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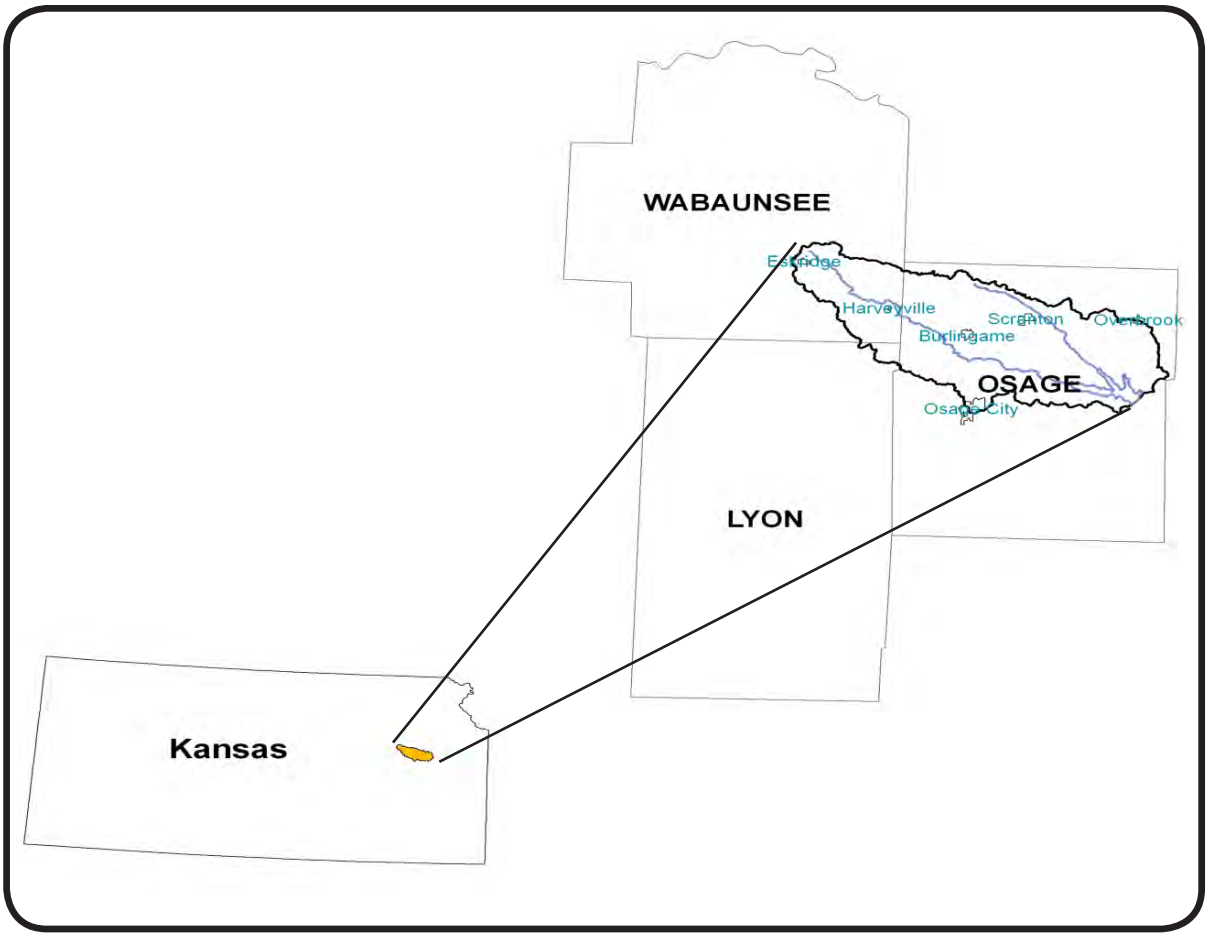
Pomona Lake Watershed Assessment: Preliminary Report



2009

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1.0 Pomona Lake Watershed Assessment

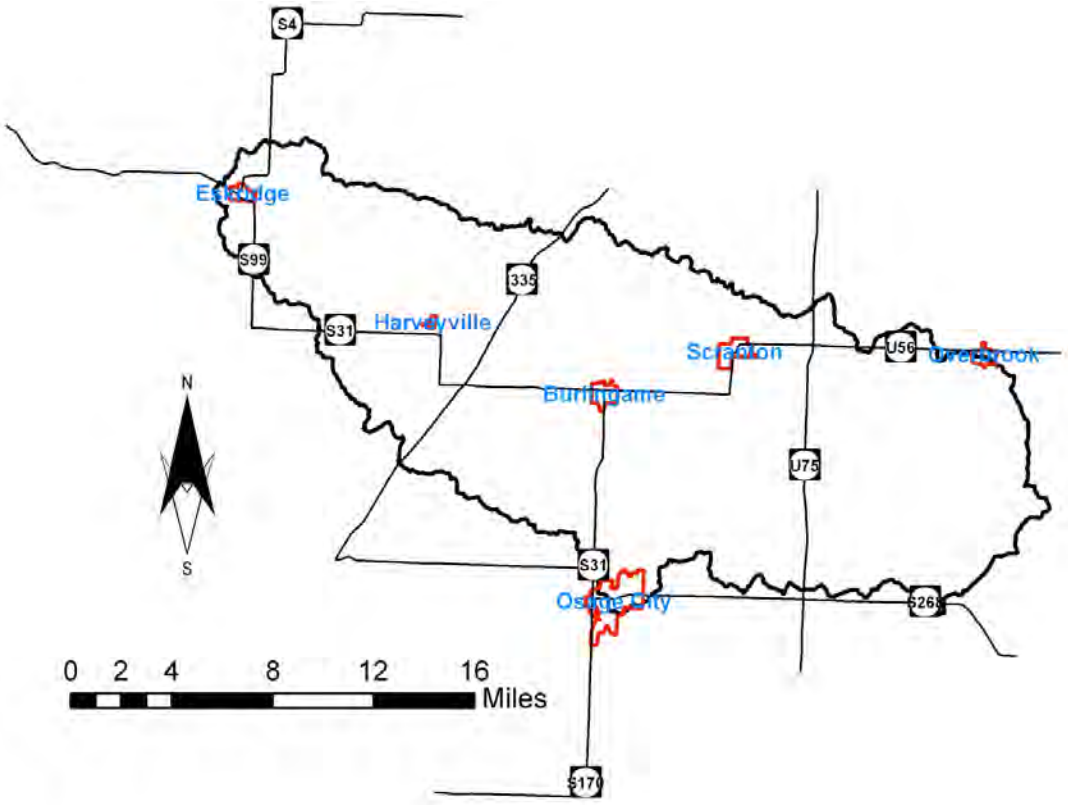

Figure 1. Major roads and cities – Pomona Lake Watershed

1.1 Watershed Summary

The Pomona Lake Watershed is located primarily in Osage county with the headwaters originating in the Flint Hills of Wabaunsee County in east central Kansas. It contains numerous creeks and tributaries including Hundred and Ten Mile Creek, Dragoon Creek and Switzler Creek. All surface waters in the watershed drain into Pomona Lake. Pomona Lake was impounded in 1963 and covers approximately 4,000 acres. The Pomona Lake Watershed is a small portion of the larger Upper Marais des Cygnes Watershed. According to the Kansas Unified Watershed Assessment prepared by KDHE (Kansas Department of Health and Environment) and NRCS (Natural Resources Conservation Service), the Upper Marais des Cygnes Watershed is rated as a Category I watershed indicating it is in need of restoration and protection to sustain water quality. It is ranked 5th out of 92 watersheds in the state for restoration priority.

Grassland is the predominant land usage (42.1 percent) for the watershed. Crop production is the second largest land usage at 41.7 percent. Woodland, water, and urban areas constitute the remaining 16.2 percent of land cover[1].

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1.2 Overview of Water Quality Issues and Potential Pollution Sources

When river segments or lakes that are monitored by KDHE have experienced poor quality, a Total Maximum Daily Load (commonly referred to as a TMDL) is established. A TMDL is the maximum amount of pollution that a surface water body can receive and still meet water quality standards.

Low dissolved oxygen is an impairment in Dragoon Creek and One Hundred Ten Mile Creek. This has resulted in TMDLs aimed at increasing dissolved oxygen concentrations to provide full support of aquatic life. Riparian vegetation restoration, grass buffer strips along streams, proper manure storage and distribution, adequately functioning septic systems, and proper chemical fertilizer rates should help improve water quality and raise dissolved oxygen rates.

Figure 2. Relief Maps – Pomona Lake Watershed [3]

Switzler Creek has a TMDL for selenium. Selenium loading may be associated with natural background levels, especially with the mobilization of selenium in soils and plants during wet periods and then release to water during drier periods.

Eutrophication is a primary pollutant for Pomona Lake. Excess nutrient loading from the watershed creates conditions favorable for algae blooms and aquatic plant growth resulting in low dissolved oxygen rates and an unfavorable habitat for aquatic life. Surplus nutrients originate from manure and fertilizer runoff in rural and urban areas. Many agricultural producers in the watershed implement best management practices (known as BMPs) to prevent nutrient runoff. Some common BMPs include: the use of conservation tillage and cover crops, maintaining buffer strips along field edges, and proper timing of fertilizer application.

Pomona Lake is also impaired by siltation. Silt or sediment accumulation in lakes and wetlands reduces reservoir volume and limits recreational access to the lake. Reducing erosion is necessary for a reduction in sediment. Agricultural best management practices, such as conservation tillage, grass buffer strips around cropland, and reducing activities within the riparian areas will reduce erosion and improve water quality.

One Hundred Ten Mile Creek has been included on the 2008 "303d" list for atrazine. This list is developed biennially and submitted by KDHE to EPA. To be included on the 303d list, samples taken during the KDHE monitoring program must show that water quality standards are not being met. After being included on the 303d list, a water body will then be assigned a TMDL for that impairment. Atrazine is a relatively inexpensive and effective herbicide that is widely used in corn, soybean and sorghum production. After field application this highly soluble herbicide is susceptible to overland runoff during rainfall events. It enters the water supply through soil erosion and runoff. Prevention methods include incorporating atrazine in the soil at time of application, applying in split applications, and establishing buffer strips along streams[2].

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2.0 Climate Mapping System

2.1 Precipitation Map[4]

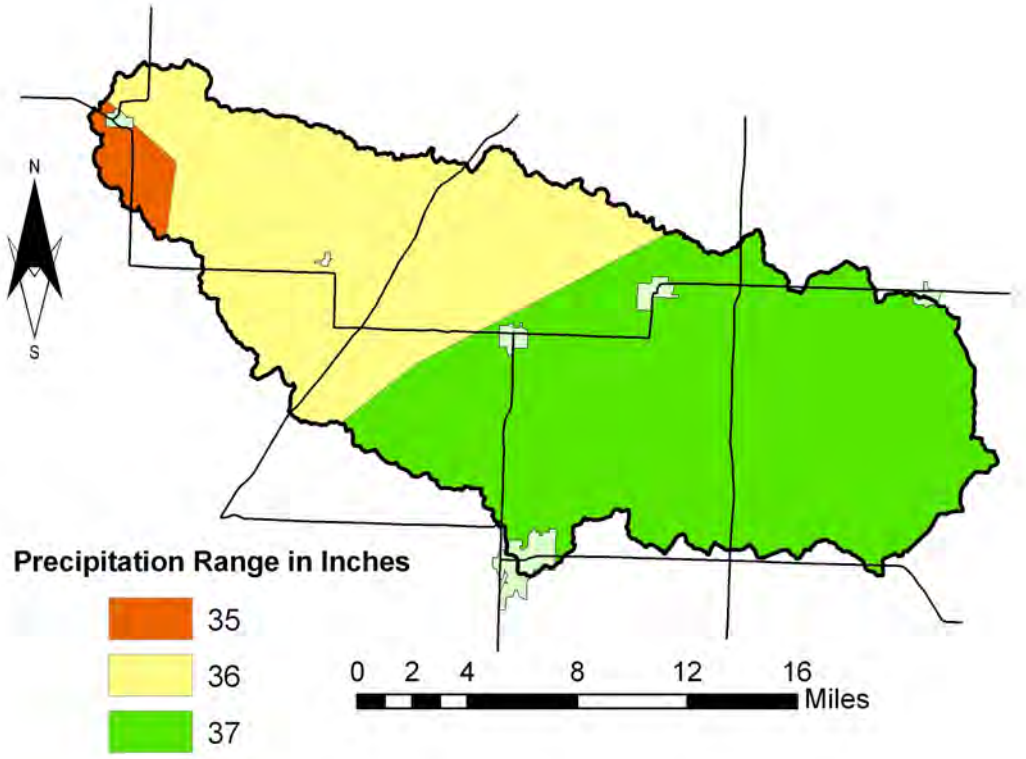

Figure3. 30-year average annual precipitation in inches, 1971 – 2000.

2.2 30-Year Average Daily Maximum Temperature Map[5]

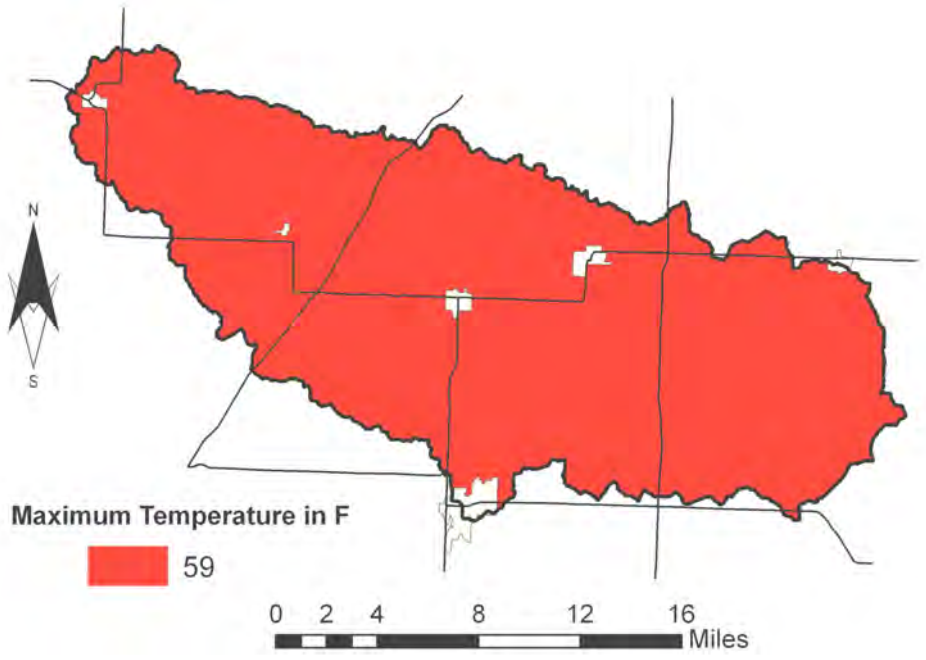

Figure 4. 30-year average daily maximum temperature in degrees Fahrenheit, 1971 – 2000

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2.3 30-Year Average Daily Minimum Temperature Map[6]

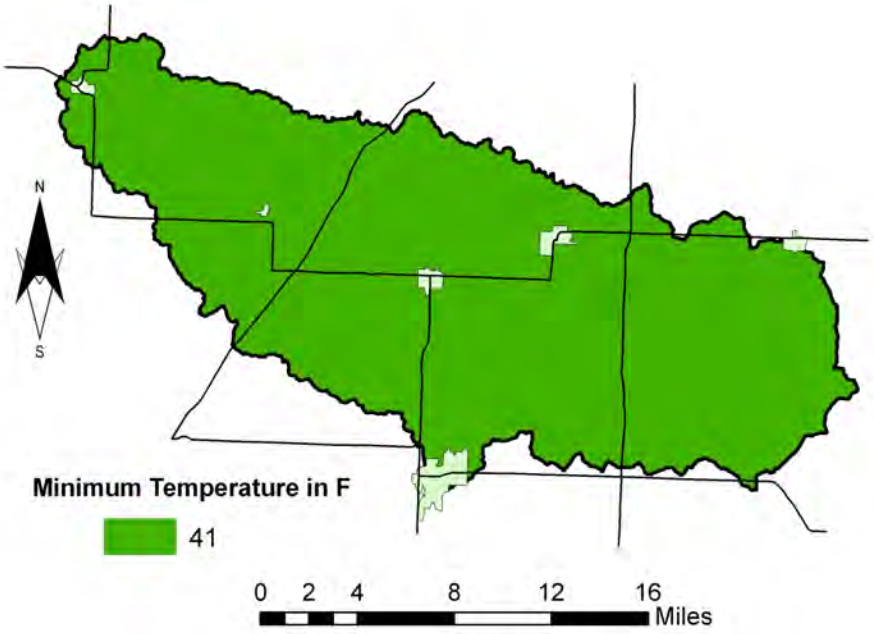

Figure 5. 30-year average daily minimum temperature in degrees Fahrenheit, 1971 – 2000

3.0 Land Use/ Land Cover

3.1 Land Use (GIRAS 1980s)[7]

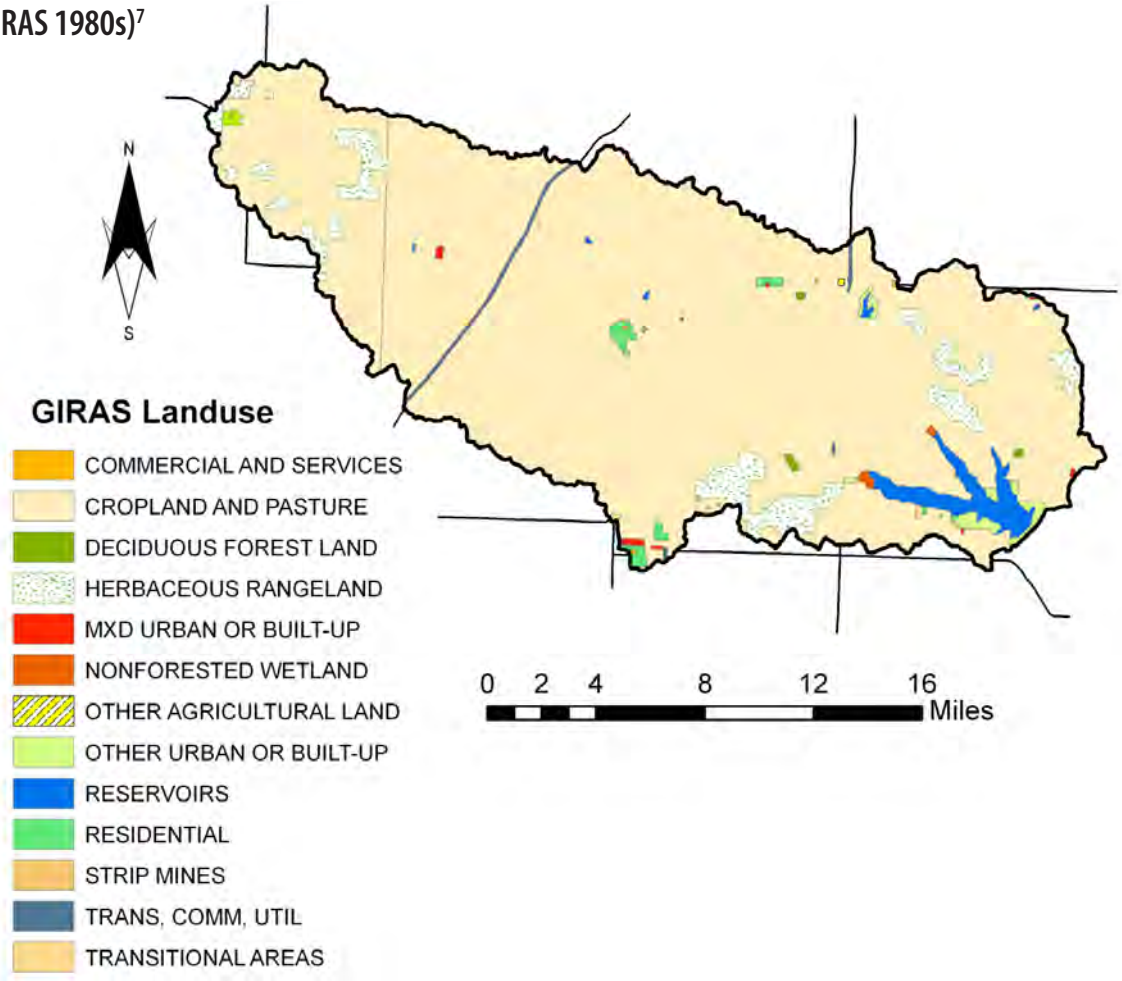

Figure 6. GIRAS 1980s land use classification.

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3.2 Land Use (NLCD 1992)[8]

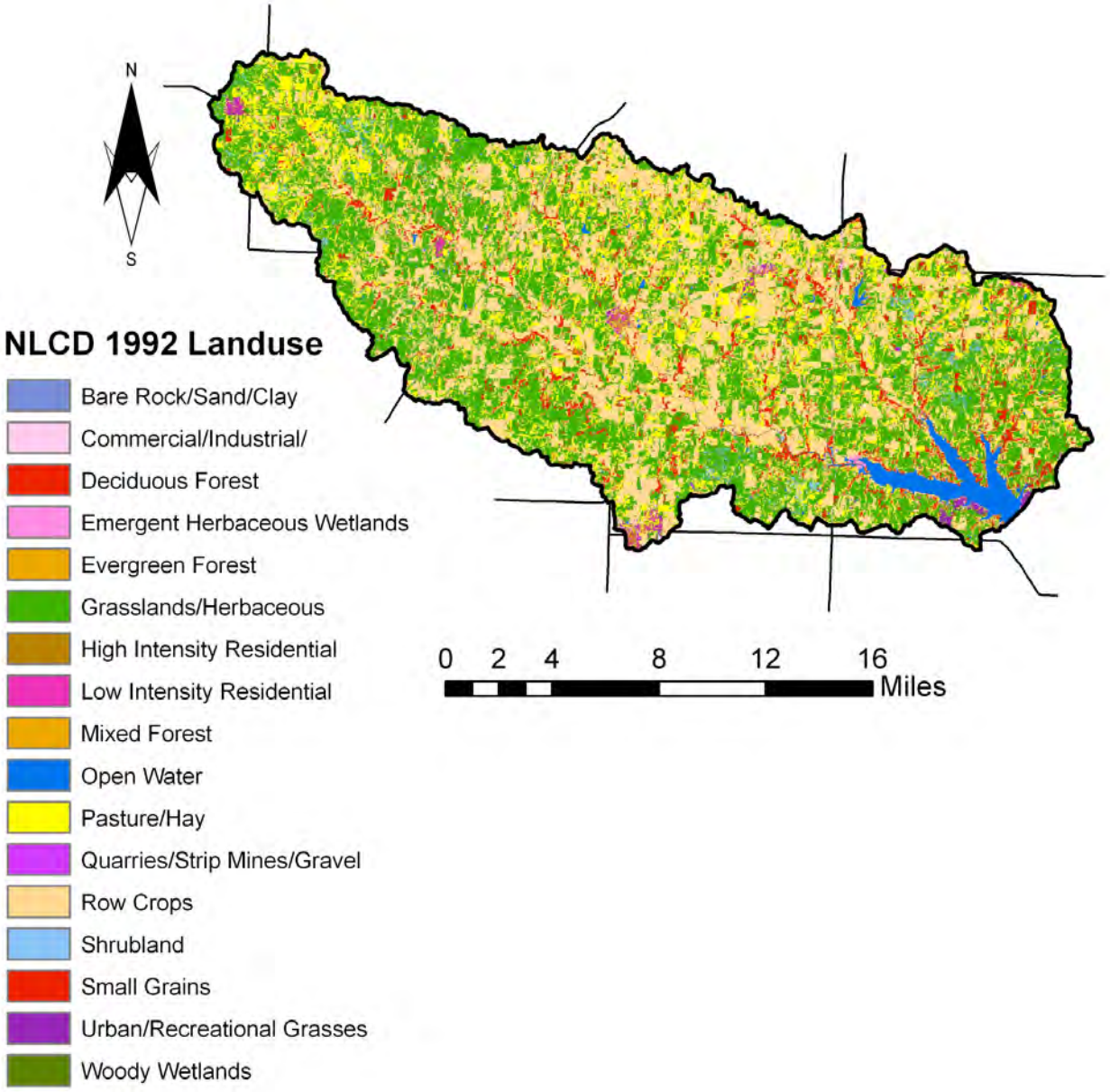

Figure 7. NLCD 1992 land use classification.

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3.2.1 NLCD 1992 Land Cover Class Definitions[29]

The following definitions are from the EPA's National Land Cover Database, found at: *http://www.epa.gov/mrlc/definitions.html#1992*

11. Open Water – all areas of open water, generally with less than 25 percent cover of vegetation/land cover.

21. Low Intensity Residential – Includes areas with a mixture of constructed materials and vegetation. Constructed materials account for 30-80 percent of the cover. Vegetation may account for 20 to 70 percent of the cover. These areas most commonly include single-family housing units. Population densities will be lower than in high intensity residential areas.

22. High Intensity Residential – Includes highly developed areas where people reside in high numbers. Examples include apartment complexes and row houses. Vegetation accounts for less than 20 percent of the cover. Constructed materials account for 80 to100 percent of the cover.

23. Commercial/Industrial/Transportation – Includes infrastructure (e.g. roads, railroads, etc.) and all highly developed areas not classified as High Intensity Residential.

31. Bare Rock/Sand/Clay – Perennially barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, beaches, and other accumulations of earthen material.

32. Quarries/Strip Mines/Gravel Pits – Areas of extractive mining activities with significant surface expression.

41. Deciduous Forest – Areas dominated by trees where 75 percent or more of the tree species shed foliage simultaneously in response to seasonal change.

42. Evergreen Forest – Areas dominated by trees where 75 percent or more of the tree species` maintain their leaves all year. Canopy is never without green foliage.

43. Mixed Forest – Areas dominated by trees where neither deciduous nor evergreen species represent more than 75 percent of the cover present.

51. Shrubland – Areas dominated by shrubs; shrub canopy accounts for 25-100 percent of the cover. Shrub cover is generally greater than 25 percent when tree cover is less than 25 percent. Shrub cover may be less than 25 percent in cases when the cover of other life forms (e.g. herbaceous or tree) is less than 25 percent and shrubs cover exceeds the cover of the other life forms.

71. Grasslands/Herbaceous – Areas dominated by upland grasses and forbs. In rare cases, herbaceous cover is less than 25 percent, but exceeds the combined cover of the woody species present. These areas are not subject to intensive management, but they are often utilized for grazing.

81. Pasture/Hay – Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops.

82. Row Crops – Areas used for the production of crops, such as corn, soybeans, vegetables, tobacco, and cotton.

83. Small Grains – Areas used for the production of graminoid crops such as wheat, barley, oats, and rice.

85. Urban/Recreational Grasses – Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Examples include parks, lawns, golf courses, airport grasses, and industrial site grasses.

91. Woody Wetlands – Areas where forest or shrubland vegetation accounts for 25-100 percent of the cover and the soil or substrate is periodically saturated with or covered with water.

92. Emergent Herbaceous Wetlands – Areas where perennial herbaceous vegetation accounts for 75-100 percent of the cover and the soil or substrate is periodically saturated with or covered with water.

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3.3 Land Use (NLCD 2001)[1]

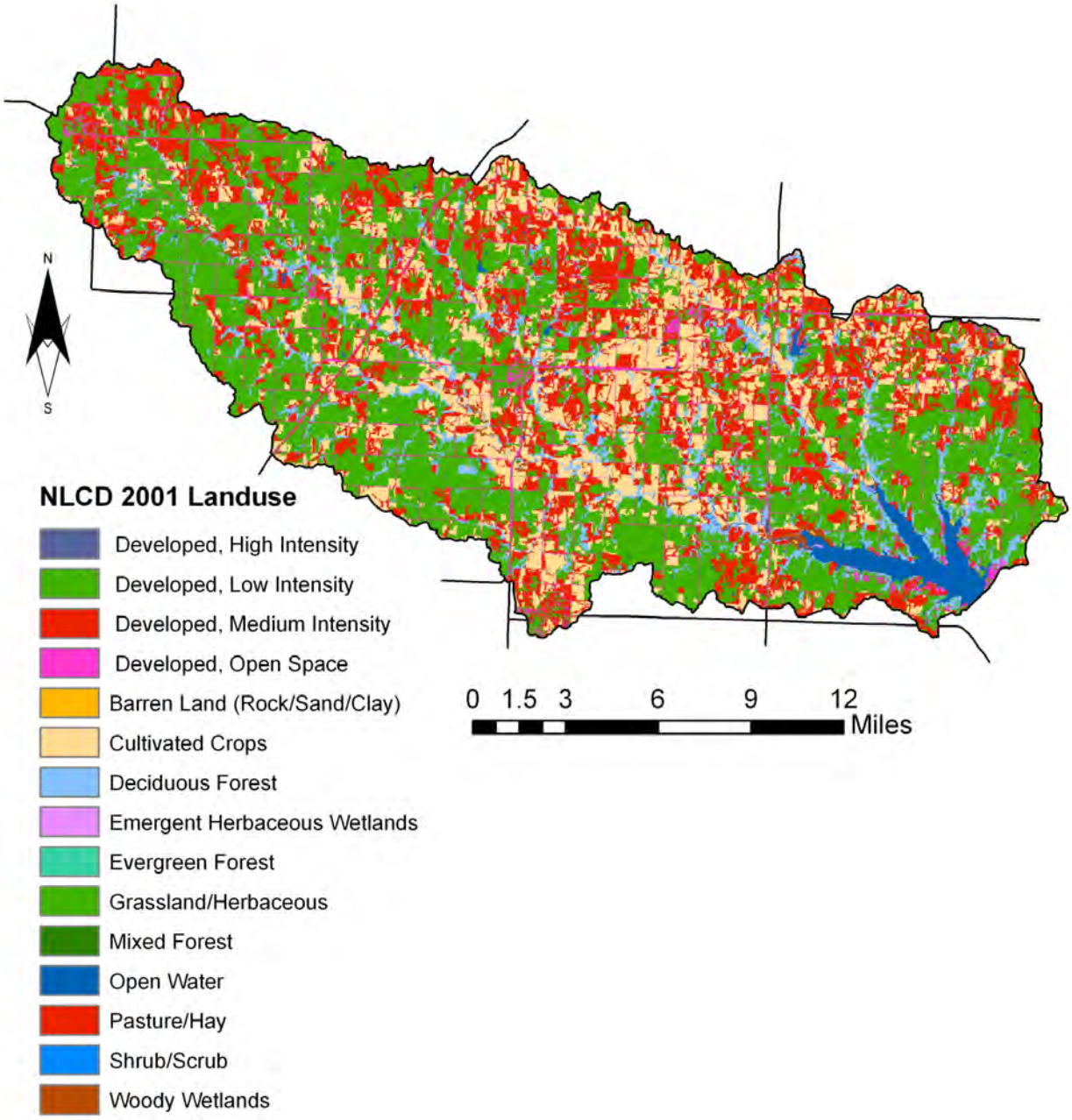

Figure 8. NLCD 2001 land use classification.

3.3.1 NLCD 2001 Land Cover Class Definitions[30]

The following definitions are from the EPA's National Land Cover Database, found at: *http://www.epa.gov/mrlc/definitions.html#2001*

11. **Open Water –** All areas of open water, generally with less than 25% cover of vegetation or soil.
21. **Developed, Open Space –** Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
22. **Developed, Low Intensity –** Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49 percent of total cover. These areas most commonly include single-family housing units.

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23. Developed, Medium Intensity – Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-79 percent of the total cover. These areas most commonly include single-family housing units.

24. Developed, High Intensity – Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to 100 percent of the total cover.

31. Barren Land (Rock/Sand/Clay) – Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.

41. Deciduous Forest – Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change.

42. Evergreen Forest – Areas dominated by trees where 75 percent or more of the tree species` maintain their leaves all year. Canopy is never without green foliage.

43. Mixed Forest – Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75 percent of total tree cover.

52. Shrub/Scrub – Areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20 percent of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.

71. Grassland/Herbaceous – Areas dominated by grammanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.

81. Pasture/Hay – Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation.

82. Cultivated Crops – Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled.

90. Woody Wetlands – Areas where forest or shrubland vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

92. Emergent Herbaceous Wetlands – Areas where perennial herbaceous vegetation accounts for 75-100 percent of the cover and the soil or substrate is periodically saturated with or covered with water.

Table 1. Summary of land use covers

Land Use Type	Agriculture			Barren Land	Forest Land	Grassland	Urban	Wetlands/ Water	Shrub	Total
	Cropland	Pasture	Total							
GIRAS 1980s	186104		186104	151	232	11344	4327	4413	0	206571
NLCD 1992	63536	37315	100851	27	11696	83003	1840	7361	1790	206568
NLCD 2001	37228	49149	86377	48	15047	87040	11694	6373	86	206665

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4.0 River Network[9]

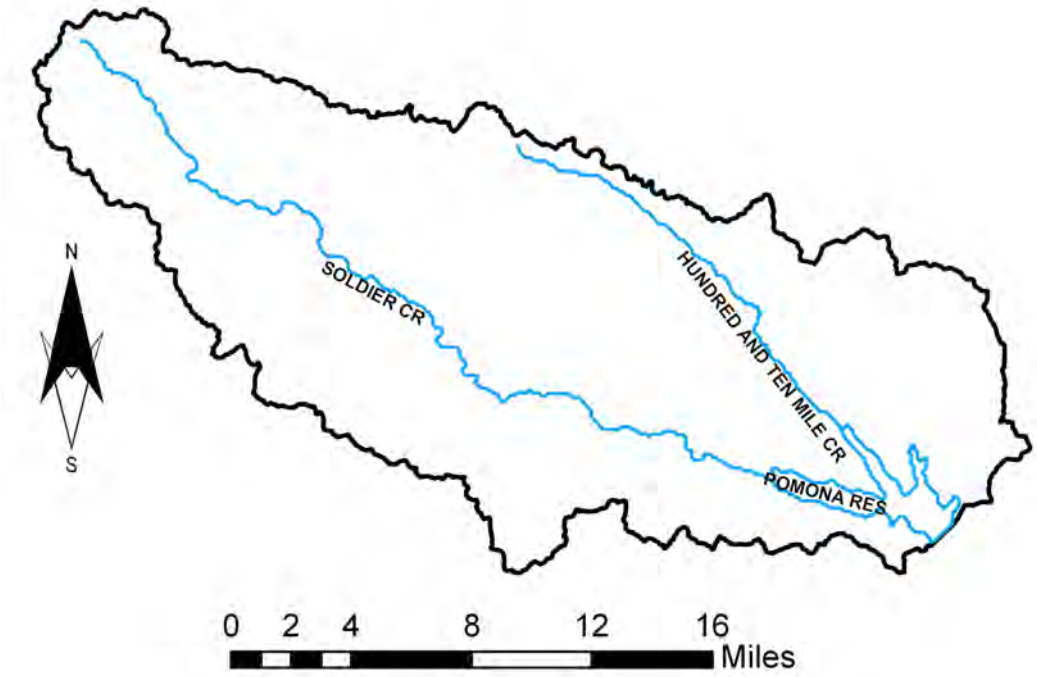

Figure 9. River network – Pomona Lake Watershed

5.0 Hydrologic Soil Groups[10]

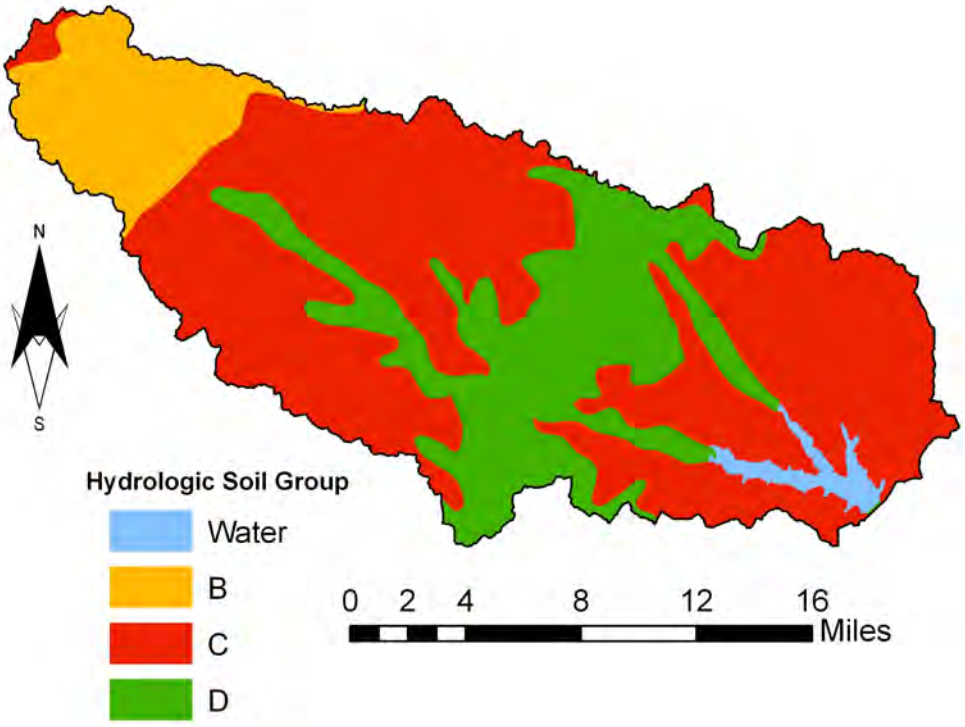

Figure 10. Hydrologic Soil Groups – SSURGO Database – Pomona Lake Watershed

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6.0 Water Quality Conditions

6.1 The 303d List of Impaired Waterbodies[2]

This map shows all impaired streams that are not meeting their designated uses (impaired waters) because of excess pollutants as defined in Section 303(d) of the Clean Water Act. The list of impaired waterways is updated by the states every two years. This can be used to identify specific stream segments and lakes for which, in accordance with their priority ranking, TMDLs may need to be developed.

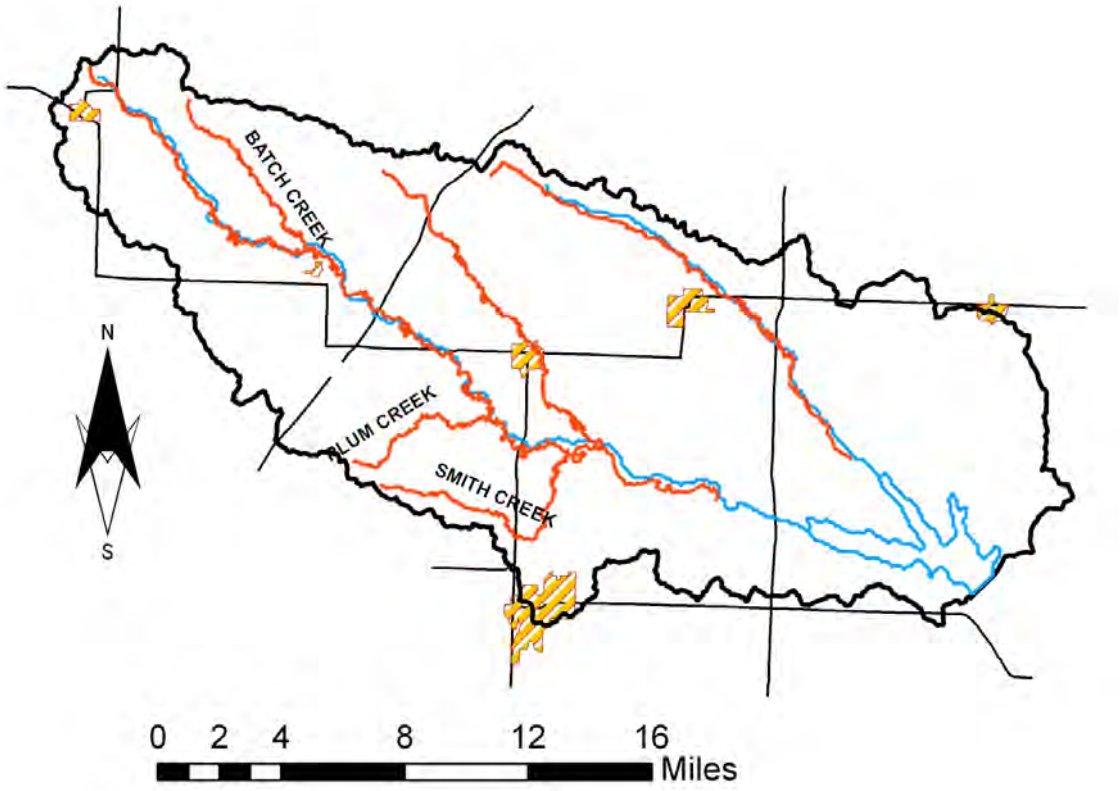

Figure 11. Impaired Waterbodies based on the 303d list – Pomona Lake Watershed.

Table 2. The 303d List of Impaired Waterbodies

State	Waterbody Name	Epa Impairment	State Impairment
KS	Soldier Creek	Organic Enrichment/Low DO	Low Dissolved Oxygen
KS	Plum Creek	Organic Enrichment/Low DO	Low Dissolved Oxygen
KS	Switzler Creek	Metals, Organic Enrichment/ Low DO	Selenium, Low Dissolved Oxygen
KS	Batch Creek	Organic Enrichment/Low DO	Low Dissolved Oxygen
KS	Hundred And Ten Mile Creek	Organic Enrichment/Low DO	Low Dissolved Oxygen
KS	Smith Creek	Organic Enrichment/Low DO	Low Dissolved Oxygen
KS	Pomona Lake	Organic Enrichment/Low DO, Sediment/Siltation	Eutrophication, Siltation

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6.2 Water Quality Observation Stations[11]

USEPA Observation-level water quality monitoring data is useful for identifying the location of water quality data in a given watershed.

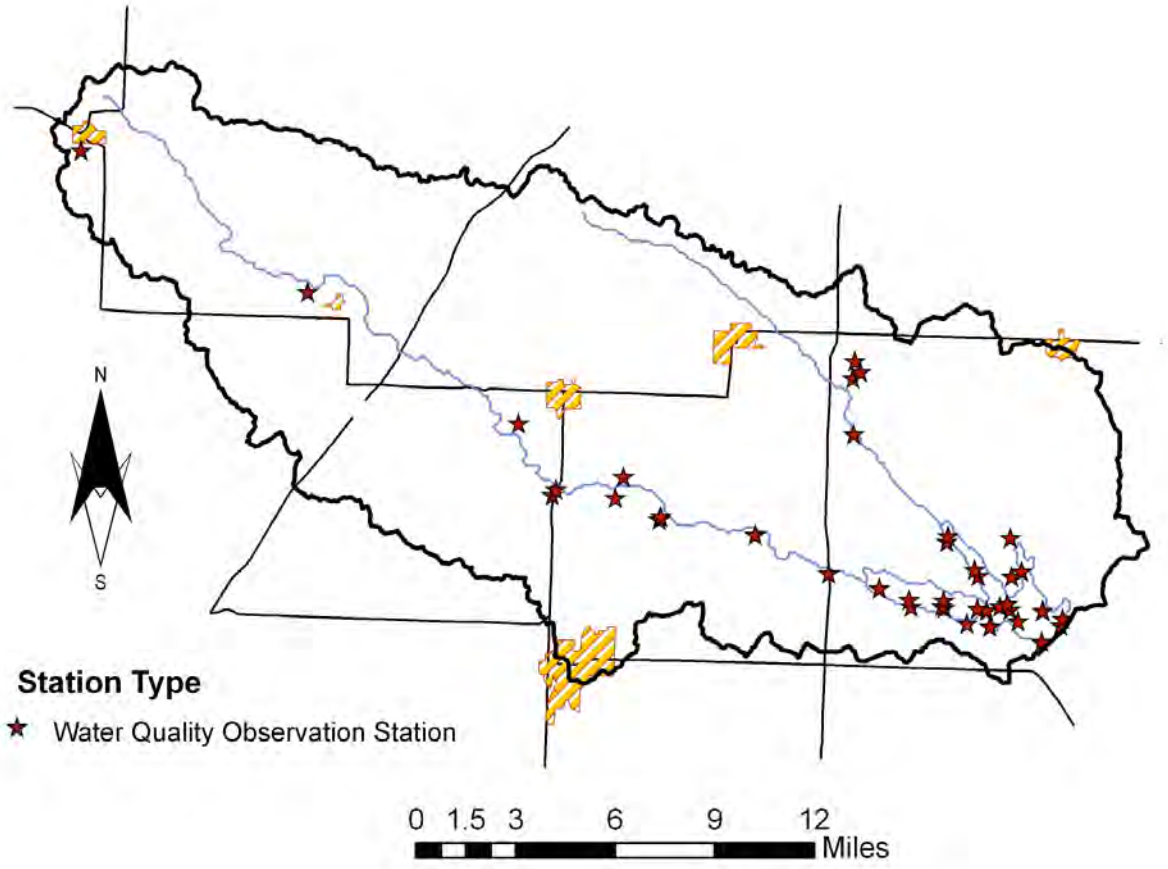

Figure 12. Lakes and Streams Water Quality Observation Stations – Pomona Lake Watershed.

Table 3. Water Quality Observation Station

State	Agency	Station ID	Station Name
KS	US EPA Region 7	009477	Dragoon Creek
KS	USGS	06912490	Pomona Lk Nr Quenemo, KS
KS	USGS	383851095335002	110 Mile Cr At Pomona Dam Outflow, KS Po-2
KS	USGS	383924095353417	Marina Vassar State Park, Pomona Lake, KS Po-17
KS	USGS	383929095331219	Pomona Lake Mich Valley B Nr Mich Valley, KS Po-
KS	USGS	383927095362018	Beach Vassar State Park, Pomona Lake, KS Po-18
KS	USGS	383935095343003	110 Mile Cr In Pomona Res, KS Po-3
KS	USGS	383939095330816	Marina Michigan Valley, Pomona Lake, KS Po-16
KS	USGS	384002095381707	Pomona Lake 4 Mi Uplake From Dam, KS Po-7
KS	USGS	384010095401000	Osage City Lake, KS
KS	USGS	384052095360812	Pomona Lake 3 Mi Uplake From Dam, Ks Po-12
KS	USGS	06912300	Dragoon C Tr Nr Lyndon, KS
KS	USGS	06911900	Dragoon C Nr Burlingame, KS
KS	USGS	384239095501311	Dragon C 2.25 Mi S/Burlingame, KS Po-11
KS	USGS	384332095514601	15S 14E 21Cdd 01
KS	USGS	384653095471301	15S 15E 06Abb 01

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State	Agency	Station ID	Station Name
KS	USEPA	201201	Pomona Reservoir
KS	USEPA	201202	Pomona Reservoir
KS	USEPA	201203	Pomona Reservoir
KS	USEPA	2012B1	Dragoon Creek
KS	USEPA	2012C1	Switzler Creek
KS	USEPA	2012D1	Plummer Creek
KS	USEPA	2012A2	Hundred And Ten Mile Cr
KS	USEPA	2012C2	Switzler Creek
KS	Corps Of Engineers	190203	110 Mile Cr @ Pomona Dam Outflow
KS	Corps Of Engineers	190343	Marina Vassar St Pk Pomona Lake
KS	Corps Of Engineers	190993	Pomona Lake, Mich Valley Beach Nr Mich Valley KS
KS	Corps Of Engineers	190342	Beach Vassar State Park Pomona L
KS	Corps Of Engineers	190344	Pomona L 1 Mi Uplake From Dam
KS	Corps Of Engineers	190340	Marina Michigan Valley Pomona L
KS	Corps Of Engineers	190345	Pomona L 2 Mi Uplake From Dam
KS	Corps Of Engineers	190346	Pomona L 3 Mi Uplake From Dam
KS	Corps Of Engineers	190347	Pomona L 4 Mi Uplake From Dam
KS	Corps Of Engineers	190348	Pomona L 5 Mi Uplake From Dam
KS	Corps Of Engineers	190349	Pomona L 7 Mi Uplake From Dam
KS	Corps Of Engineers	190354	Pomona L 2 Mi Uplake From Dam
KS	Corps Of Engineers	190352	Pomona L 3 Mi Uplake From Dam
KS	Corps Of Engineers	190370	Pomona L 3 Mi Uplake From Dam
KS	Corps Of Engineers	190353	Pomona L 4 Mi Uplake From Dam
KS	Corps Of Engineers	190350	Pomona L Ne Of Osage City, Kans.
KS	Corps Of Engineers	190351	Dragon C 2.25Mi S/Burlingame, KS
KS	KDHE	028001	Pomona Reservoir Sta 1
KS	KDHE	028002	Pomona Reservoir Sta 2
KS	KDHE	028003	Pomona Reservoir Sta 3
KS	KDHE	028005	Pomona Reservoir Sta 5
KS	KDHE	028008	Pomona Reservoir Sta 8
KS	KDHE	028009	Pomona Reservoir Sta 9
KS	KDHE	028010	Pomona Reservoir Sta 10
KS	KDHE	028004	Pomona Reservoir Sta 4
KS	KDHE	028006	Pomona Reservoir Sta 6
KS	KDHE	028007	Pomona Reservoir Sta 7
KS	KDHE	028011	Pomona Lake/Dragoon Creek Inflow
KS	KDHE	000577	Dragoon Creek Near Burlingame
KS	KDHE	000687	Switzler Creek Near Burlingame
KS	KDHE	000633	110 Mile Creek Near Scranton
KS	KDHE	012401	Osage Co State Lake Sta 1
KS	KDHE	012402	Osage Co State Lake Sta 2
KS	KDHE	012403	Osage Co State Lake Sta 3
KS	KDHE	040801	Harveyville Lake

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6.3. USGS Gage Stations[12]

USGS inventory of surface water gaging station data including 7Q10 low and monthly mean stream flow.

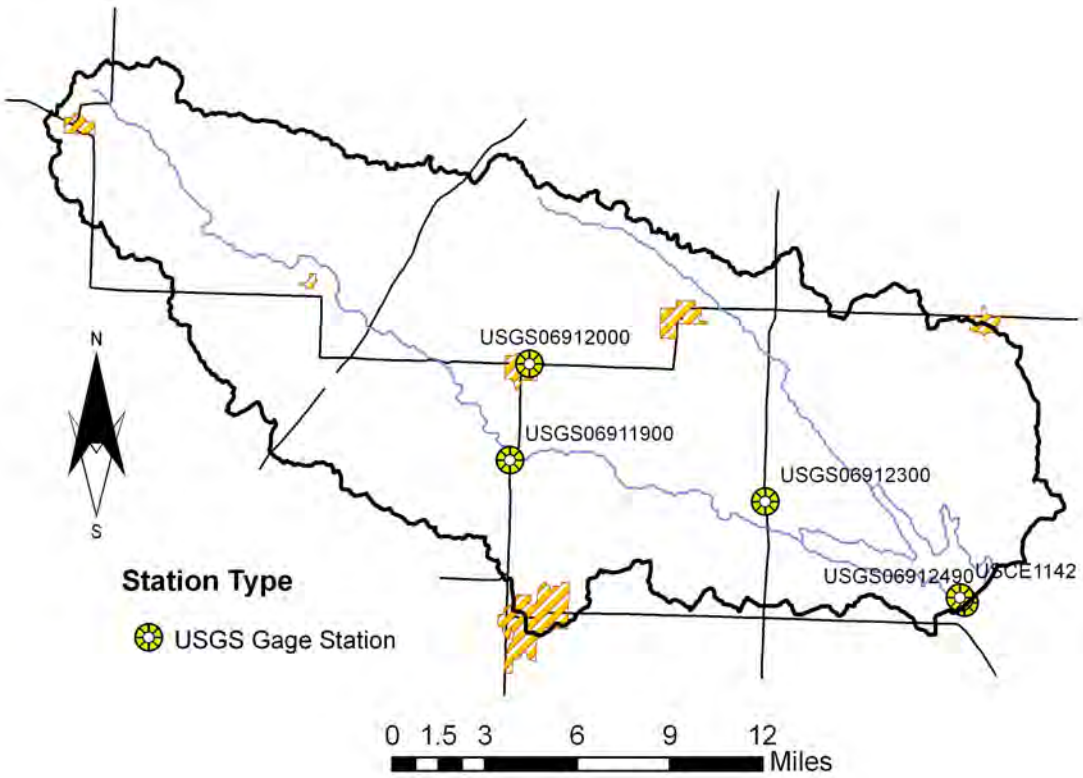

Figure 13. USGS Gage Stations – Pomona Lake Watershed.

Table 4. USGS Gage Station[12]

Gage Id	Stream Flow (Cfs)												
	Mean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
USGS06912490	-	-	-	-	-	-	-	-	-	-	-	-	-
USCE1142	-	-	-	-	-	-	-	-	-	-	-	-	-
USGS06912300	-	-	-	-	-	-	-	-	-	-	-	-	-
USGS06911900	64.96	38.21	50.70	95.20	94.65	85.90	166.63	50.07	18.73	49.09	54.87	42.23	31.19
USGS06912000	8.32	3.50	6.91	28.96	7.28	5.80	11.32	18.45	1.15	2.01	7.78	4.06	2.24

Table 5. Estimated peak-streamflow frequencies for selected gaging stations with at least 10 years of annual peak-discharge data for unregulated, rural streams in Kansas[13]

USGS ID	Station Name	Drainage Area (mi^2)	2-year ft^3/s	5-year ft^3/s	10-year ft^3/s	25-year ft^3/s	50-year ft^3/s	100-year ft^3/s	200-year ft^3/s
06912300	Dragoon Creek tributary near Lyndon	3.76	1220	2940	4610	7430	10100	13200	16900
06911900	Dragon Creek near Burlingame	114	4780	8780	12000	16600	20500	24700	29300

Table 6. USGS gaging stations period of record for Pomona Lake Watershed[12]

USGS ID	Drainage Area (mi^2)	Period of record	
		Begin	End
06911900	114	03/01/1960	Present
06912000	26.3	08/19/1954	06/30/1961

This file is for historical purposes only and may not reflect current practices. For current recommendations, contact K-State Research and Extension.

6.4 Permitted Point Source Facilities[14]

NPDES permit-holding facility information; contains parameter-specific loadings to surface waters computed using the EPA Effluent Decision Support System (EDSS) for 1990-1999. The summary of discharge concentrations and loads allows the user to perform a planning-level assessment of the magnitude and severity of point source contributions. Analyzing the data for different years can provide information to evaluate changes in contributions from various point sources over time and support trend analysis.

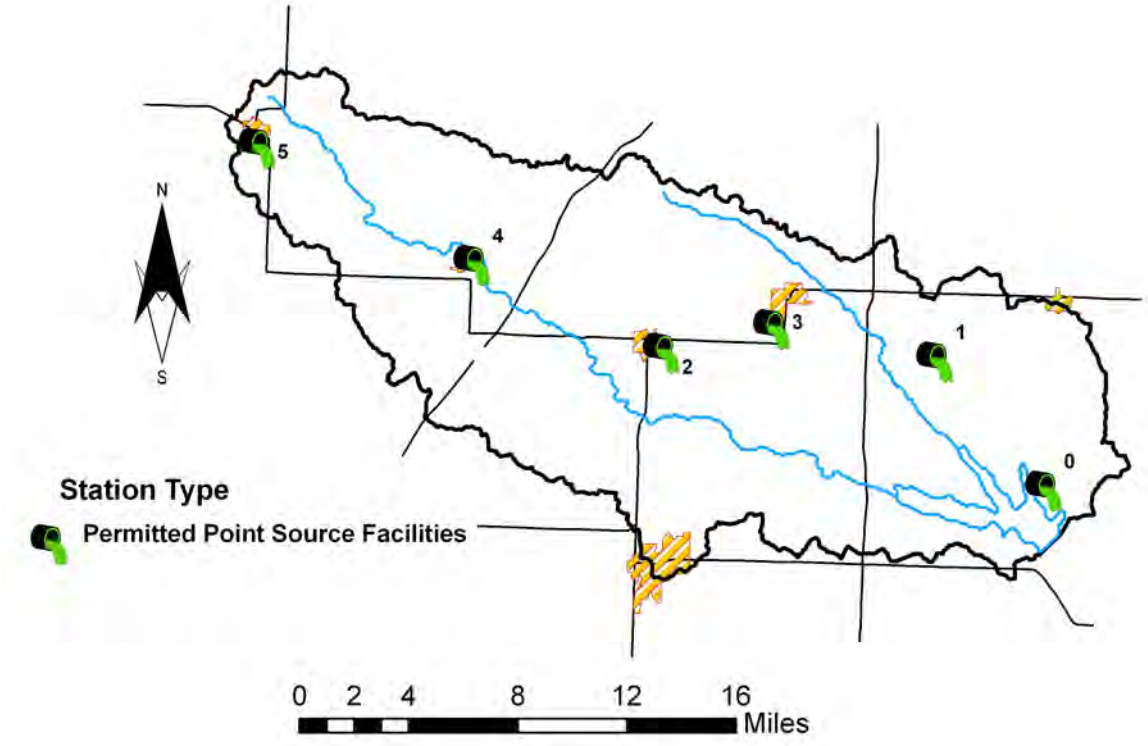

Figure 14. NPDES permit-holding facilities – Pomona Lake Watershed.

Table 7. Permitted Point Source Facilities[14]

ID	NPDES	Facility Name	Ownership	Description	Industrial Classification	City	County	Flow Rate (million gallons/day)
0	KS0085383	Pomona Lake - Michigan Valley	Public	Rec Vehicle Parks & Campsites	Not ON Elg	Vassar	Osage	0.00000
1	KS0085502	Gloss Quarry #6	Private	Crushed And Broken Limestone	ON Elg	Perry	Jefferson	0.00000
2	KS0024694	Burlingame City Of Stp	Public	Sewerage Systems	Municipal	Burlingame	Osage	0.00000
3	KS0031283	Scranton City Of Wwtf	Public	Sewerage Systems	Municipal	Scranton	Osage	0.00000
4	KS0046418	Harveyville City Of Stp	Public	Sewerage Systems	Municipal	Harveyville	Wabaunsee	0.00000
5	KS0046400	Eskridge City Of Wwtp	Public	Sewerage Systems	Municipal	Eskridge	Wabaunsee	0.00000

This file is for historical purposes only and may not reflect current practices. For current recommendations, contact K-State Research and Extension.

6.5 Confined Animal Feeding Operations (CAFOs)[15]

Animal feeding operations classified as large or presenting a high risk to discharge can be classified as CAFOs and are likely required to have an NPDES permit. This map shows the locations and permit numbers for these sites in the Pomona Lake Watershed.

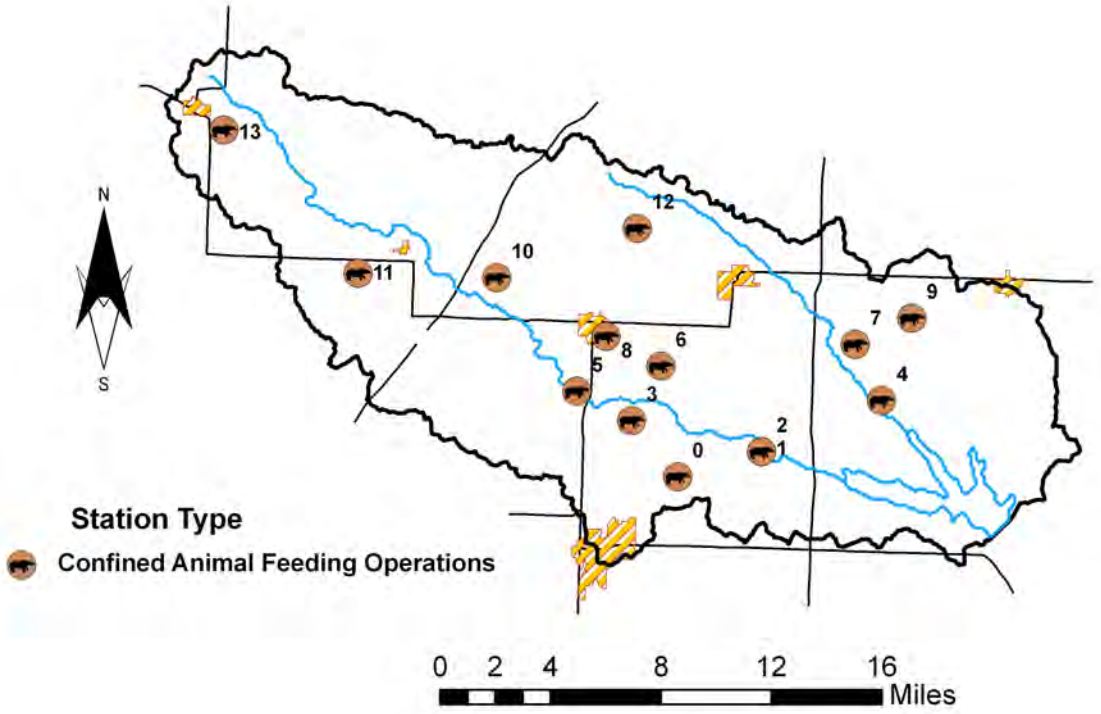

Figure 15. Confined Animal Feeding Operations facilities – Pomona Lake Watershed.

Table 8. Confined Animal Feeding Operations[15]

ID	Permit No.	Total Head	Federal AUS	Kansas AUS	Animal Type
0	A-MCOS-BA04	75	75	75	Beef
1	A-MCOS-BA14	80	80	80	Beef
2	A-MCOS-B006	475	303	300	Beef, Swine
3	A-MCOS-B003	500	500	500	Beef
4	A-KSOS-S003	620	217	220	Swine, Beef
5	A-MCOS-BA18	300	300	300	Beef
6	A-MCOS-BA02	500	500	500	Beef
7	A-MCOS-SA02	150	60	60	Swine
8	A-MCOS-BA13	160	160	160	Beef
9	A-MCOS-BA10	120	120	120	Beef
10	A-MCOS-B005	440	290	440	Beef
11	A-MCWB-S001	1705	496	434	Swine
12	A-MCOS-S008	650	295	470	Swine, Beef
13	A-MCWB-BA01	780	390	780	Beef

* Animal System Unit

This file is for historical purposes only and may not reflect current practices. For current recommendations, contact K-State Research and Extension.

6.6 1990 Population and Sewerage by Census Tract[16]

The 1990 Population and Sewerage by Census Tract can be used to examine specific areas for population density and the prevalence of septic systems, which can be significant sources of pathogens, household chemicals, and nutrients (especially nitrate) escaping into groundwater and nearby receiving water bodies.

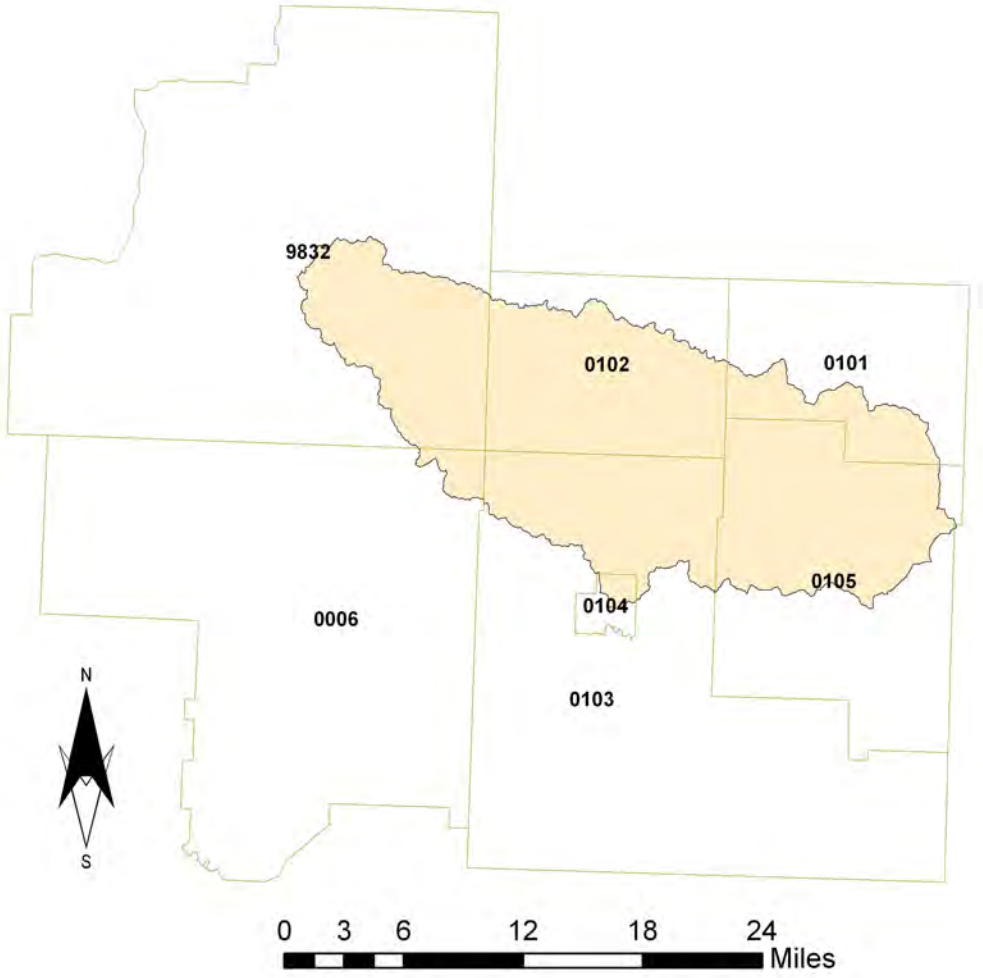

Figure 16. Population and Sewerage by Census – Pomona Lake Watershed.

Table 9. 1990 Population and Sewerage by Census Tract[16]

ID	Tract	Population	House Units	Sewerage Public	Sewerage Septic	Sewerage Other
0	9832	2554	1205	384	767	54
1	0101	4156	1533	945	565	23
2	0102	2908	1185	694	479	12
3	0105	3210	1474	698	740	36
4	0006	2595	1047	297	693	57
5	0103	2181	891	198	675	18
6	0104	2793	1241	1177	64	0

This file is for historical purposes only and may not reflect current practices. For current recommendations, contact K-State Research and Extension.

7.0. Agricultural Economy

7.1 Corn Cost-Return Budget[17]

Table 10. Cost-return projections for corn crops in the Pomona Lake Watershed, 2006.

Corn	Yield Level (bu)		
	80	110	140
Income Per Acre			
A. Yield per acre	80	110	140
B. Price per bushel	$2.70	$2.70	$2.70
C. Net government payment	$10.48	$11.39	$12.30
D. Indemnity payments			
E. Miscellaneous income			
F. Returns/acre ((AxB)+C+D+E)	$226.48	$308.39	$390.30
Costs Per Acre			
1. Seed	$32.43	$32.43	$36.66
2. Herbicide	33.85	33.85	33.85
3. Insecticide/Fungicide	0.27	0.27	0.27
4. Fertilizer and Lime	37.48	45.40	53.32
5. Crop Consulting			
6. Crop Insurance			
7. Drying			
8. Miscellaneous	7.00	7.00	7.00
9. Custom Hire / Machinery Expense	90.16	98.83	107.50
10. Non-machinery Labor	10.19	11.17	12.15
11. Irrigation			
12. Land Charge/Rent	34.40	43.00	51.60
G. Sub Total	$245.77	$271.94	$302.34
13. Interest on ½ Nonland Costs	9.51	10.30	11.28
H. Total Costs	$255.28	$282.25	$313.63
I. Returns Over Costs (F-H)	**-$28.81**	**$26.14**	**$76.68**
J. Total Costs/bushel (H/A)	$3.19	$2.57	$2.24
K. Return To Annual Cost (I+13)/G	-7.85%	13.40%	29.09%

This file is for historical purposes only and may not reflect current practices. For current recommendations, contact K-State Research and Extension.

Table 11. Southeast Kansas Farm Management Association profit Center Analysis: 5-year Average and 2006 Nonirrigated Corn.[26]

	2001-2005 Average	2006
Number of Farms	55	38
Crop Acres	402	529
Acres Owned	121	155
Acres Rented	281	374
Yield / Acre	109	95
Bushels	36,359	40,404
Operator Percentage	83.15%	80.47%
Gross Income / Acre	$233.40	$242.68
Variable Costs / Acre	$160.45	$178.68
Total Expense / Acre	$230.79	$248.23
Gross Income / Bushel	$2.58	$3.18
Total Expense / Bushel	$2.55	$3.25

	Total Dollars	$/Bushel	$/Acre	Total Dollars	$/Bushel	$/Acre
INCOME:						
Corn (Operator's Share)	$80,290.82	$2.21	$199.63	$120,532.52	$2.98	$227.85
Patronage Refunds	$266.75	0.01	0.66	$673.05	0.02	1.27
Government Payments	$12,131.76	0.33	30.16	$6,674.57	0.17	12.62
Miscellaneous Income	$20.08	0.00	0.05	($147.10)	(0.00)	(0.28)
Crop Insurance Proceeds	$1,163.31	0.03	2.89	$645.16	0.02	1.22
OTHER INCOME	$13,581.90	$0.37	$33.77	$7,845.68	$0.19	$14.83
GROSS INCOME	$93,872.72	$2.58	$233.40	$128,378.20	$3.18	$242.68
EXPENSES:						
Labor Hired	$3,453.01	$0.09	$8.59	$4,657.12	$0.12	$8.80
General Machinery Repairs	$6,156.94	0.17	15.31	$8,142.53	0.20	15.39
Interest Paid	$3,812.10	0.10	9.48	$6,394.41	0.16	12.09
Seed / Other Crop Expense	$12,012.77	0.33	29.87	$18,201.43	0.45	34.41
Crop Insurance	$2,119.32	0.06	5.27	$3,501.80	0.09	6.62
Fertilizer / Lime	$16,167.67	0.44	40.20	$25,235.64	0.62	47.70
Machine Hire - Lease	$2,389.04	0.07	5.94	$2,745.59	0.07	5.19
Farm Org Fees / Travel / Publ	$655.92	0.02	1.63	$877.00	0.02	1.66
Gas / Fuel / Oil	$4,069.75	0.11	10.12	$7,761.81	0.19	14.67
Crop Storage & Marketing	$498.96	0.01	1.24	$551.75	0.01	1.04
Personal Property Tax	$292.99	0.01	0.73	$331.64	0.01	0.63
General Farm Insurance	$1,099.50	0.03	2.73	$1,398.60	0.03	2.64
Utilities	$843.34	0.02	2.10	$974.65	0.02	1.84
Cash Farm Rent	$3,252.51	0.09	8.09	$2,491.15	0.06	4.71
Herbicide / Insecticide	$7,424.28	0.20	18.46	$10,987.66	0.27	20.77
Conservation	$42.18	0.00	0.10	$0.58	0.00	0.00
Auto Expense	$241.21	0.01	0.60	$265.72	0.01	0.50
TOTAL VARIABLE COSTS	$64,531.50	$1.77	$160.45	$94,519.08	$2.34	$178.68
RETURN ABOVE VARIABLE COSTS	$29,341.23	$0.81	$72.95	$33,859.12	$0.84	$64.01
Depreciation	$8,551.91	0.24	21.26	$11,757.89	0.29	22.23
Real Estate Tax	$1,014.99	0.03	2.52	$1,207.60	0.03	2.28
Unpaid Operator Labor	$6,259.53	0.17	15.56	$6,654.67	0.16	12.58
Interest Charge *	$2,730.39	0.08	6.79	$2,664.72	0.07	5.04
TOTAL FIXED COSTS	$18,556.82	$0.51	$46.14	$22,284.88	$0.55	$42.13
Land Charge **	$9,735.65	$0.27	$24.21	$14,510.87	$0.36	$27.43
TOTAL EXPENSE	$92,823.97	$2.55	$230.79	$131,314.83	$3.25	$248.23
NET RETURN TO MANAGEMENT	$1,048.75	$0.03	$2.61	($2,936.63)	($0.07)	($5.55)
NET RETURN TO LABOR-MGT	$10,761.29	$0.30	$26.76	$8,375.16	$0.21	$15.83

*Interest charge equals: ((8.0% times three-fourths the variable costs) plus (4.0% times depreciation times 8)) minus cash interest paid.

**Land charge represents a charge (equal to landlord's share) on owned land and equals (production from owned acres X price / unit X 33.33%). Crop production paid to the landlord on rented land (already removed above), or cash rent is the charge on rented land.

This crop enterprise is based on the operator's share of production, and thus includes only production expenses paid by the operator. A charge for management is not included in the expenses.

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7.2 Soybean Cost-Return Budget[17]

Table 12. Cost-return projections for soybean crops in the Pomona Lake Watershed, 2006.

Soybeans	Yield Level (bu)		
	25	35	45
Income Per Acre			
A. Yield per acre	25	35	45
B. Price per bushel	$6.08	$6.08	$6.08
C. Net government payment	$10.48	$11.39	$12.30
D. Indemnity payments			
E. Miscellaneous income			
F. Returns/acre ((AxB)+C+D+E)	$162.48	$224.19	$285.90
Costs Per Acre			
1. Seed	$30.60	$30.60	$32.95
2. Herbicide	8.86	8.86	8.86
3. Insecticide/Fungicide			
4. Fertilizer and Lime	16.41	17.70	21.20
5. Crop Consulting			
6. Crop Insurance			
7. Drying			
8. Miscellaneous	7.00	7.00	7.00
9. Custom Hire / Machinery Expense	73.03	77.25	80.22
10. Non-machinery Labor	8.25	8.75	9.06
11. Irrigation			
12. Land Charge/Rent	34.40	43.00	51.60
G. Sub Total	$178.55	$193.14	$210.89
13. Interest on ½ Nonland Costs	6.49	6.76	7.17
H. Total Costs	$185.03	$199.89	$218.06
I. Returns Over Costs (F-H)	**-$22.56**	**$24.30**	**$67.84**
J. Total Costs/bushel (H/A)	$7.40	$5.71	$4.85
K. Return To Annual Cost (I+13)/G	-9.00%	16.08%	35.57%

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Table 13. Southeast Kansas Farm Management Association profit Center Analysis: 5-year Average and 2006 Nonirrigated Soybeans.[26]

	2001-2005 Average	2006
Number of Farms	71	49
Crop Acres	476	442
Acres Owned	113	101
Acres Rented	362	342
Yield / Acre	28	26
Bushels	10,662	8,906
Operator Percentage	80.73%	78.77%
Gross Income / Acre	$149.07	$148.18
Variable Costs / Acre	$94.54	$105.63
Total Expense / Acre	$145.78	$154.47
Gross Income / Bushel	$6.65	$7.35
Total Expense / Bushel	$6.50	$7.67

	Total Dollars	$/Bushel	$/Acre	Total Dollars	$/Bushel	$/Acre
INCOME:						
Soybeans (Operator's Share)	$58,823.37	$5.52	$123.68	$56,216.35	$6.31	$127.19
Patronage Refunds	$300.71	0.03	0.63	$402.25	0.05	0.91
Government Payments	$9,645.70	0.90	20.28	$5,941.08	0.67	13.44
Miscellaneous Income	$23.47	0.00	0.05	($1.98)	(0.00)	(0.00)
Crop Insurance Proceeds	$2,103.66	0.20	4.42	$2,937.50	0.33	6.65
OTHER INCOME	$12,073.55	$1.13	$25.39	$9,278.85	$1.04	$20.99
GROSS INCOME	$70,896.91	$6.65	$149.07	$65,495.20	$7.35	$148.18
EXPENSES:						
Labor Hired	$2,364.92	$0.22	$4.97	$3,016.89	$0.34	$6.83
General Machinery Repairs	$5,957.40	0.56	12.53	$5,633.38	0.63	12.75
Interest Paid	$4,288.15	0.40	9.02	$4,077.73	0.46	9.23
Seed / Other Crop Expense	$8,987.19	0.84	18.90	$10,131.36	1.14	22.92
Crop Insurance	$2,024.04	0.19	4.26	$2,890.62	0.32	6.54
Fertilizer / Lime	$1,917.37	0.18	4.03	$2,658.14	0.30	6.01
Machine Hire - Lease	$2,164.97	0.20	4.55	$1,534.20	0.17	3.47
Farm Org Fees / Travel / Publ	$659.88	0.06	1.39	$795.70	0.09	1.80
Gas / Fuel / Oil	$3,999.51	0.38	8.41	$5,529.03	0.62	12.51
Crop Storage & Marketing	$343.58	0.03	0.72	$290.45	0.03	0.66
Personal Property Tax	$283.04	0.03	0.60	$305.12	0.03	0.69
General Farm Insurance	$1,112.99	0.10	2.34	$1,079.54	0.12	2.44
Utilities	$932.69	0.09	1.96	$797.39	0.09	1.80
Cash Farm Rent	$3,457.04	0.32	7.27	$2,897.97	0.33	6.56
Herbicide / Insecticide	$6,090.26	0.57	12.81	$4,872.54	0.55	11.02
Conservation	$44.19	0.00	0.09	$0.20	0.00	0.00
Auto Expense	$334.90	0.03	0.70	$177.81	0.02	0.40
TOTAL VARIABLE COSTS	$44,962.11	$4.22	$94.54	$46,688.07	$5.24	$105.63
RETURN ABOVE VARIABLE COSTS	$25,934.80	$2.43	$54.53	$18,807.13	$2.11	$42.55
Depreciation	$8,254.98	0.77	17.36	$8,348.84	0.94	18.89
Real Estate Tax	$1,057.10	0.10	2.22	$922.51	0.10	2.09
Unpaid Operator Labor	$8,002.74	0.75	16.83	$6,059.39	0.68	13.71
Interest Charge *	$994.65	0.09	2.09	$1,152.23	0.13	2.61
TOTAL FIXED COSTS	$18,309.47	$1.72	$38.50	$16,482.97	$1.85	$37.29
Land Charge **	$6,060.95	$0.57	$12.74	$5,103.12	$0.57	$11.55
TOTAL EXPENSE	$69,332.53	$6.50	$145.78	$68,274.16	$7.67	$154.47
NET RETURN TO MANAGEMENT	$1,564.38	$0.15	$3.29	($2,778.96)	($0.31)	($6.29)
NET RETURN TO LABOR-MGT	$11,932.05	$1.12	$25.09	$6,297.32	$0.71	$14.25

*Interest charge equals: ((8.0% times three-fourths the variable costs) plus (4.0% times depreciation times 8)) minus cash interest paid.

**Land charge represents a charge (equal to landlord's share) on owned land and equals (production from owned acres X price / unit X 33.33%). Crop production paid to the landlord on rented land (already removed above), or cash rent is the charge on rented land.

This crop enterprise is based on the operator's share of production, and thus includes only production expenses paid by the operator. A charge for management is not included in the expenses.

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7.3 Wheat Cost-Return Budget[17]

Table 14. Cost-return projections for wheat crops in the Pomona Lake Watershed, 2006.

Wheat	Yield Level (bu)		
	35	45	55
Income Per Acre			
A. Yield per acre	35	45	55
B. Price per bushel	$4.41	$4.41	$4.41
C. Net government payment	$10.48	$11.39	$12.30
D. Indemnity payments			
E. Miscellaneous income			
F. Returns/acre ((AxB)+C+D+E)	$164.83	$209.84	$254.85
Costs Per Acre			
1. Seed	$9.90	$9.90	$9.90
2. Herbicide	2.75	2.75	2.75
3. Insecticide/Fungicide			
4. Fertilizer and Lime	36.65	43.71	52.06
5. Crop Consulting			
6. Crop Insurance			
7. Drying			
8. Miscellaneous	7.00	7.00	7.00
9. Custom Hire / Machinery Expense	60.61	63.62	66.63
10. Non-machinery Labor	6.85	7.19	7.53
11. Irrigation			
12. Land Charge/Rent	34.40	43.00	51.60
G. Sub Total	$158.16	$177.17	$197.47
13. Interest on ½ Nonland Costs	5.57	6.04	6.56
H. Total Costs	$163.73	$183.20	$204.04
I. Returns Over Costs (F-H)	**$1.10**	**$26.64**	**$50.81**
J. Total Costs/bushel (H/A)	$4.68	$4.07	$3.71
K. Return To Annual Cost (I+13)/G	4.22%	18.44%	29.06%

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Table 15. Southeast Kansas Farm Management Association profit Center Analysis: 5-year Average and 2006 Nonirrigated Wheat.[26]

	2001-2005 Average	2006
Number of Farms	73	48
Crop Acres	429	524
Acres Owned	93	126
Acres Rented	337	398
Yield / Acre	45	40
Bushels	15,355	16,758
Operator Percentage	79.19%	80.78%
Gross Income / Acre	$136.15	$157.92
Variable Costs / Acre	$88.81	$106.21
Total Expense / Acre	$133.82	$156.76
Gross Income / Bushel	$3.81	$4.94
Total Expense / Bushel	$3.74	$4.90

	Total Dollars	$/Bushel	$/Acre	Total Dollars	$/Bushel	$/Acre
INCOME:						
Wheat (Operator's Share)	$50,409.65	$3.28	$117.45	$73,816.79	$4.40	$140.87
Patronage Refunds	$398.25	0.03	0.93	$692.50	0.04	1.32
Government Payments	$6,980.10	0.45	16.26	$6,865.51	0.41	13.10
Miscellaneous Income	$37.94	0.00	0.09	$24.76	0.00	0.05
Crop Insurance Proceeds	$610.26	0.04	1.42	$1,349.38	0.08	2.58
OTHER INCOME	$8,026.55	$0.52	$18.70	$8,932.15	$0.53	$17.05
GROSS INCOME	$58,436.20	$3.81	$136.15	$82,748.94	$4.94	$157.92
EXPENSES:						
Labor Hired	$2,566.56	$0.17	$5.98	$3,476.58	$0.21	$6.63
General Machinery Repairs	$5,037.99	0.33	11.74	$6,209.33	0.37	11.85
Interest Paid	$3,870.05	0.25	9.02	$5,123.64	0.31	9.78
Seed / Other Crop Expense	$2,669.10	0.17	6.22	$4,401.92	0.26	8.40
Crop Insurance	$1,180.39	0.08	2.75	$2,280.47	0.14	4.35
Fertilizer / Lime	$11,256.34	0.73	26.23	$18,173.35	1.08	34.68
Machine Hire - Lease	$1,570.07	0.10	3.66	$852.43	0.05	1.63
Farm Org Fees / Travel / Publ	$528.11	0.03	1.23	$628.46	0.04	1.20
Gas / Fuel / Oil	$3,361.19	0.22	7.83	$5,860.11	0.35	11.18
Crop Storage & Marketing	$286.55	0.02	0.67	$383.48	0.02	0.73
Personal Property Tax	$219.98	0.01	0.51	$282.79	0.02	0.54
General Farm Insurance	$985.82	0.06	2.30	$1,416.01	0.08	2.70
Utilities	$748.60	0.05	1.74	$778.21	0.05	1.49
Cash Farm Rent	$2,512.88	0.16	5.85	$2,920.36	0.17	5.57
Herbicide / Insecticide	$1,088.84	0.07	2.54	$2,669.37	0.16	5.09
Conservation	$46.99	0.00	0.11	$0.39	0.00	0.00
Auto Expense	$185.99	0.01	0.43	$198.85	0.01	0.38
TOTAL VARIABLE COSTS	$38,115.46	$2.48	$88.81	$55,655.75	$3.32	$106.21
RETURN ABOVE VARIABLE COSTS	$20,320.74	$1.32	$47.35	$27,093.19	$1.62	$51.70
Depreciation	$7,038.32	0.46	16.40	$9,641.06	0.58	18.40
Real Estate Tax	$745.82	0.05	1.74	$1,177.16	0.07	2.25
Unpaid Operator Labor	$6,218.48	0.40	14.49	$6,997.50	0.42	13.35
Interest Charge *	$663.69	0.04	1.55	$994.86	0.06	1.90
TOTAL FIXED COSTS	$14,666.31	$0.96	$34.17	$18,810.58	$1.12	$35.90
Land Charge **	$4,654.48	$0.30	$10.84	$7,675.82	$0.46	$14.65
TOTAL EXPENSE	$57,436.25	$3.74	$133.82	$82,142.15	$4.90	$156.76
NET RETURN TO MANAGEMENT	$999.95	$0.07	$2.33	$606.79	$0.04	$1.16
NET RETURN TO LABOR-MGT	$9,785.00	$0.64	$22.80	$11,080.87	$0.66	$21.15

*Interest charge equals: ((8.0% times three-fourths the variable costs) plus (4.0% times depreciation times 8)) minus cash interest paid.

**Land charge represents a charge (equal to landlord's share) on owned land and equals (production from owned acres X price / unit X 33.33%). Crop production paid to the landlord on rented land (already removed above), or cash rent is the charge on rented land.

This crop enterprise is based on the operator's share of production, and thus includes only production expenses paid by the operator. A charge for management is not included in the expenses.

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7.4 Grain Sorghum Cost-Return Budget[17]

Table 16. Cost-return projections for grain sorghum crops in the Pomona Lake Watershed, 2006.

Grain Sorghum	Yield Level (bu)		
	70	85	110
Income Per Acre			
A. Yield per acre	70	85	110
B. Price per bushel	$2.82	$2.82	$2.82
C. Net government payment	$10.48	$11.39	$12.30
D. Indemnity payments			
E. Miscellaneous income			
F. Returns/acre ((AxB)+C+D+E)	$207.88	$207.88	$207.88
Costs Per Acre			
1. Seed	$12.29	$12.29	$12.29
2. Herbicide	20.34	20.34	20.34
3. Insecticide/Fungicide	5.90	5.90	5.90
4. Fertilizer and Lime	39.68	43.64	50.24
5. Crop Consulting			
6. Crop Insurance			
7. Drying			
8. Miscellaneous	7.00	7.00	7.00
9. Custom Hire / Machinery Expense	82.39	86.92	94.47
10. Non-machinery Labor	9.31	9.82	10.68
11. Irrigation			
12. Land Charge/Rent	34.40	43.00	51.60
G. Sub Total	$211.30	$228.90	$252.51
13. Interest on ½ Nonland Costs	7.96	8.37	9.04
H. Total Costs	$219.26	$237.27	$261.55
I. Returns Over Costs (F-H)	**-$11.38**	**$13.82**	**$60.95**
J. Total Costs/bushel (H/A)	$3.13	$2.79	$2.38
K. Return To Annual Cost (I+13)/G	-1.62%	9.69%	27.72%

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Table 17. Southeast Kansas Farm Management Association profit Center Analysis: 5-year Average and 2006 Nonirrigated Sorghum.[26]

	2001-2005 Average	2006
Number of Farms	50	20
Crop Acres	231	206
Acres Owned	46	20
Acres Rented	185	186
Yield / Acre	80	63
Bushels	14,154	9,948
Operator Percentage	76.56%	77.01%
Gross Income / Acre	$147.94	$162.55
Variable Costs / Acre	$109.23	$123.03
Total Expense / Acre	$161.11	$169.51
Gross Income / Bushel	$2.42	$3.37
Total Expense / Bushel	$2.63	$3.51

	Total Dollars	$/Bushel	$/Acre	Total Dollars	$/Bushel	$/Acre
INCOME:						
Grain Sorghum (Operator's Share)	$28,484.90	$2.01	$123.10	$28,576.75	$2.87	$138.72
Patronage Refunds	$183.45	0.01	0.79	$244.77	0.02	1.19
Government Payments	$5,171.17	0.37	22.35	$3,028.68	0.30	14.70
Miscellaneous Income	$15.62	0.00	0.07	($5.39)	(0.00)	(0.03)
Crop Insurance Proceeds	$377.57	0.03	1.63	$1,641.25	0.16	7.97
OTHER INCOME	$5,747.80	$0.41	$24.84	$4,909.31	$0.49	$23.83
GROSS INCOME	$34,232.69	$2.42	$147.94	$33,486.06	$3.37	$162.55
EXPENSES:						
Labor Hired	$776.03	$0.05	$3.35	$1,020.45	$0.10	$4.95
General Machinery Repairs	$2,973.93	0.21	12.85	$2,416.47	0.24	11.73
Interest Paid	$1,990.96	0.14	8.60	$1,830.30	0.18	8.88
Seed / Other Crop Expense	$2,291.49	0.16	9.90	$2,124.92	0.21	10.32
Crop Insurance	$755.85	0.05	3.27	$892.81	0.09	4.33
Fertilizer / Lime	$6,805.97	0.48	29.41	$7,084.17	0.71	34.39
Machine Hire - Lease	$867.87	0.06	3.75	$349.53	0.04	1.70
Farm Org Fees / Travel / Publ	$300.03	0.02	1.30	$232.82	0.02	1.13
Gas / Fuel / Oil	$1,957.06	0.14	8.46	$2,555.35	0.26	12.40
Crop Storage & Marketing	$159.04	0.01	0.69	$238.19	0.02	1.16
Personal Property Tax	$138.23	0.01	0.60	$155.67	0.02	0.76
General Farm Insurance	$555.12	0.04	2.40	$490.42	0.05	2.38
Utilities	$416.80	0.03	1.80	$306.05	0.03	1.49
Cash Farm Rent	$1,021.00	0.07	4.41	$1,759.59	0.18	8.54
Herbicide / Insecticide	$4,093.49	0.29	17.69	$3,824.34	0.38	18.56
Conservation	$23.29	0.00	0.10	$0.00	-	-
Auto Expense	$148.86	0.01	0.64	$63.88	0.01	0.31
TOTAL VARIABLE COSTS	$25,275.01	$1.79	$109.23	$25,344.96	$2.55	$123.03
RETURN ABOVE VARIABLE COSTS	$8,957.68	$0.63	$38.71	$8,141.10	$0.82	$39.52
Depreciation	$4,067.83	0.29	17.58	$3,728.53	0.37	18.10
Real Estate Tax	$417.68	0.03	1.81	$335.16	0.03	1.63
Unpaid Operator Labor	$4,148.64	0.29	17.93	$3,421.13	0.34	16.61
Interest Charge *	$809.19	0.06	3.50	$775.81	0.08	3.77
TOTAL FIXED COSTS	$9,443.33	$0.67	$40.81	$8,260.63	$0.83	$40.10
Land Charge **	$2,562.55	$0.18	$11.07	$1,313.88	$0.13	$6.38
TOTAL EXPENSE	$37,280.89	$2.63	$161.11	$34,919.47	$3.51	$169.51
NET RETURN TO MANAGEMENT	($3,048.20)	($0.22)	($13.17)	($1,433.41)	($0.14)	($6.96)
NET RETURN TO LABOR-MGT	$1,876.47	$0.13	$8.11	$3,008.17	$0.30	$14.60

*Interest charge equals: ((8.0% times three-fourths the variable costs) plus (4.0% times depreciation times 8)) minus cash interest paid.

**Land charge represents a charge (equal to landlord's share) on owned land and equals (production from owned acres X price / unit X 33.33%). Crop production paid to the landlord on rented land (already removed above), or cash rent is the charge on rented land.

This crop enterprise is based on the operator's share of production, and thus includes only production expenses paid by the operator. A charge for management is not included in the expenses.

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7.5 Alfalfa Cost-Return Budget[17]

Table 18. Cost-return projections for alfalfa crops in the Pomona Lake Watershed, 2006.

Alfalfa	Yield Level (ton)		
	3.0	3.5	4.0
Income Per Acre			
A. Yield per acre	3.0	3.5	4.0
B. Price per bushel	$101.00	$101.00	$101.00
C. Net government payment	$12.30	$13.37	$14.44
D. Indemnity payments			
E. Miscellaneous income			
F. Returns/acre ((AxB)+C+D+E)	$315.30	$366.87	$418.44
Costs Per Acre			
1. Seed	$10.17	$10.17	$10.17
2. Herbicide	2.51	2.51	2.51
3. Insecticide/Fungicide	7.08	7.08	7.08
4. Fertilizer and Lime	19.90	26.89	33.88
5. Crop Consulting			
6. Crop Insurance			
7. Drying			
8. Miscellaneous	6.38	6.38	6.38
9. Custom Hire / Machinery Expense	109.42	118.08	126.61
10. Non-machinery Labor	12.36	13.34	14.31
11. Irrigation			
12. Land Charge/Rent	31.60	39.50	47.40
G. Sub Total	$199.43	$223.96	$248.34
13. Interest on ½ Nonland Costs	7.55	8.30	9.04
H. Total Costs	$206.98	$232.26	$257.38
I. Returns Over Costs (F-H)	**$108.32**	**$134.61**	**$161.06**
J. Total Costs/bushel (H/A)	$68.99	$66.36	$64.35
K. Return To Annual Cost (I+13)/G	58.10%	63.81%	68.50%

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Table 19. Southeast Kansas Farm Management Association profit Center Analysis: 5-year Average and 2006 Nonirrigated Alfalfa.[26]

	2001-2005 Average	2006
Number of Farms	13	10
Crop Acres	141	158
Acres Owned	31	10
Acres Rented	110	148
Yield / Acre	3.3	2.4
Tons	400	317
Operator Percentage	84.86%	83.95%
Gross Income / Acre	$233.47	$246.44
Variable Costs / Acre	$157.84	$169.51
Total Expense / Acre	$227.09	$226.92
Gross Income / Ton	$82.37	$122.83
Total Expense / Ton	$80.12	$113.10

	Total Dollars	$/Ton	$/Acre	Total Dollars	$/Ton	$/Acre
INCOME:						
Alfalfa (Operator's Share)	$30,456.04	$76.10	$215.69	$36,468.80	$115.04	$230.82
Patronage Refunds	$146.31	0.37	1.04	$81.22	0.26	0.51
Government Payments	$2,240.67	5.60	15.87	$2,558.32	8.07	16.19
Miscellaneous Income	$122.68	0.31	0.87	($171.53)	(0.54)	(1.09)
OTHER INCOME	$2,509.66	$6.27	$17.77	$2,468.01	$7.79	$15.62
GROSS INCOME	$32,965.70	$82.37	$233.47	$38,936.81	$122.83	$246.44
EXPENSES:						
Labor Hired	$1,925.16	$4.81	$13.63	$2,961.95	$9.34	$18.75
General Machinery Repairs	$2,912.30	7.28	20.63	$2,898.55	9.14	18.35
Interest Paid	$2,045.40	5.11	14.49	$2,090.90	6.60	13.23
Seed / Other Crop Expense	$1,719.19	4.30	12.18	$2,812.50	8.87	17.80
Crop Insurance	$371.29	0.93	2.63	$60.00	0.19	0.38
Fertilizer / Lime	$2,595.20	6.48	18.38	$2,223.55	7.01	14.07
Machine Hire - Lease	$3,509.54	8.77	24.86	$4,540.56	14.32	28.74
Farm Org Fees / Travel / Publ	$639.87	1.60	4.53	$306.15	0.97	1.94
Gas / Fuel / Oil	$1,209.12	3.02	8.56	$1,786.21	5.63	11.31
Crop Storage & Marketing	$180.84	0.45	1.28	$147.76	0.47	0.94
Personal Property Tax	$185.47	0.46	1.31	$187.51	0.59	1.19
General Farm Insurance	$539.39	1.35	3.82	$825.63	2.60	5.23
Utilities	$796.46	1.99	5.64	$204.08	0.64	1.29
Cash Farm Rent	$1,851.47	4.63	13.11	$3,112.89	9.82	19.70
Herbicide / Insecticide	$1,683.03	4.21	11.92	$2,497.13	7.88	15.80
Conservation	$24.43	0.06	0.17	$0.13	0.00	0.00
Auto Expense	$99.50	0.25	0.70	$126.75	0.40	0.80
TOTAL VARIABLE COSTS	$22,287.65	$55.69	$157.84	$26,782.25	$84.49	$169.51
RETURN ABOVE VARIABLE COSTS	$10,678.05	$26.68	$75.62	$12,154.56	$38.34	$76.93
Depreciation	$3,138.56	7.84	22.23	$4,010.39	12.65	25.38
Real Estate Tax	$373.53	0.93	2.65	$279.01	0.88	1.77
Unpaid Operator Labor	$3,236.12	8.09	22.92	$2,916.00	9.20	18.46
Interest Charge *	$314.16	0.79	2.22	$687.45	2.17	4.35
TOTAL FIXED COSTS	$7,062.36	$17.65	$50.02	$7,892.85	$24.90	$49.95
Land Charge **	$2,715.60	$6.79	$19.23	$1,178.81	$3.72	$7.46
TOTAL EXPENSE	$32,065.61	$80.12	$227.09	$35,853.91	$113.10	$226.92
NET RETURN TO MANAGEMENT	$900.09	$2.25	$6.37	$3,082.90	$9.73	$19.51
NET RETURN TO LABOR-MGT	$6,061.36	$15.15	$42.93	$8,960.85	$28.27	$56.71

*Interest charge equals: ((8.0% times three-fourths the variable costs) plus (4.0% times depreciation times 8)) minus cash interest paid.

**Land charge represents a charge (equal to landlord's share) on owned land and equals (production from owned acres X price / unit X 33.33%). Crop production paid to the landlord on rented land (already removed above), or cash rent is the charge on rented land.

This crop enterprise is based on the operator's share of production, and thus includes only production expenses paid by the operator. A charge for management is not included in the expenses.

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7.6 Common Cropland BMPs in Pomona Lake Watershed

BMPs help reduce the amount of soil and nutrients that run off of cropland fields. Keeping these valuable inputs (soil and nutrients) in the field can be of benefit to both the landowner/producer and to society as a whole. Here are just a couple of the benefits:

1. Top soil savings can result in higher yields and lower fertilizer costs.
2. Certain BMPs can offer both water quality protection and wildlife habitat.

Below are some of the more popular BMPs in use throughout the state of Kansas and in the Pomona Lake Watershed.

Contour farming[24] is farming the land, tillage and planting of the crop, on the level around the hill. By doing this, each furrow or ridge left by the different implements acts as a miniature dam, trapping water, allowing more to soak into the ground. Each row of crop also slows the water. Combined, less water runs off. Soil is erosion reduced. Crop yields are increased in arid areas.

Grassed waterways[25] are used as outlets to prevent silt and gully formation. The vegetation cover slows the water flow and minimizes channel surface erosion. They can also be used as outlets for water from terraces.

Vegetative buffers[25] are areas of land that are maintained in permanent vegetation to help reduce nutrient and sediment loss from agricultural fields, improve runoff water quality, and provide habitat for wildlife. Because of these societal benefits, there are several federal and state programs that encourage the installation and maintenance of vegetative buffers.

No-till[25] is a form of conservation tillage in which chemicals are used in place of tillage for weed control and seedbed preparation. In other words, the soil surface is never disturbed except for planting or drilling operations in a 100 percent no-till system. Two other forms of tillage, **reduced tillage** and **rotational no-till**, involve a light to moderate use of tillage equipment. These forms of tillage also control erosion and nutrient runoff, but are not as effective as 100 percent no-till.

Terraces[25] are embankments constructed perpendicular to the slope of the field and are designed to reduce the length of a field slope and catch water flowing off the slope. Terraces reduce the rate of runoff and allow soil particles to settle out.

Streambank stabilization[25] projects can reduce the amount of streambank erosion and help prevent the loss of valuable cropland. Stabilization techniques reduce streambank erosion through diverting and/or slowing the movement of water in a stream channel. Some methods that can be employed include bendway-weirs, stone toes, pools and riffles, stream barbs, and willow post plantings.

The following pages contain typical BMP budgets and economic analyses for vegetative buffers and streambank stabilization projects in the Pomona Lake Watershed. These reports were generated using the KSU-Vegetative Buffer and KSU-Streambank Stabilization Decision-Making Tools[27].

This file is for historical purposes only and may not reflect current practices. For current recommendations, contact K-State Research and Extension.

7.6.1 Vegetative Buffer: Economic Analysis

Your project area is located in Osage County, Kansas. Your project area (buffer size) is 1.0 acres.

The results are based upon the following assumptions:

One time Costs:	**$187.28**	*One time Cost-Share Payments:*	**$268.55**	*Time Period Selected:*	**10 years**
Annual Costs:	**$6.67**	*Annual Incentive Payments:*	**$102.15**	*Opportunity Cost of Your Money:*	**5.00%**

The first year out-of-pocket costs of the vegetative buffer would be **$0.00** *this accounts for any cost-share payments you may receive.*

Based on the information you have provided, a vegetative buffer on the project area would **return** **$104.79** per acre annually.

Based on the information you have provided, a vegetative buffer on the project area would **return** **$104.79** annually.

Based on the information you have provided, cropland on the project area would return **$57.98** per acre annually.

Based on the information you have provided, cropland on the project area would return **$57.98** annually.

Take Home Message:

You would be **$46.81** per year **better off** installing this area to a vegetative buffer versus using it for crop production.

Discussion

In order to effectively compare scenarios which occur over multiple years (10 to 15 years), we must convert all costs and returns to today's dollars (e.g., 2008 dollars).

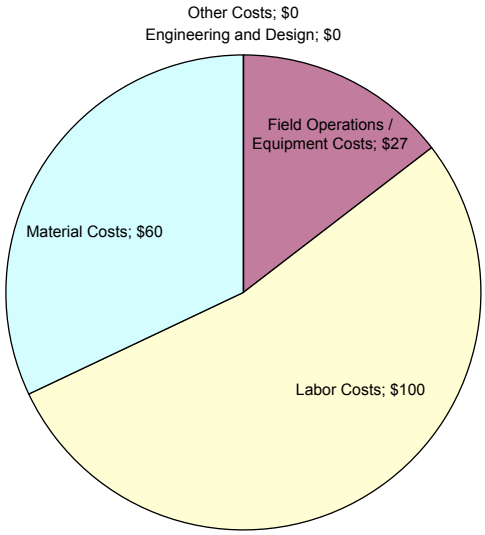
Net Present Value calculations convert future values into today's dollars. The net present value analysis uses a discount factor to equate a series of future cash flows into an equivalent amount of cash today. For example, if you are considering enrolling land into a 15 year Continuous Conservation Reserve Program (CRP) program, the projected net income in years 2 through 15 is discounted back to its equivalent value in today's dollars. Because a dollar today can earn interest until next year, it will be valued more highly than a dollar received in the future

For more information regarding the economics of vegetative buffers, check out K-State Research and Extension publication MF-2536 *"Using Conservation Buffers to Protect Water Quality and Enhance Agricultural Profitability." http://www.oznet.ksu.edu/library/h20ql2/mf2536.pdf*

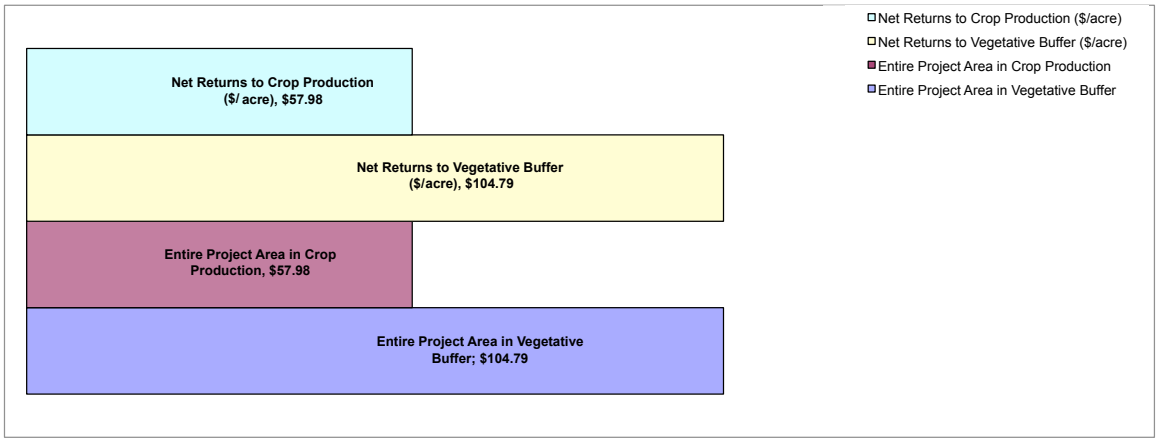
For vegetative buffer assistance, be sure to contact your local county conservation district. A Kansas Conservation District Directory can be found at: *http://scc.ks.gov/index.php?option=com_content&task=view&id=779&Itemid=178*

If you have any questions regarding this decision-making tool, please contact:
Craig Smith
Ph.D. Graduate Student
Kansas State University
craigsmith@agecon.ksu.edu

One Time Costs of the Vegetative Buffer



Annual Net Returns to the Project Area



Annual net returns

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Budget information for the vegetative buffer project

General Data For Vegetative Buffer		
Discount Rate	5.00%	
Cropland Rental Rate - not CCRP rental rate	$51.03	per acre/year
Annual Cropland Rental Growth Rate	3.07%	
Total Annual Costs	$6.67	per acre/year
Inflation Rate of Annual Costs	4.00%	
Project Length (feet)	660	
Project Width (feet)	66	
Acres (length x width/43,560)	1.00	
Length of analysis (years)	10	
Cropland Property Tax ($/acre)	$5.00	
Tame Grass Property Tax ($/acre)	$5.00	

Costs			Payments Received	
Total one-time	**$187.28**		Total one-time	**$268.55**
Total annual	**$6.67**		Total annual	**$102.15**

Net Present Value Table: Vegetative Buffer (per acre)					
Year	**One Time Costs**	**Annual Costs**	**One Time Payments**	**Annual Payments**	**Net Property Tax Impact**
0	$187.28	$0.00	$268.55	$0.00	$0.00
1	$0.00	$6.67	$0.00	$102.15	$0.00
2	$0.00	$6.94	$0.00	$102.15	$0.00
3	$0.00	$7.21	$0.00	$102.15	$0.00
4	$0.00	$7.50	$0.00	$102.15	$0.00
5	$0.00	$7.80	$0.00	$102.15	$0.00
6	$0.00	$8.12	$0.00	$102.15	$0.00
7	$0.00	$8.44	$0.00	$102.15	$0.00
8	$0.00	$8.78	$0.00	$102.15	$0.00
9	$0.00	$9.13	$0.00	$102.15	$0.00
10	$0.00	$9.49	$0.00	$102.15	$0.00
11	$0.00	-	$0.00	-	$0.00
12	$0.00	-	$0.00	-	$0.00
13	$0.00	-	$0.00	-	$0.00
14	$0.00	-	$0.00	-	$0.00
15	$0.00	-	$0.00	-	$0.00
Sum totals	$187.28	$80.08	$268.55	$1,021.46	$0.00
Present Value	$187.28	$60.87	$268.55	$788.75	$0.00
Net Present Value	**$809.15**				
Annualized Value	**$104.79**				

NPV Table: Cropland Rent (per acre)	
Year	**Rent**
0	$0.00
1	$51.03
2	$52.60
3	$54.21
4	$55.88
5	$57.59
6	$59.36
7	$61.18
8	$63.06
9	$65.00
10	$66.99
11	-
12	-
13	-
14	-
15	-
Sum totals	$586.89
Present Value	$447.71
Net Present Value	**$447.71**
Annualized Value	**$57.98**

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Net Present Value Table: Vegetative Buffer (total project area)					
Year	**One Time Costs**	**Annual Costs**	**One Time Payments**	**Annual Payments**	**Net Property Tax Impact**
0	$187.28	$0.00	$268.55	**$0.00**	$0.00
1	$0.00	$6.67	$0.00	**$102.15**	$0.00
2	$0.00	$6.94	$0.00	$102.15	$0.00
3	$0.00	$7.21	$0.00	$102.15	$0.00
4	$0.00	$7.50	$0.00	$102.15	$0.00
5	$0.00	$7.80	$0.00	$102.15	$0.00
6	$0.00	$8.12	$0.00	$102.15	$0.00
7	$0.00	$8.44	$0.00	$102.15	$0.00
8	$0.00	$8.78	$0.00	$102.15	$0.00
9	$0.00	$9.13	$0.00	$102.15	$0.00
10	$0.00	$9.49	$0.00	$102.15	$0.00
11	$0.00	-	$0.00	-	$0.00
12	$0.00	-	$0.00	-	$0.00
13	$0.00	-	$0.00	-	$0.00
14	$0.00	-	$0.00	-	$0.00
15	$0.00	-	$0.00	-	$0.00
Sum totals	$187.28	$80.08	$268.55	$1,021.46	$0.00
Present Value	$187.28	$60.87	$268.55	$788.75	$0.00
Net Present Value	**$809.15**				
Annualized Value	**$104.79**				

NPV Table: Cropland Rental Rate (total project area)	
Year	**Rent**
0	$0.00
1	$51.03
2	$52.60
3	$54.21
4	$55.88
5	$57.59
6	$59.36
7	$61.18
8	$63.06
9	$65.00
10	$66.99
11	-
12	-
13	-
14	-
15	-
Sum totals	$586.89
Present Value	$447.71
Net Present Value	**$447.71**
Annualized Value	**$57.98**

This file is for historical purposes only and may not reflect current practices. For current recommendations, contact K-State Research and Extension.

7.6.2 Streambank Stabilization: Economic Analysis

Your project area is located in Osage County, Kansas on a 80 acre field. Your project area is: 4.55 acres in size.

The results are based upon the following assumptions:

One time Costs:	**$18,495.60**	One time Cost-Share Payments:	**$9,702.30**	Time Period Selected:	**10 years**
Annual Costs:	**$30.32**	Annual Incentive Payments:	**$464.30**	Opportunity Cost of Your Money:	**5.00%**

The first year out-of-pocket costs of the streambank project would be **$8,793.30.** *This accounts for any cost-share payments you may receive.*

Based on the information you have provided, a streambank stabilization project could potentially save **2.00** acres annually.

Take Home Message:

If you consider the asset value of the land that is preserved by the streambank stabilization project, then the take-home message is:

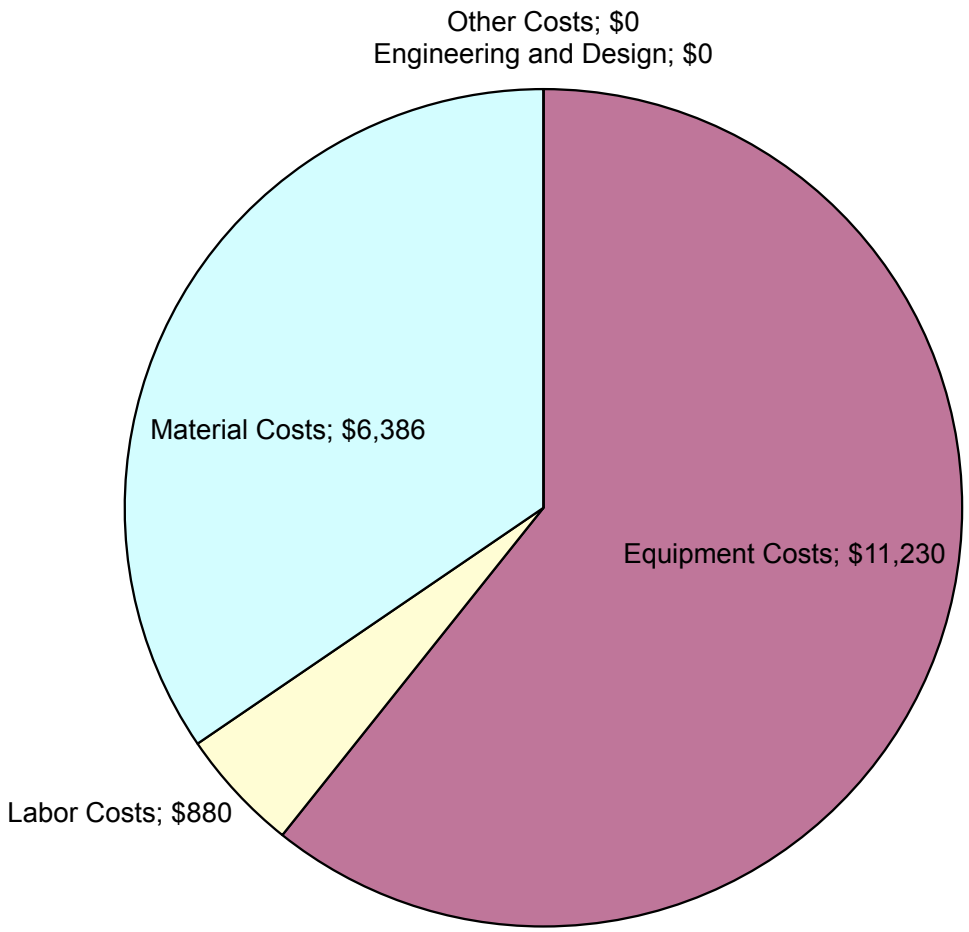
You would be	**$2,371.73**	per year	**better off**	by stabilizing this streambank versus doing nothing.
A streambank project would	**return**	**$18,313.88**		in total over the 10 year time period you have selected.

If you DO NOT consider the asset value of the land that is preserved by the streambank stabilization project, then the take-home message is:

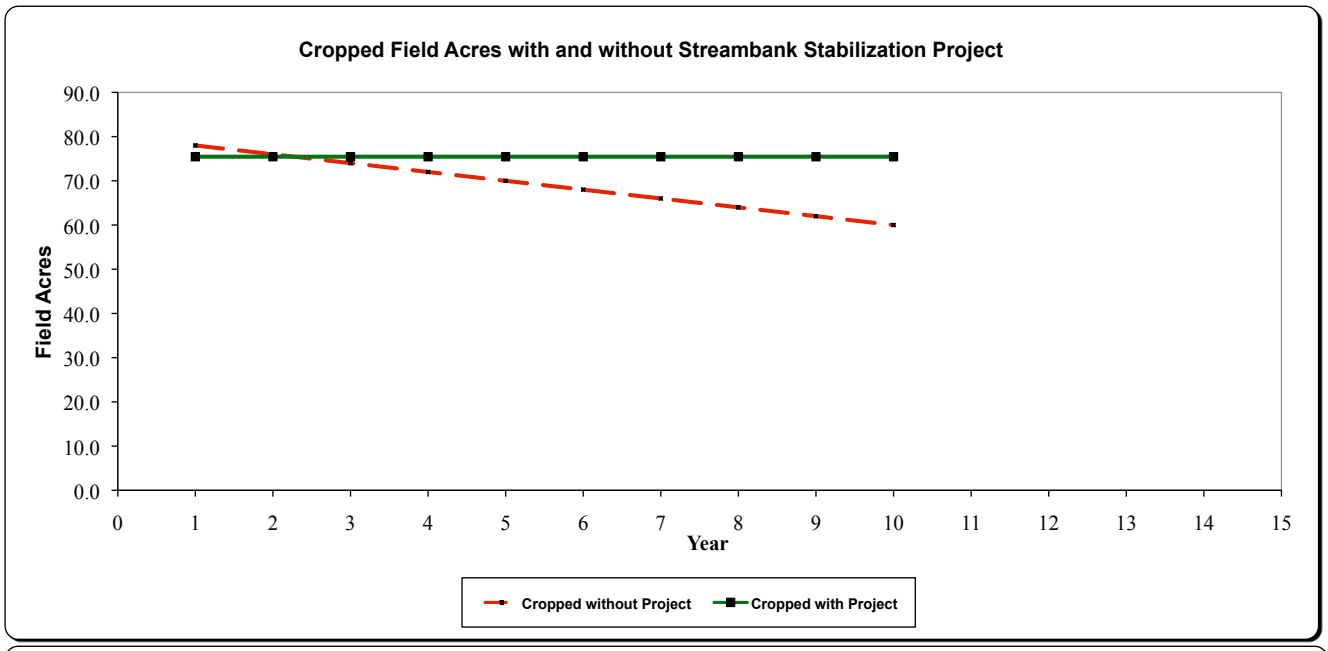
You would be	**($473.49)**	per year	**worse off**	by stabilizing this streambank versus doing nothing.
A streambank project would	**lose**	**($3,656.18)**		in total over the 10 year time period you have selected.

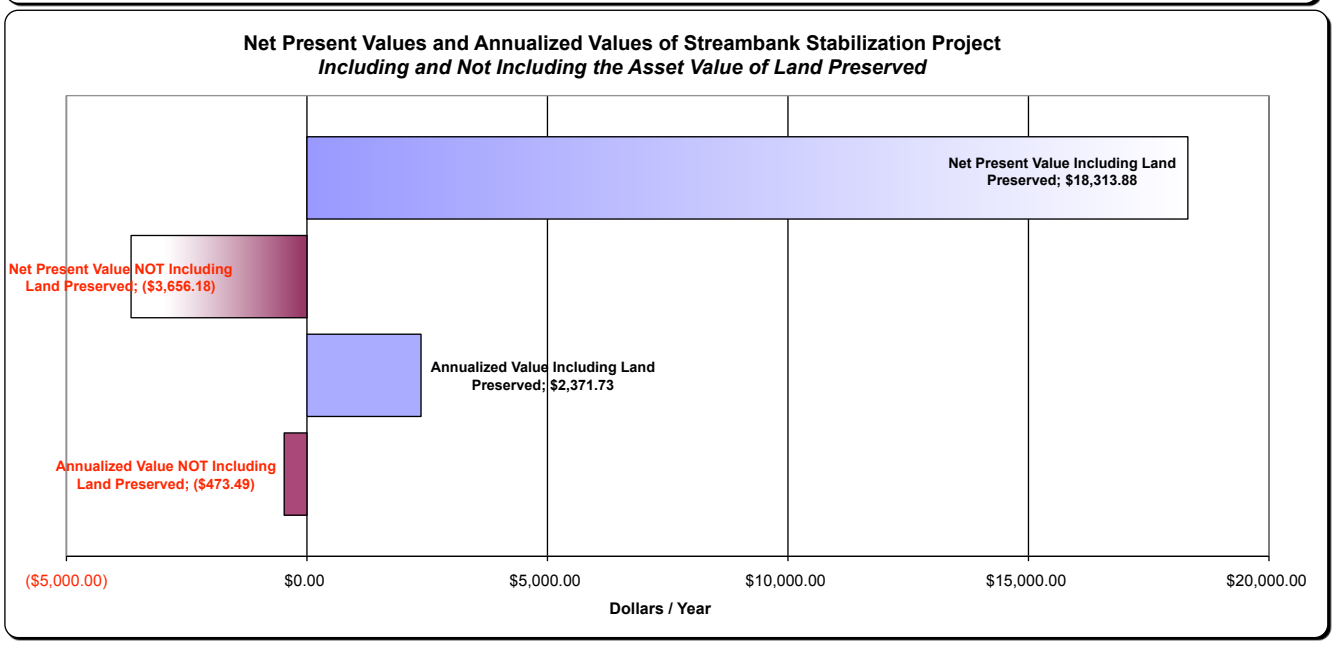
The asset value of the land that is preserved by the project is a real value that should probably be considered in your decision-making. It is, however, a value that would not be realized as cash until the property is sold.

One Time Costs of the Streambank Stabilization Project



This file is for historical purposes only and may not reflect current practices. For current recommendations, contact K-State Research and Extension.





Discussion

In general, the **benefits** of a streambank stabilization project come in the form of: value of acres not lost to erosion, income from being able to crop the preserved acres not in CCRP acres, cost-share and incentive payments, and tax breaks from the reclassification of ag land.

The **costs** of a streambank stabilization project come in the form of: one time installation costs, annual maintenance costs, and the initial loss of cropping income from cropland being taken out of production and enrolled into CCRP.

In order to effectively compare scenarios which occur over multiple years (10 to 15 years), we must convert all costs and returns to today's dollars (e.g., 2008 dollars).

Net Present Value calculations convert future values into today's dollars. The net present value analysis uses a discount factor to equate a series of future cash flows into an equivalent amount of cash today. For example, if you are considering enrolling land into a 15 year Continuous Conservation Reserve Program (CRP) program, the projected net income in years 2 through 15 is discounted back to its equivalent value in today's dollars. Because a dollar today can earn interest until next year, it will be valued more highly than a dollar received in the future

For streambank stabilization assistance, be sure to contact your local county conservation district. A Kansas Conservation District Directory can be found at: *http://scc.ks.gov/index.php?option=com_content&task=view&id=779&Itemid=178*

If you have any questions regarding this Decision-Making Tool, please contact:
Craig Smith
Ph.D. Graduate Student Kansas State University
craigsmith@agecon.ksu.edu

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Budget information for the streambank stabilization project

General Data For Streambank Stabilization		
Discount Rate	5.00%	
Cropland Value	$1,170.00	per acre
Annual Cropland Value Growth Rate	4.34%	
Cropland Rental Rate - not CCRP rental rate	$51.03	per acre / year
Annual Cropland Rental Growth Rate	3.07%	
Total Annual Costs	$6.67	per acre / year
Inflation Rate of Annual Costs	4.00%	

Project Length (feet)						**1,980**
Project Width (feet)						**100**
Acres (length x width/43,560)						**4.55**
Estimated acreage lost over time period						**20.00**
Value of estimated acreage lost	20	acres	@	$1,170.00	per acre	**$23,400.00**
Estimated average annual acreage lost over period of	10	yr.				**2.00**
Estimated acreage preserved over	10	yr.				**20.00**
Value of estimated acres preserved	20.00	acres	@	$1,789.35	per acre	**$35,786.91**
Cropland Property Tax ($/acre)						**$9.88**
Tame Grass Property Tax ($/acre)						**$9.88**

Costs		**Payments**	
Total one-time	**$18,495.60**	Total one-time	**$9,702.30**
Total annual	**$30.32**	Total annual	**$464.30**

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Land Effects

									With Project			Without Project					
Year	Net Acres for Income	Rental Rate $/Ac	Rental Rate Effect	Total Acres Preserved	Land Value $/Ac	Total Additional Value	Property Tax Cropland $/Ac	Property Tax Tame Grass $/Ac	CCRP Acres	Crop Acres	Property Tax	Crop Acres	Property Tax	Net Property Tax Impact	CCRP Acres	Net Cropland Preserved	Total Saved
0	(4.55)	$51.03	($231.95)	-	$1,170.00		$9.88	$9.88	4.55	15.45	$197.60	20.00	$197.60	$0.00	4.55	-	4.55
1	(2.55)	$52.60	($133.88)	2.00	$1,220.78	$0.00	$10.18	$10.18	4.55	15.45	$203.67	20.00	$203.67	$0.00	4.55	-	4.55
2	(0.55)	$54.21	($29.57)	4.00	$1,273.76	$0.00	$10.50	$10.50	4.55	15.45	$209.92	18.00	$188.93	$20.99	4.55	-	4.55
3	1.45	$55.88	$81.27	6.00	$1,329.04	$0.00	$10.82	$10.82	4.55	15.45	$216.36	16.00	$173.09	$43.27	4.55	1.45	6.00
4	3.45	$57.59	$198.95	8.00	$1,386.72	$0.00	$11.15	$11.15	4.55	15.45	$223.01	14.00	$156.10	$66.90	4.55	3.45	8.00
5	5.45	$59.36	$323.78	10.00	$1,446.91	$0.00	$11.49	$11.49	4.55	15.45	$229.85	12.00	$137.91	$91.94	4.55	5.45	10.00
6	7.45	$61.18	$456.08	12.00	$1,509.70	$0.00	$11.85	$11.85	4.55	15.45	$236.91	10.00	$118.45	$118.45	4.55	7.45	12.00
7	9.45	$63.06	$596.20	14.00	$1,575.22	$0.00	$12.21	$12.21	4.55	15.45	$244.18	8.00	$97.67	$146.51	4.55	9.45	14.00
8	11.45	$65.00	$744.49	16.00	$1,643.59	$0.00	$12.58	$12.58	4.55	15.45	$251.68	6.00	$75.50	$176.17	4.55	11.45	16.00
9	13.45	$66.99	$901.33	18.00	$1,714.92	$0.00	$12.97	$12.97	4.55	15.45	$259.40	4.00	$51.88	$207.52	4.55	13.45	18.00
10	15.45	$69.05	$1,067.10	20.00	$1,789.35	$35,786.91	$13.37	$13.37	4.55	15.45	$267.37	2.00	$26.74	$240.63	4.55	15.45	20.00
11	-	-	-	-	-	$0.00	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	$0.00	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	$0.00	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	$0.00	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	$0.00	-	-	-	-	-	-	-	-	-	-	-

This file is for historical purposes only and may not reflect current practices. For current recommendations, contact K-State Research and Extension.

7.8 Census Data[18]

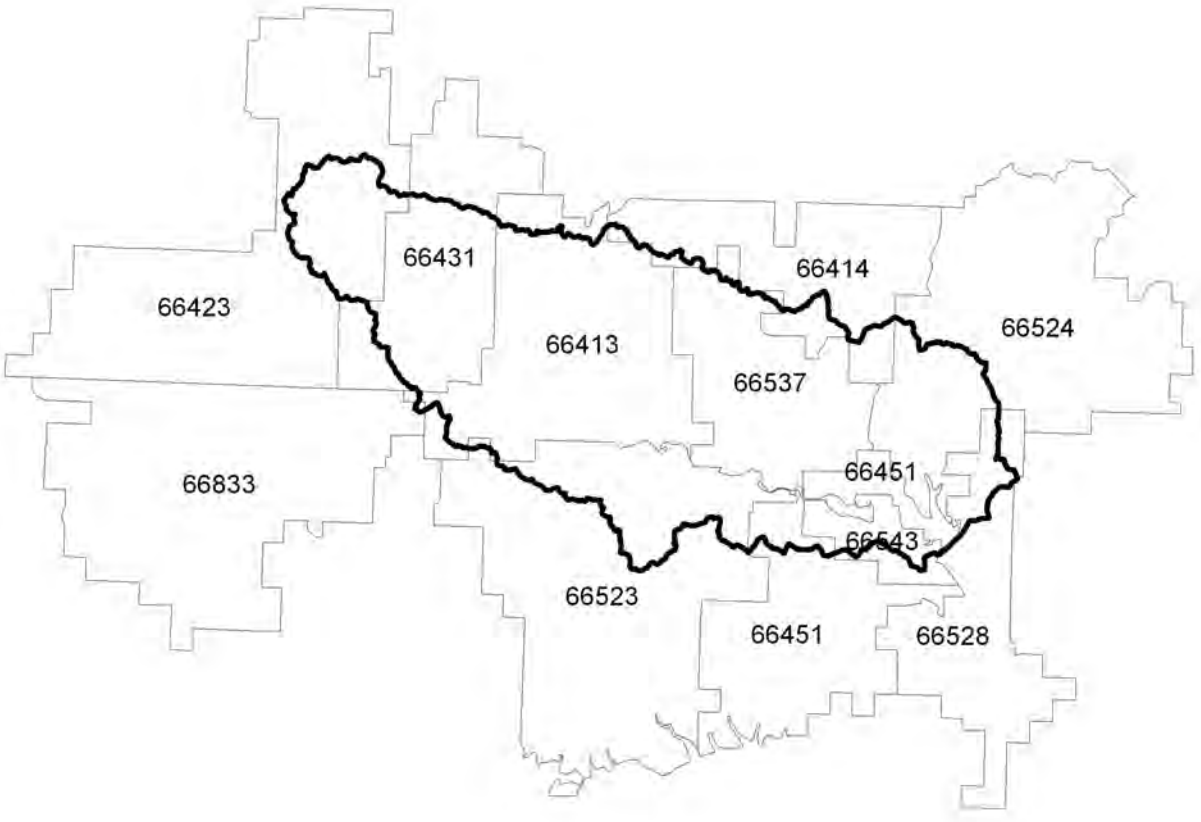

Figure 17. Zip Code Boundary Map.

This file is for historical purposes only and may not reflect current practices. For current recommendations, contact K-State Research and Extension.

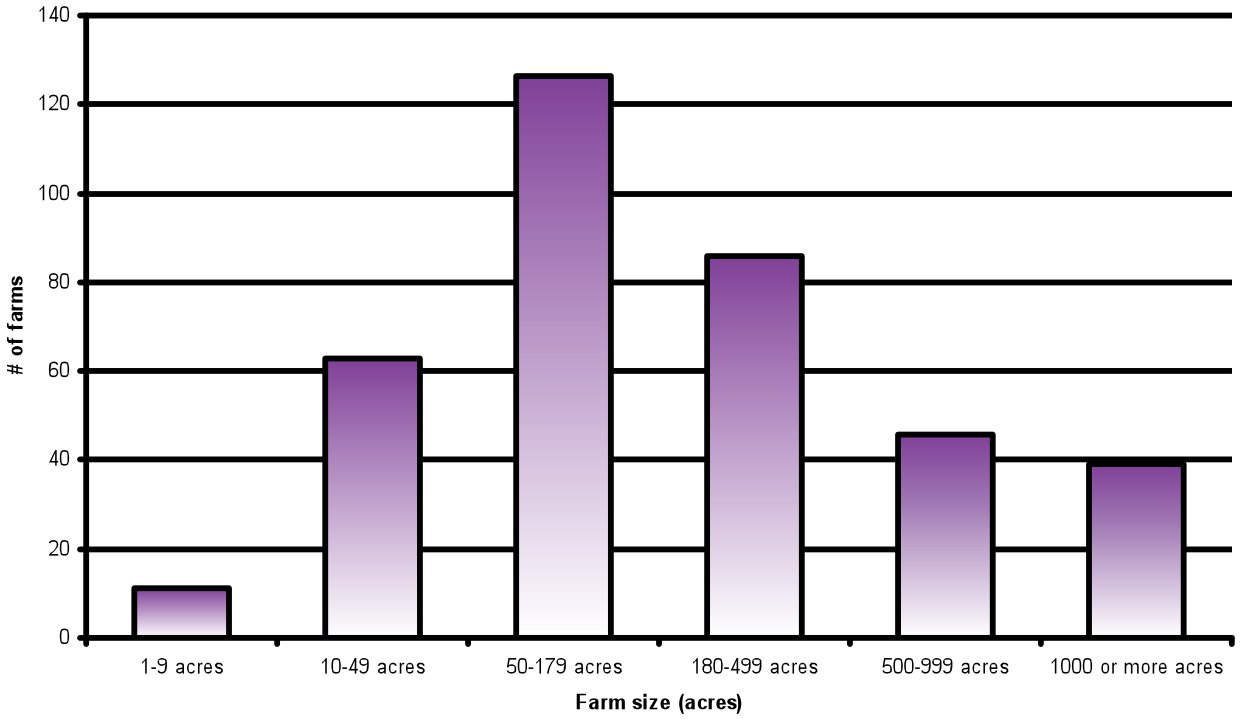

Figure 18. Size Distribution of Farms in Pomona Lake Watershed, 2002[18]

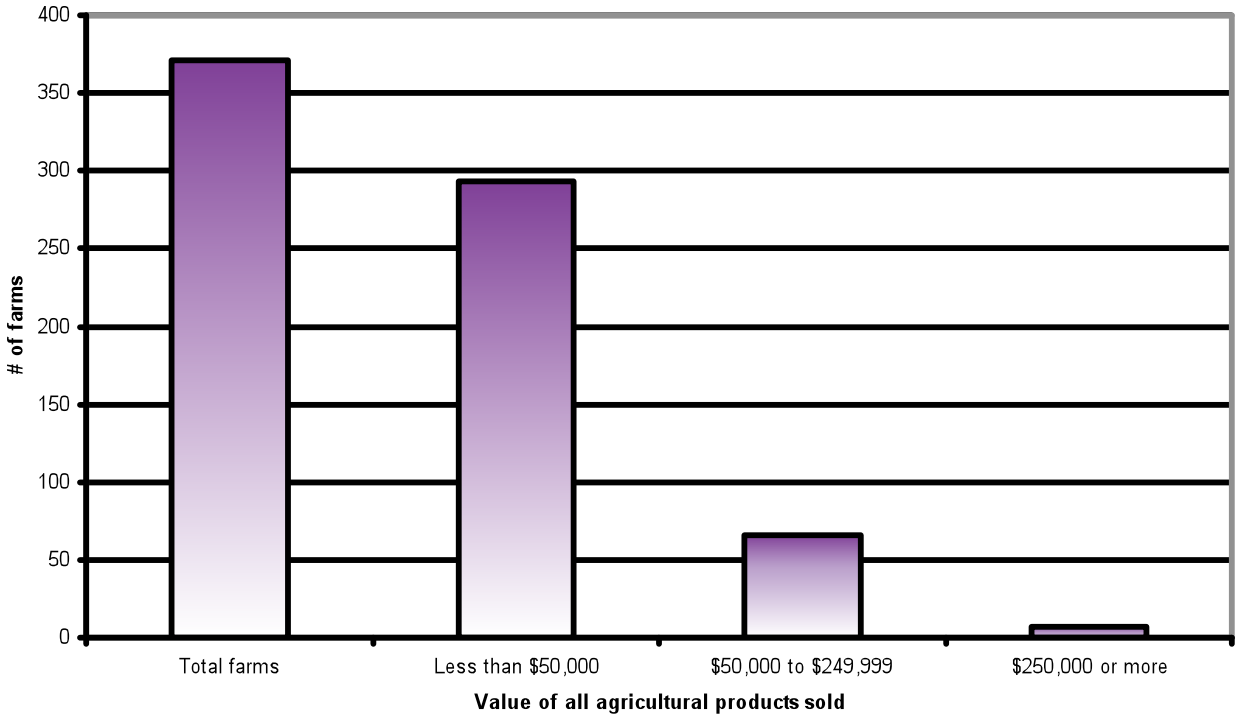

Figure 19. Sales Distribution of Farms in Pomona Lake Watershed, 2002[18]

This file is for historical purposes only and may not reflect current practices. For current recommendations, contact K-State Research and Extension.

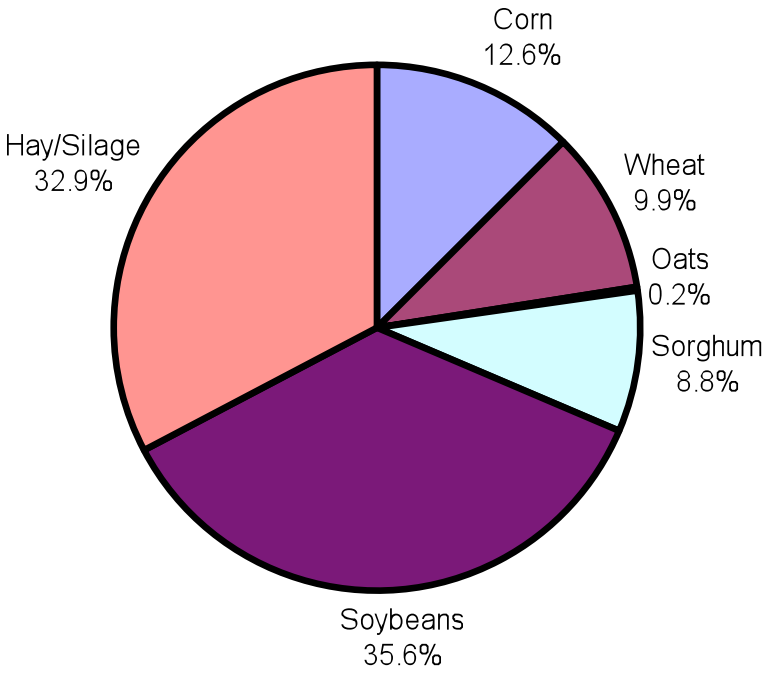

Figure 20. Harvested Crop Acreage in Pomona Lake Watershed, 2002[18]

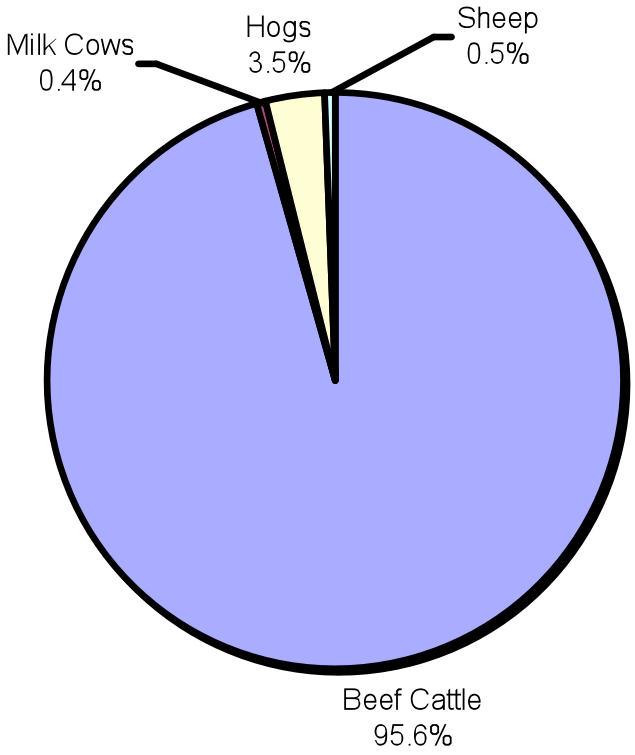

Figure 21. Livestock Number Distribution in Pomona Lake Watershed, 2002[18]

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8.0 Modeling

8.1 Subbasin Map[19]

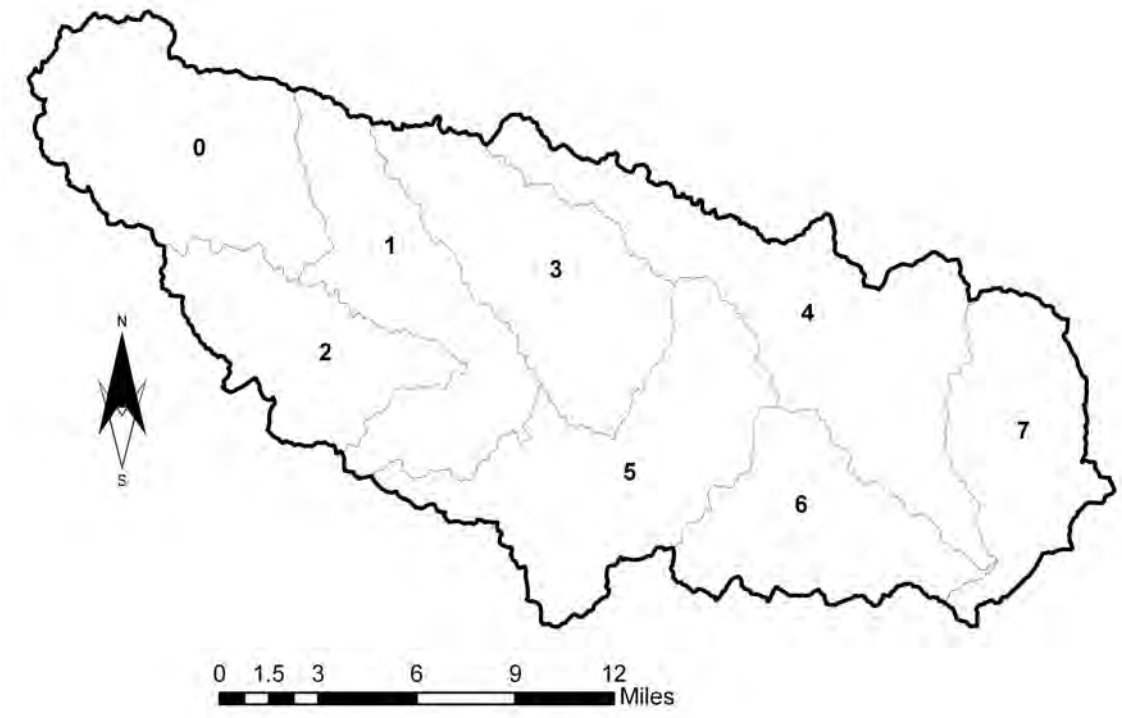

Figure 22. Subbasin Map – Lower Pomona Lake Watershed.

Table 20. Pomona Lake Watershed Subbasin Area

Subbasin	State	HUC ID	Area (acres)
0	KS	10290101030010	28894
1	KS	10290101030030	24710
2	KS	10290101030020	26152
3	KS	10290101030040	36777
4	KS	10290101030070	18568
5	KS	10290101030050	31344
6	KS	10290101030060	19802
7	KS	10290101030080	20323
Total			**206570**

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8.2 Input Data

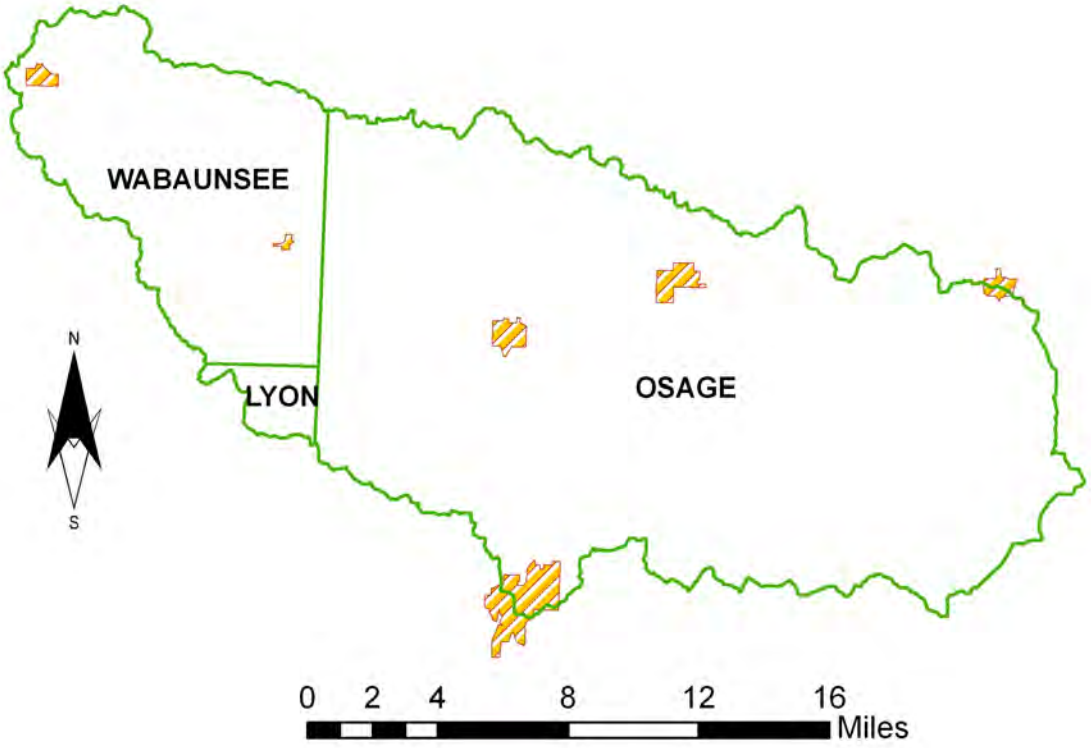

Figure 23. County Map – Pomona Lake Watershed.

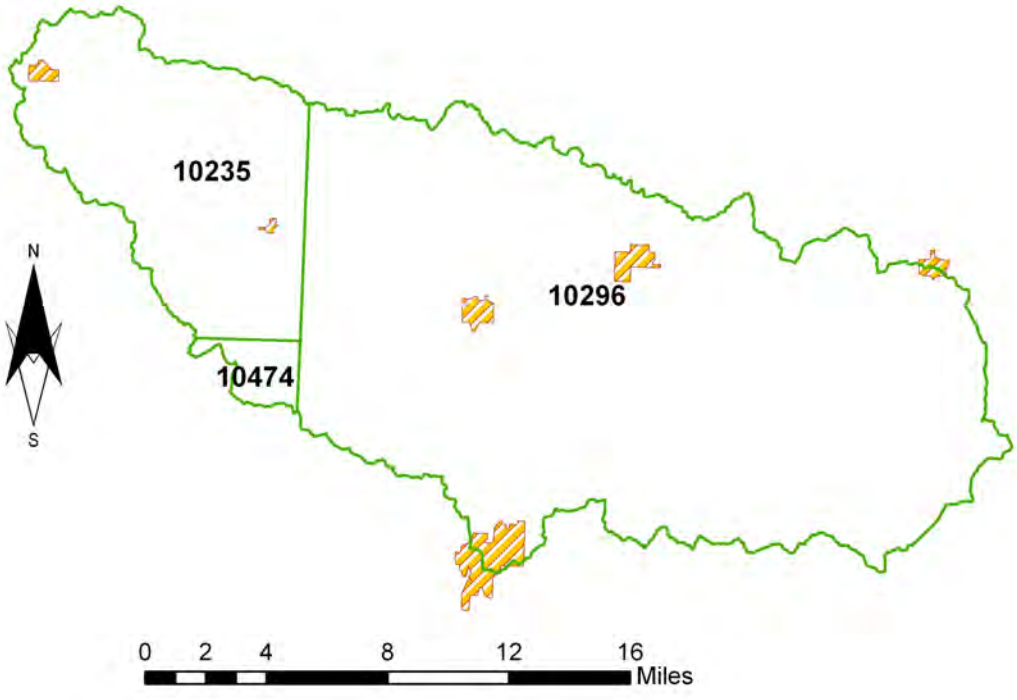

Figure 24. HUCO Map (overlay of county and 8-digit hydrologic unit boundary) – Pomona Lake Watershed[23]

This file is for historical purposes only and may not reflect current practices. For current recommendations, contact K-State Research and Extension.

Table 21. Pomona Lake Watershed Summary[23]

Polygon ID	County Name	State	HUC	Area (acre)
10235	Wabaunsee	KS	10290101	41847
10296	Osage	KS	10290101	160883
10474	Lyon	KS	10290101	3754

Table 22. Landuse Area (acre)[20, 28]

Polygon ID	Urban/ Transportation	Cropland	Pasture/ Rangeland	Forest	Feedlots	Water	Others
10235	704	11790	13007	4115	0.07	108	12123
10296	1400	62500	84500	6000	3.62	5000	1478
10474	68	1320	1944	85	0.09	33	304

Table 23. Agricultural Animals[18]

Polygon ID	Beef Cattle	Dairy Cattle	Swine (Hog)	Sheep	Horse	Chicken	Turkey	Duck
Pomona Lake	14489	52	200	2300	1000	0	0	0

D = data withheld to avoid disclosing information for individual farms

Table 24. Septic System[21, 28]

Polygon ID	No. of Septic Systems	Population per Septic System	Septic Failure Rate, %
10235	82	3	1.8
10296	1500	3	13
10474	13	2.49	0.93

Table 25. Hydrological Soil Group[22]

Polygon ID	Hydrological Group
10235	B
10296	C
10474	C

A = well to excessively drained soil

B = moderately-well to well drained soil

C = poorly drained soil

D = very poorly drained soil

Table 26. Modify the Universal Soil Loss Equation (USLE) parameters[23, 28]

Polygon ID	Land Cover	R	K	LS	C	P
10235	Crop land	200	0.370	0.210	0.200	0.800
10296	Crop land	225	0.320	0.300	0.210	1.000
10474	Crop land	225	0.370	0,220	0.244	0.830
10235	Pasture Land	200	0.370	0.190	0.020	1.000
10296	Pasture Land	225	0.370	0.560	0.001	1.000
10474	Pasture Land	225	0.390	0.301	0.026	1.000
10235	Rangeland	200	0.370	0.190	0.020	1.000
10296	Rangeland	225	0.370	0.560	0.001	1.000
10474	Rangeland	225	0.360	0.464	0.015	1.000
10235	Forest	200	0.370	0.190	0.020	1.000
10296	Forest	225	0.280	0.100	0.001	1.000
10474	Forest	225	0.320	0.330	0.003	1.000

This file is for historical purposes only and may not reflect current practices. For current recommendations, contact K-State Research and Extension.

8.3 Model Outputs

Table 27. Total Load by Land Uses[23]

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	13637	1985	51755	307
Cropland	1351514	327364	2188826	21268
Pastureland	239112	18122	776353	191
Forest	3920	1931	9673	80
Feedlots	14263	2853	19018	0.00
Rangeland/Grassland	689067	52094	2237799	417
Septic	8044	3056	33547	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.00	0.00	0.00	0.00
Groundwater	0.00	0.00	0.00	0.00
Total	**2319558**	**407404**	**5316971**	**22263**

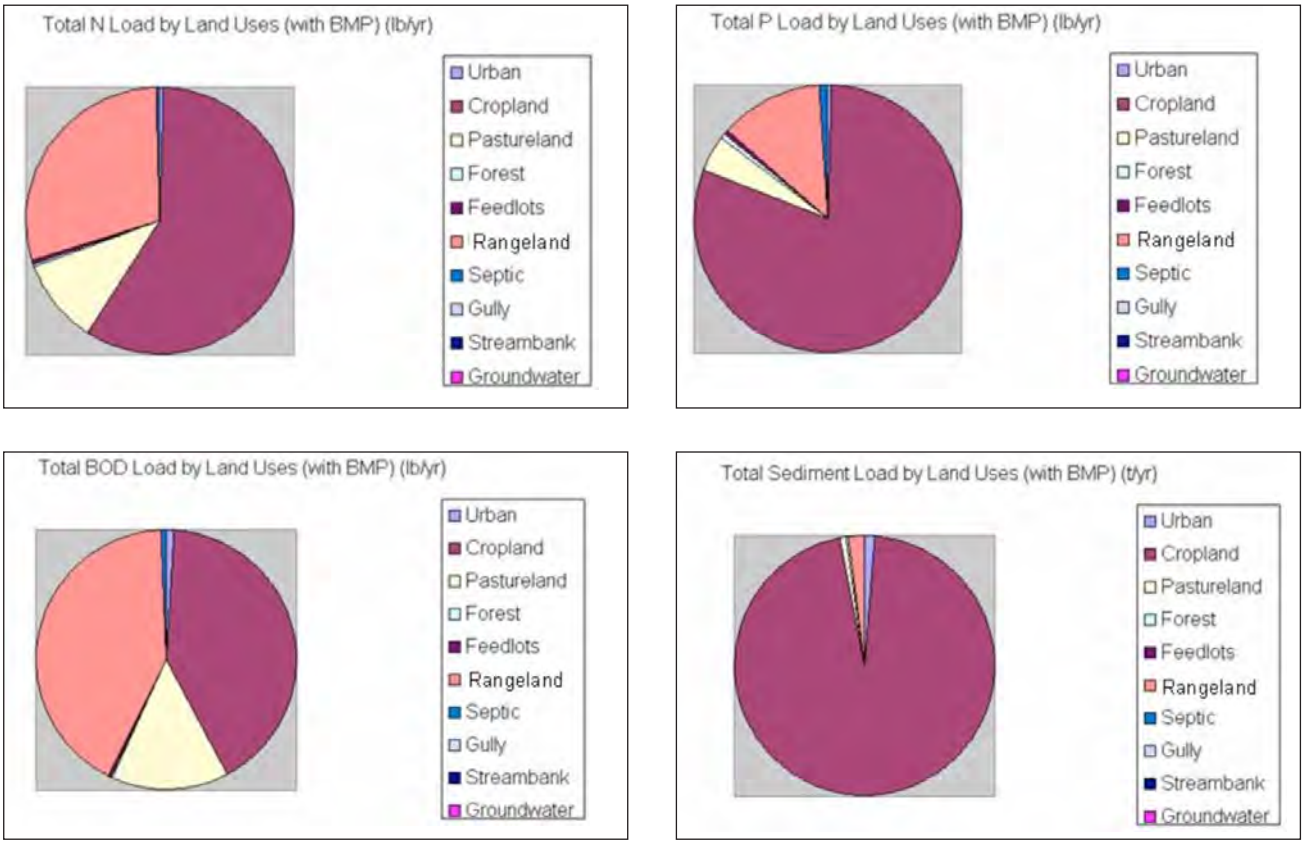

Figure 25. Total Load by Land Uses – Pomona Lake Watershed.

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9.0 Acknowledgment

The authors would like to acknowledge Dr. William Hargrove, Dr. Danny Rogers, Ms. Judy Willingham, and Mr. Don Snethen for their help and comments.

Funding for this project was provided in part by Kansas Water Plan Funds, and EPA 319 funds through Kansas Department of Health and Environment, Watershed Management Section.

10.0 Footnotes/Bibliography

1. *National Land Cover Database 2001 (NLCD 2001)*: "NLCD 2001 products include 21 classes of Land Cover, Percent Tree Canopy and Percent Urban Imperviousness at 30 m cell resolution."
Online reference information available at: *http://www.mrlc.gov/mrlc2k_nlcd.asp*

2. *Watershed Condition Report:* For the State of Kansas HUC 10290101 (Upper Marais des Cygnes River Watershed). Kansas Department of Health and Environment, Bureau of Water. Watershed Management Section, 1000 SW Jackson, Topeka, KS 66612. Online reference information available at: *http://www.kdheks.gov/nps/wc_reports/10290101.pdf*

3. *National Elevation Dataset*: "The USGS National Elevation Dataset (NED) has been developed by merging the highest-resolution, best quality elevation data available across the United States into a seamless raster format. NED is the result of the maturation of the USGS effort to provide 1:24,000-scale Digital Elevation Model (DEM) data for the conterminous US." Online reference information available at: *http://ned.usgs.gov/*

4. *Precipitation Map*: "Point estimates of precipitation originated from some or all of the following sources: 1) National Weather Service (NWS) Cooperative (COOP) stations, 2) Natural Resources Conservation Service (NRCS) SNOTEL, 3) United States Forest Service (USFS) and Bureau of Land Management (BLM) RAWS Stations, 4) Bureau of Reclamation (AGRIMET) stations, 5) California Data Exchange Center (CDEC) stations, 6) Storage gauges, 7) NRCS Snowcourse stations, 8) Other State and local station networks, 9) Estimated station data, 0) Canadian stations, 10) Upper air stations, and 11) NWS/Federal Aviation Administration (FAA) Automated surface observation stations (ASOS). All COOP station data were subjected to quality control checks by the National Climatic Data Center (NCDC). All COOP, SNOTEL and other data were subjected to further quality control checks by the PRISM Group."
Online reference information available at: h*ttp://prism.oregonstate.edu/docs/meta/ppt_30s_meta.htm#7*

5. *Maximum Temperature Map*: "Point estimates of temperature originated from some or all of the following sources: 1) National Weather Service (NWS) Cooperative (COOP) stations, 2) Natural Resources Conservation Service (NRCS) SNOTEL, 3) United States Forest Service (USFS) and Bureau of Land Management (BLM) RAWS Stations, 4) Bureau of Reclamation (AGRIMET) stations, 5) California Data Exchange Center (CDEC) stations, 6) Storage gauges, 7) NRCS Snowcourse stations, 8) Other State and local station networks, 9) Estimated station data, 0) Canadian stations, 10) Upper air stations, and 11) NWS/Federal Aviation Administration (FAA) Automated surface observation stations (ASOS). All COOP station data were subjected to quality control checks by the National Climatic Data Center (NCDC). All COOP, SNOTEL and other data were subjected to further quality control checks by the PRISM Group."
Online reference information available at: *http://prism.oregonstate.edu/docs/meta/tmax_30s_meta.htm*

6. *Minimum Temperature Map*: "Point estimates of temperature originated from some or all of the following sources: 1) National Weather Service (NWS) Cooperative (COOP) stations, 2) Natural Resources Conservation Service (NRCS) SNOTEL, 3) United States Forest Service (USFS) and Bureau of Land Management (BLM) RAWS Stations, 4) Bureau of Reclamation (AGRIMET) stations, 5) California Data Exchange Center (CDEC) stations, 6) Storage gauges, 7) NRCS Snowcourse stations, 8) Other State and local station networks, 9) Estimated station data, 0) Canadian stations, 10) Upper air stations, and 11) NWS/Federal Aviation Administration (FAA) Automated surface observation stations (ASOS). All COOP station data were subjected to quality control checks by the National Climatic Data Center (NCDC). All COOP, SNOTEL and other data were subjected to further quality control checks by the PRISM Group."
Online reference information available at: *http://prism.oregonstate.edu/docs/meta/tmin_30s_meta.htm*

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7. *Land Use (GIRAS 1980s)*: "This is land use/land cover digital data collected by USGS and converted to ARC/INFO by the EPA. This data which resides in EPA's Spatial Data Library (ESDLS), is useful for environmental assessment of land use patterns with respect to water quality analysis, growth management, and other types of environmental impact assessment. GIRAS LU/LC is being used in EPA's, Office of Water/ OST BASINS water quality assessment model."
Online reference information available at: *http://www.epa.gov/waterscience/basins/metadata/giras.htm*

8. *National Land Cover Database 1992 (NLCD 1992)*: "Derived from the early to mid-1990s Landsat Thematic Mapper satellite data, the National Land Cover Data (NLCD) is a 21-class land cover classification scheme applied consistently over the United States. The spatial resolution of the data is 30 meters and mapped in the Albers Conic Equal Area projection, NAD 83. The NLCD are provided on a state-by-state basis. The state data sets were cut out from larger "regional" data sets that are mosaics of Landsat TM scenes. At this time, all of the NLCD state files are available for free download as 8-bit binary files and some states are also available on CD-ROM as a Geo-TIFF."
Online reference information available at: *http://landcover.usgs.gov/us_map.php*

9. *River Network*: "The National Hydrography Dataset (NHD) is a comprehensive set of digital spatial data that contains information about surface water features such as lakes, ponds, streams, rivers, springs and wells. The NHD is based upon the content of USGS Digital Line Graph (DLG) hydrography data integrated with reach-related information from the EPA Reach File Version 3 (RF3). The stream network was generated based on the USEPA Reach File, Version 1 and National Hydrography Dataset (NHD)."
Online reference information available at: *http://nhd.usgs.gov/*
USEPA Reach File, Version 1.0.
Online reference information available at: *http://www.epa.gov/*

10. *Hydrologic Soil Groups*: "Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. Mapping scales generally range from 1:12,000 to 1:63,360; SSURGO is the most detailed level of soil mapping done by the Natural Resources Conservation Service (NRCS). SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships, and county natural resource planning and management. The user should be knowledgeable of soils data and their characteristics."
Online reference information available at: *http://www.ncgc.nrcs.usda.gov/products/datasets/ssurgo/*

11. *Water Quality Observations Stations*: "Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. Mapping scales generally range from 1:12,000 to 1:63,360; SSURGO is the most detailed level of soil mapping done by the Natural Resources Conservation Service (NRCS). SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships, and county natural resource planning and management. The user should be knowledgeable of soils data and their characteristics."
Online reference information available at: *http://www.ncgc.nrcs.usda.gov/products/datasets/ssurgo/*

12. *USGS Gage Stations*: "Inventory of surface water gaging station data including 7Q10 low and monthly mean stream flow. Better Assessment Science Integrating Point & Nonpoint Sources (BASIN v. 4.0)."
Online reference information available at: *http://www.epa.gov/waterscience/basins/index.html*

13. *Estimated Peak-Streamflow Frequencies*: "Estimated peak-streamflow frequencies for selected gaging stations with at least 10 years of annual peak-discharge data for unregulated, rural streams in Kansas."
Online reference information available at: *http://ks.water.usgs.gov/Kansas/waterwatch/flood/flood-freq.html*

14. *Permitted Point Source Facilities*: "BASINS also includes information on pollutant loading from point source discharges. The location, type of facility, and estimated loading are provided. These loadings are also used to support evaluation of watershed-based loading summaries combining point and nonpoint sources."
Online reference information available at: *http://www.epa.gov/waterscience/basins/index.html*

15. *Confined Animal Feeding Operations*: Obtained from Watershed Planning Section -Kansas Department of Health and Environment.

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16. *The 1990 Population and Sewerage by Census Tract*: "Summarizes the selected area by census tract ID. For each census tract, the report lists the population, number of housing units, type of residential sewer system, and spatial percentage of that tract located within the subject watershed area."
Online reference information available at: *http://www.epa.gov/waterscience/basins/index.html*

17. *Cost-Return Budget*: Data acquired from Sarah L. Fogleman and Stewart R. Duncan, for *Different Crop Cost-Return Budget in Southeast Kansas*, Kansas State University.

18. *Census Data:* Data was derived from the 2002 Census of Agriculture. The data presented here serves only as an estimate for agricultural activity in the Pomona Lake watershed. Since watersheds do not follow political boundaries, the estimates were made based on proportion assumptions of county and zip code census data.
Online reference information available at: *http://www.nass.usda.gov/Census_of_Agriculture/index.asp*

19. *Subbasin Map*: "This map was provided based on USGS Hydrologic Unit Level 14 Code Boundaries. United States Department of Agriculture/Natural Resources Conservation Service."
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