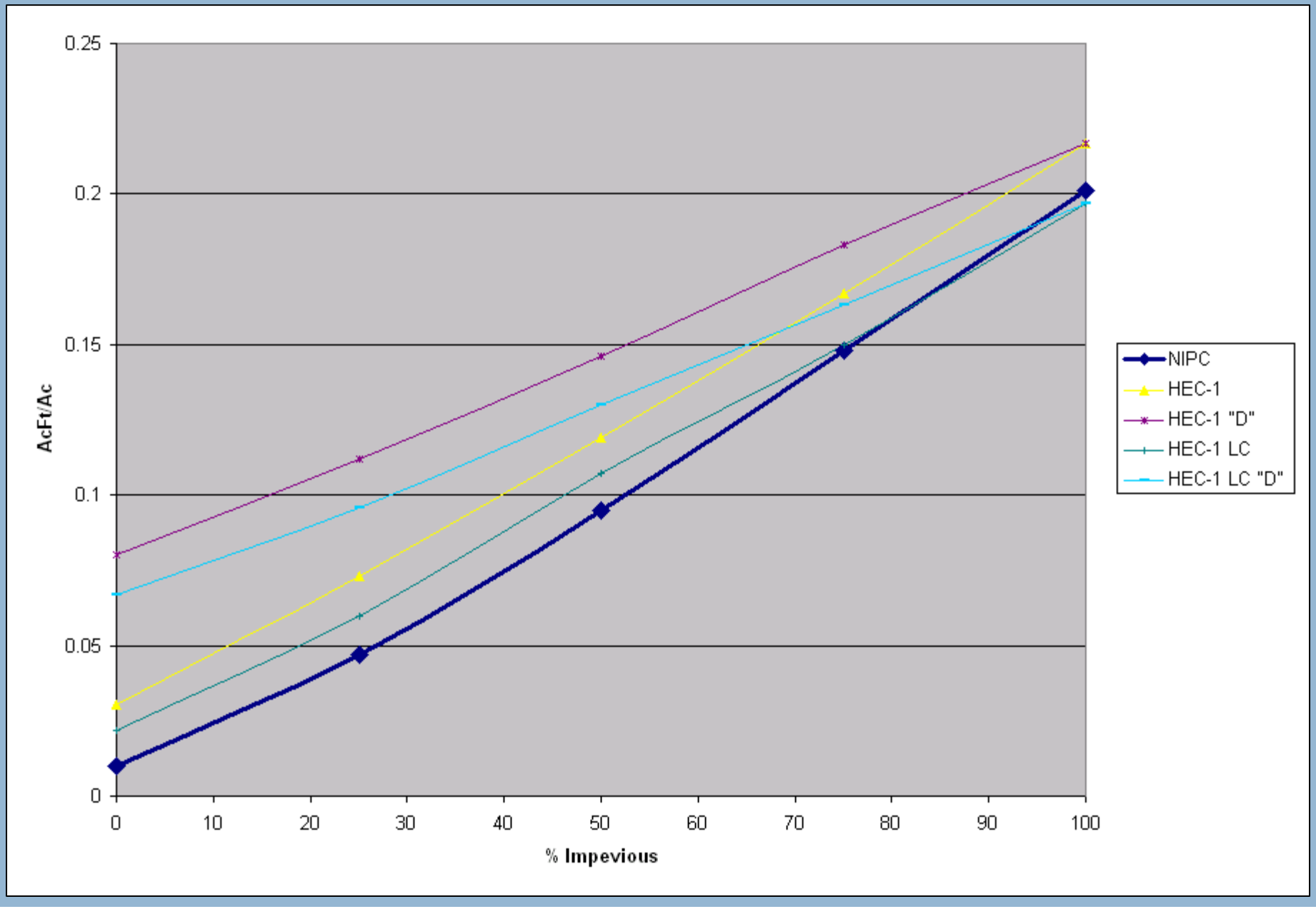
85% hydraulically connected impervious, CN 68 (15% lawn), Tc 15-min

* Bulletin 70 (3.04 and 7.58-inches), Huff 3rd quartile

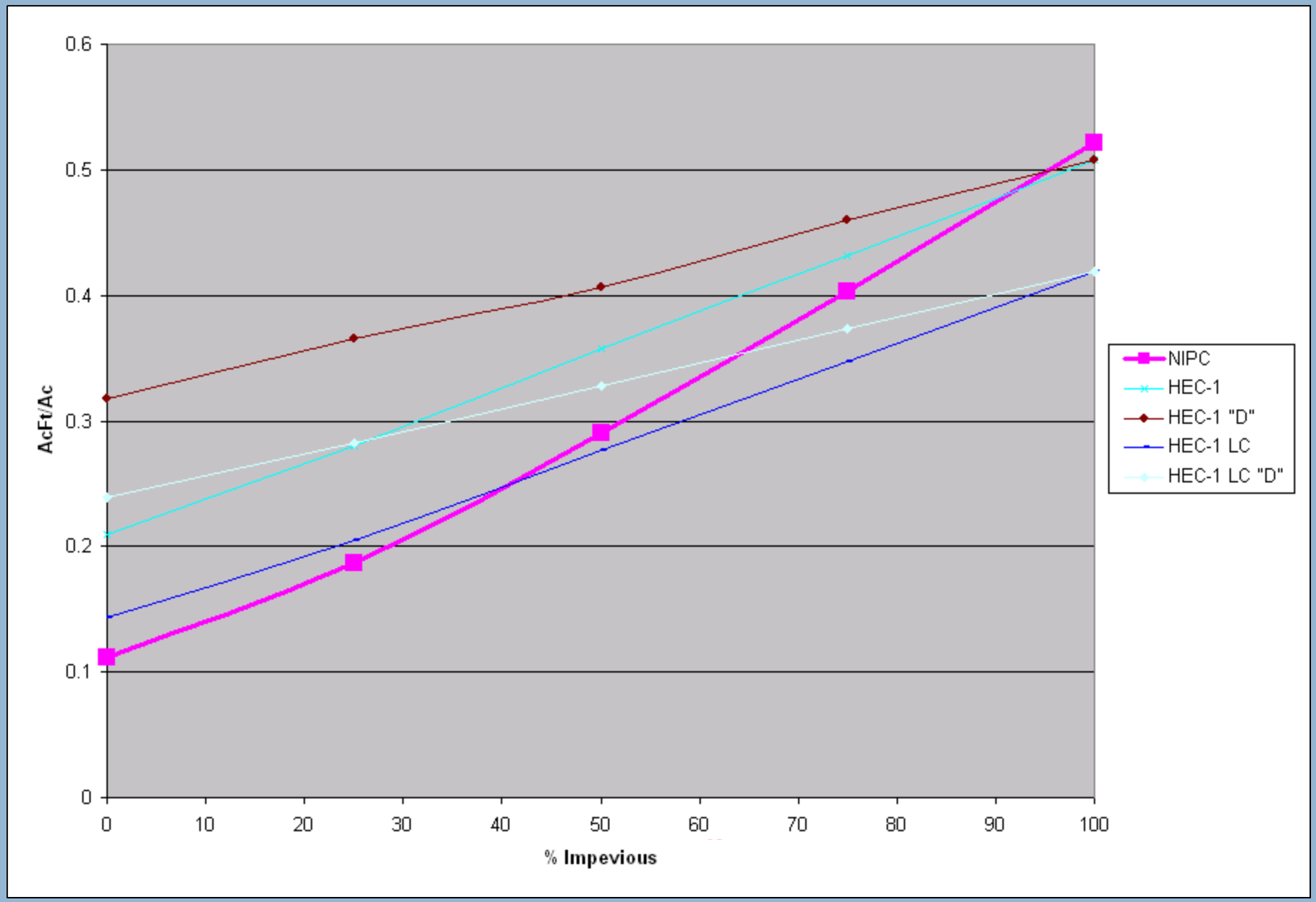
Recreate Results



2-yr comparison

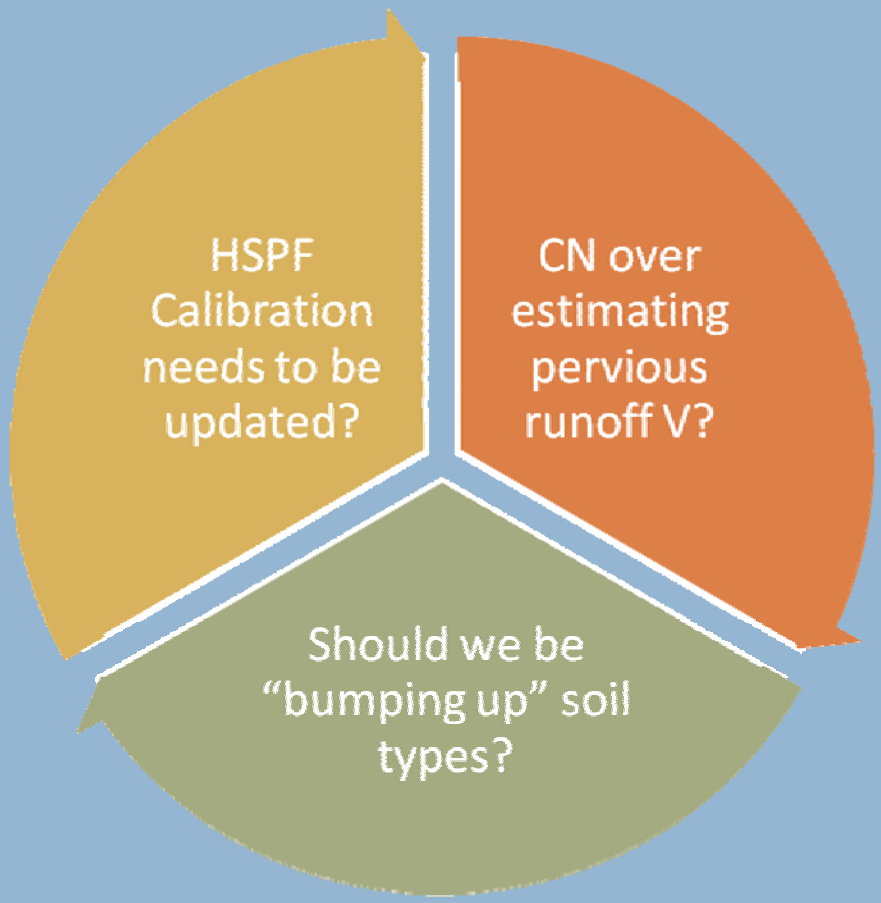


100-yr comparison

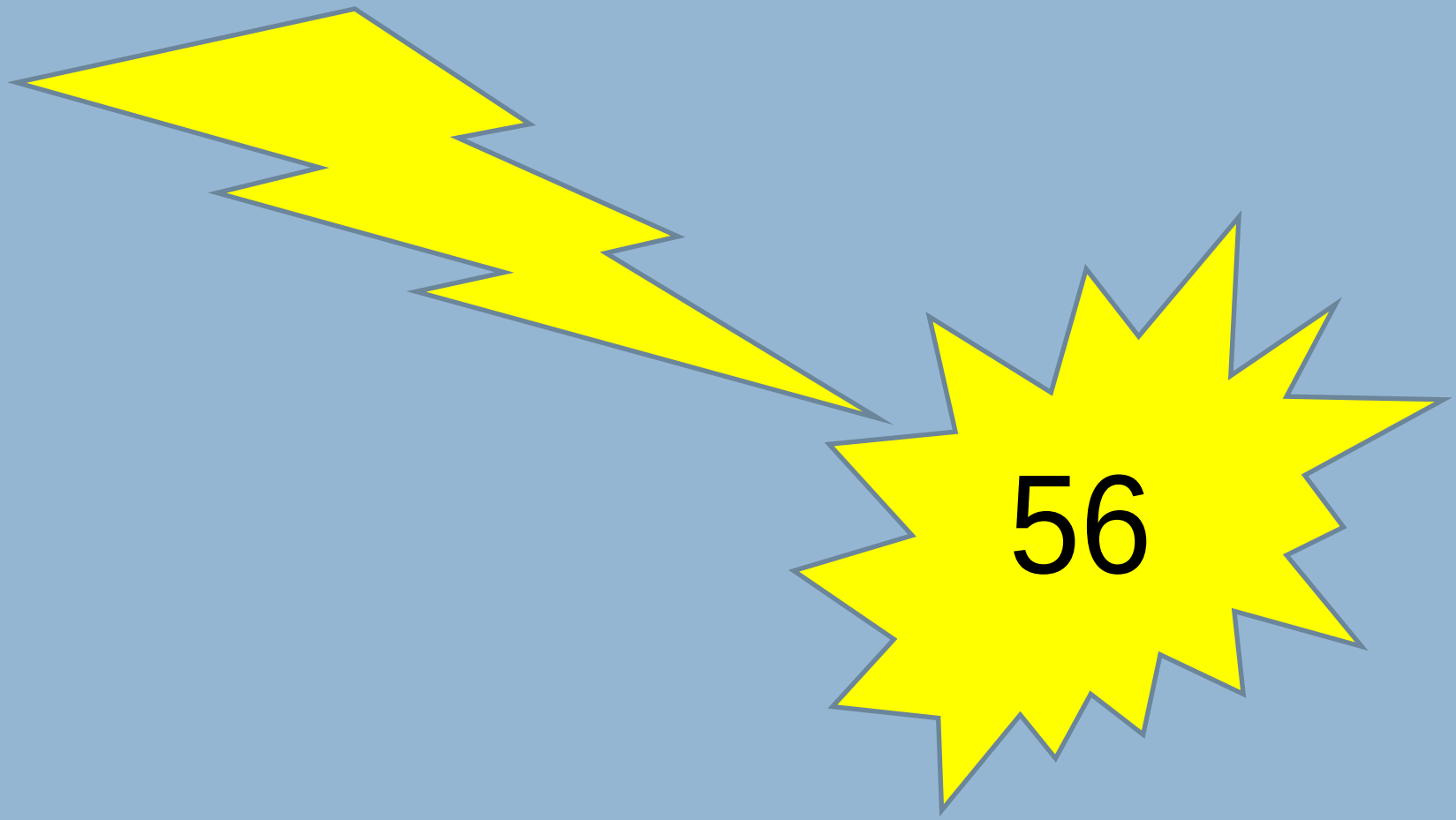


SO WHAT???


zzz


HSPF Calibration needs to be updated?
CN over estimating pervious runoff V?
Should we be "bumping up" soil types?

And the CN is...



Think...

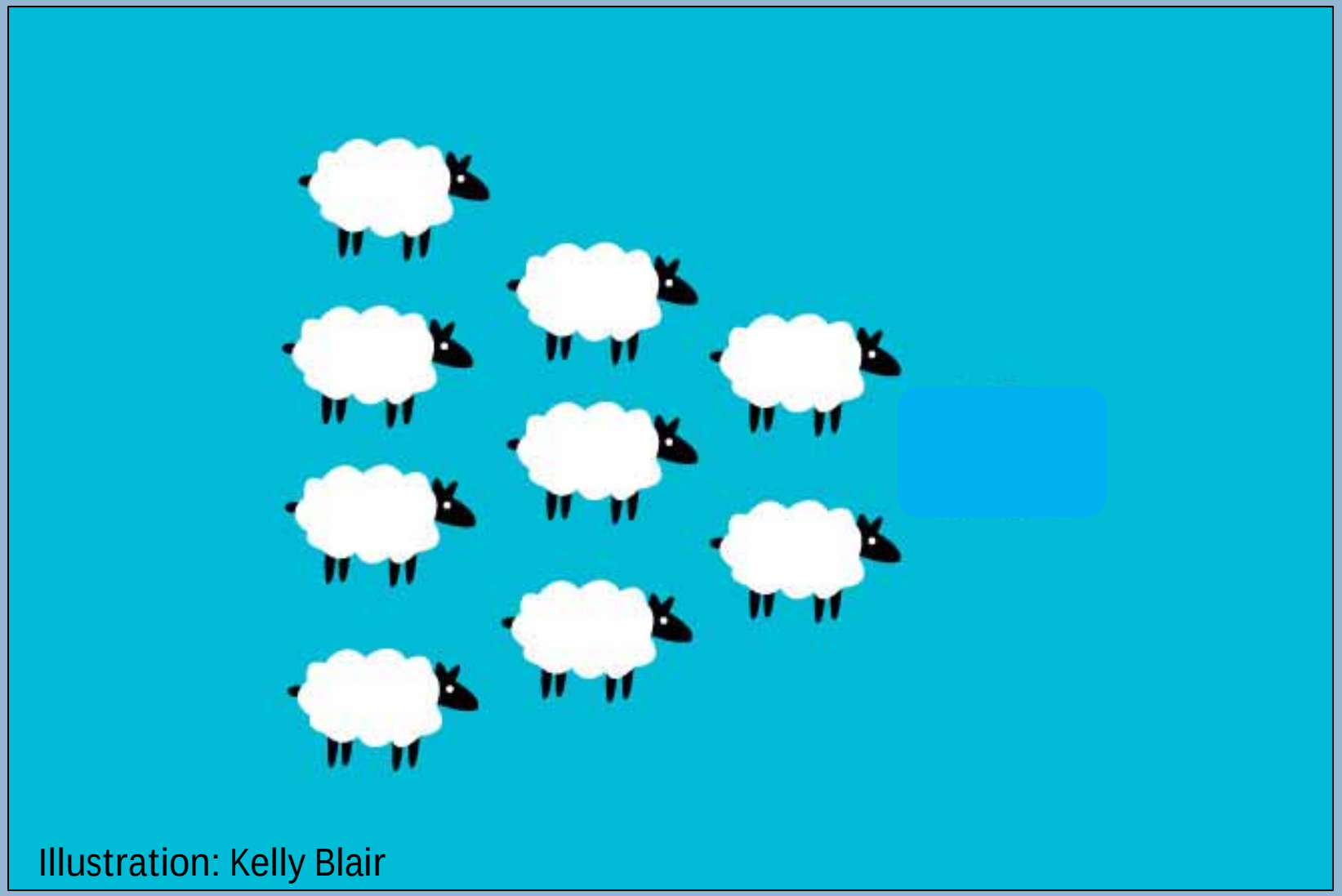


Illustration: Kelly Blair