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FINAL

Thunder Basin Watershed Management Plan

Level 1 Watershed Study

Volume II

Submitted to:
Wyoming Water Development Commission

Prepared by:
Olsson Associates

In Association With:
ESCO Associates, Inc.
Wester Wetstein Associates
Steady Stream Hydrology, Inc.

November 2009

OLSSON ASSOCIATES

Olsson Project No. 008-1217

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Thunder Basin Watershed Management Plan

Level 1 Watershed Study

WWDC Contract Number 055CO293618

November 30, 2009

Prepared for

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Volume II

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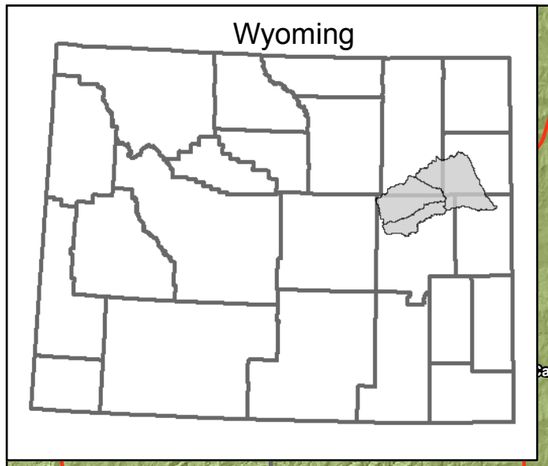

LEGEND

- Watersheds
- Counties
- Cites
- Generalized Streams
- Generalized Lakes
- Major Roads

Osage
Wright
Campbell
Weston
Natrona
Converse
Niobrara
Bill
Lance Creek
Antelope
Upper Cheyenne
Dry Fork Cheyenne River
Black Thunder Creek
Little Thunder Creek
Lodgepole Creek
Hay Creek
Wildcat Creek
Porcupine Creek
Bates Creek
Antelope Creek
Bear Creek
Sand Creek
North Fork Bear Creek
Dry Fork Cheyenne River
Snyder Creek
Cheyenne River
Lance Creek
WYOMING 116
WYOMING 450
WYOMING 387
WYOMING 59

T46N R69W, T46N R68W, T46N R67W, T46N R66W, T46N R65W
T45N R70W, T45N R69W, T45N R68W, T45N R67W, T45N R66W, T45N R65W
T44N R71W, T44N R72W, T44N R70W, T44N R69W, T44N R68W, T44N R67W, T44N R66W, T44N R65W
T43N R73W, T43N R72W, T43N R71W, T43N R70W, T43N R69W, T43N R68W, T43N R67W, T43N R66W, T43N R65W, T43N R64W
T42N R75W, T42N R74W, T42N R73W, T42N R72W, T42N R71W, T42N R70W, T42N R69W, T42N R68W, T42N R67W, T42N R66W, T42N R65W, T42N R64W
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T39N R77W, T39N R76W, T39N R75W, T39N R74W, T39N R73W, T39N R72W, T39N R71W, T39N R70W, T39N R69W, T39N R68W, T39N R67W, T39N R66W, T39N R65W, T39N R64W, T39N R63W, T39N R62W
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T37N R76W, T37N R75W, T37N R74W, T37N R73W, T37N R72W, T37N R71W
T36N R76W, T36N R75W, T36N R74W, T36N R73W, T36N R72W

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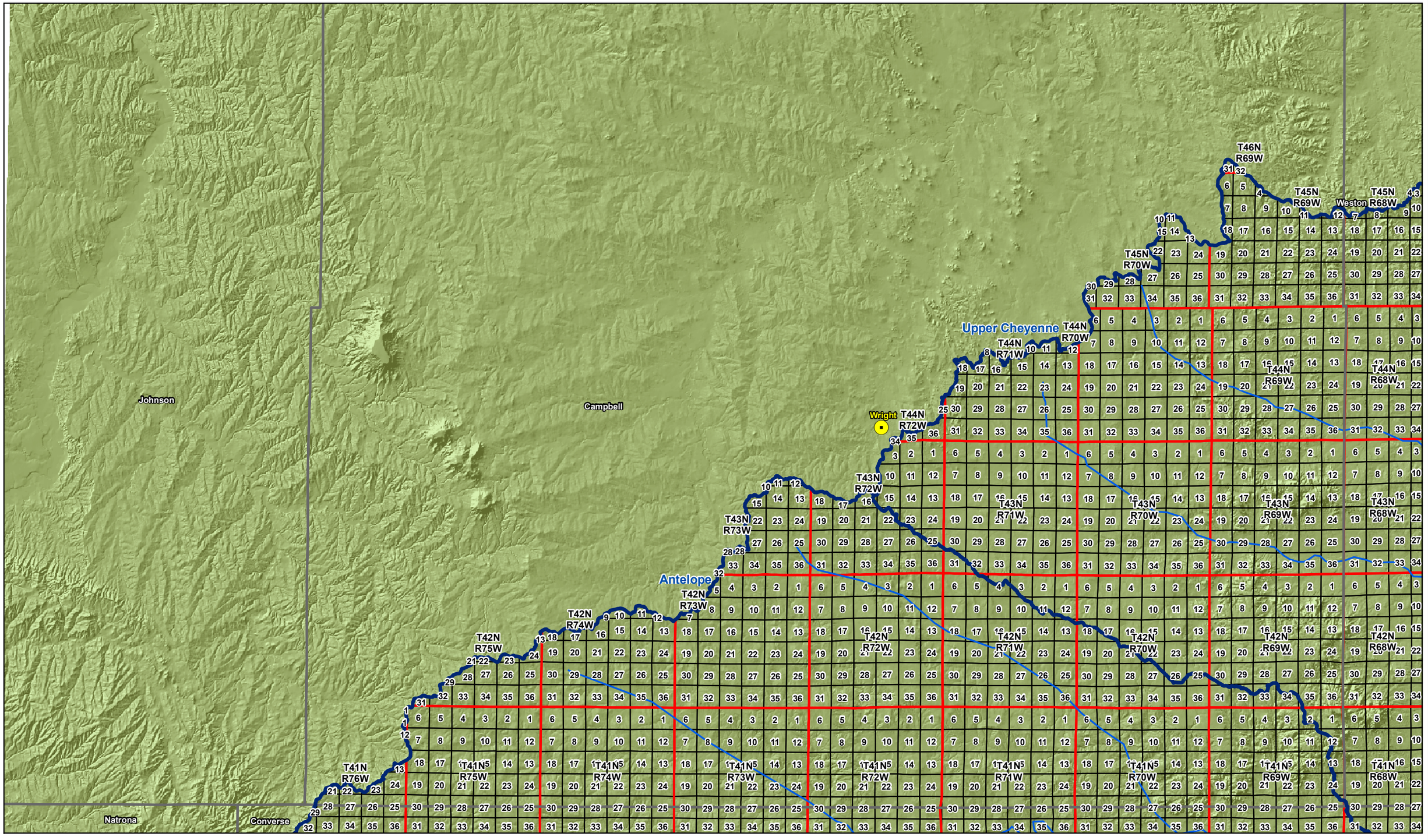
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI;	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**STUDY AREA LOCATION** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 1a



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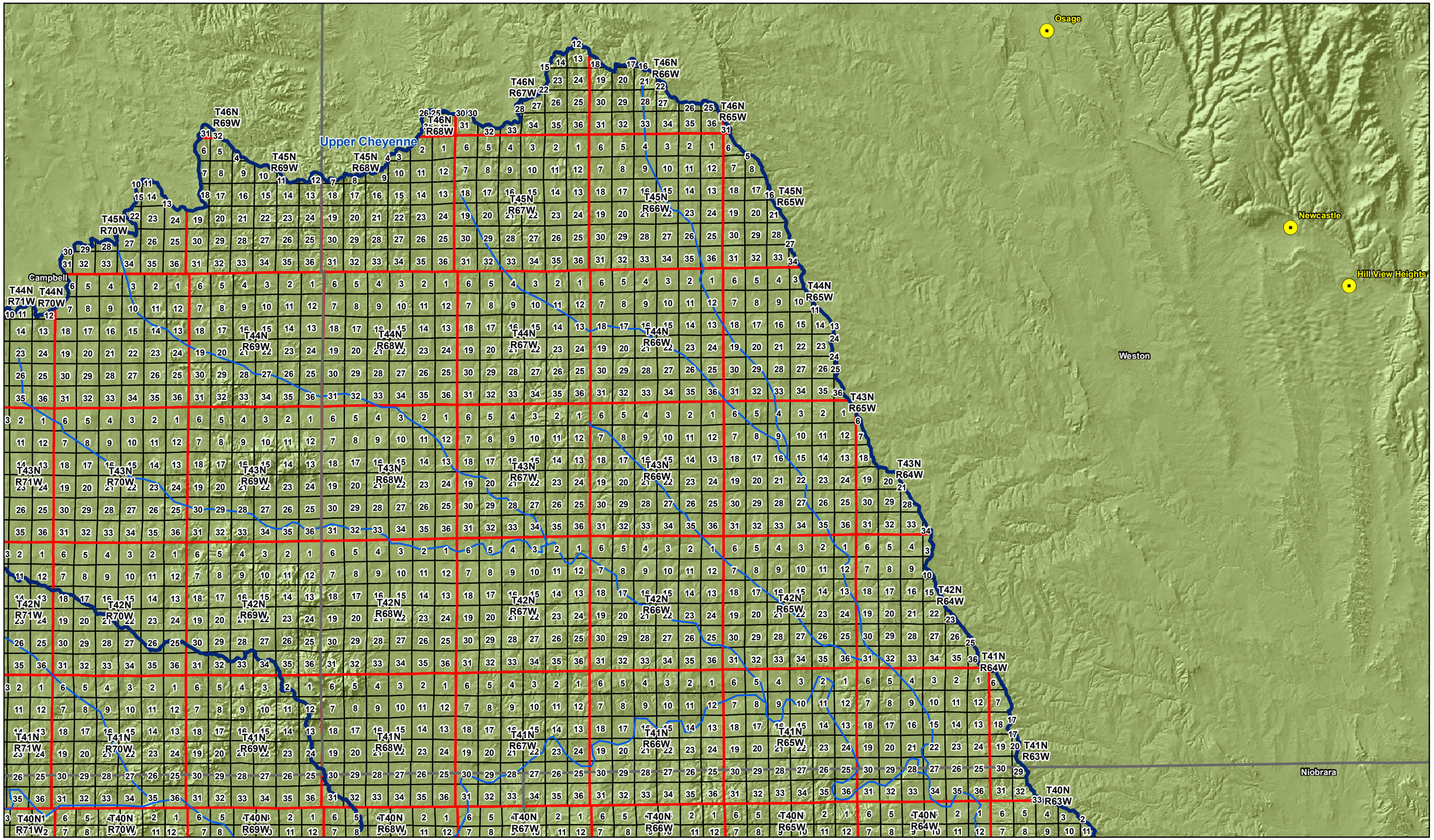

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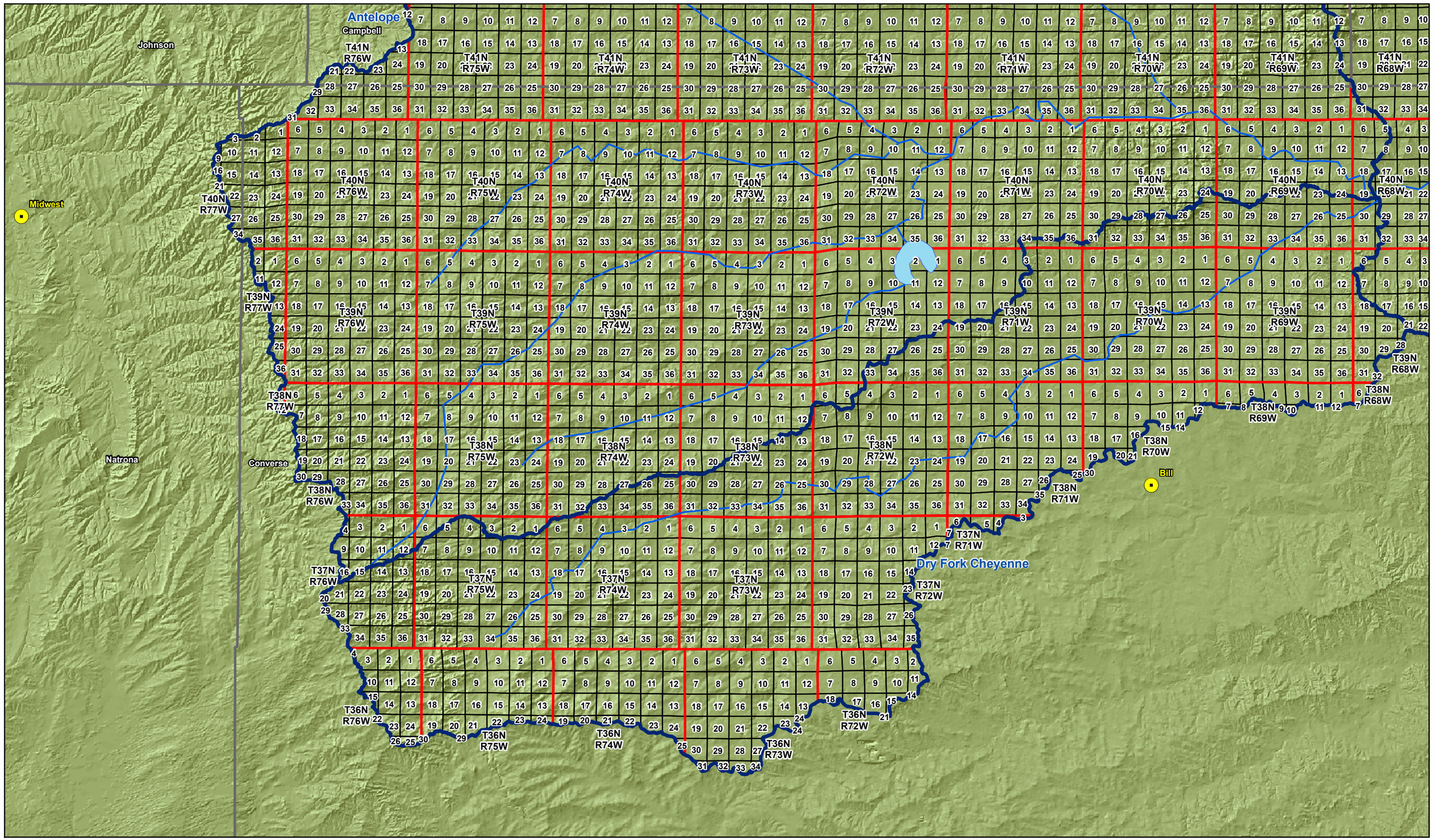

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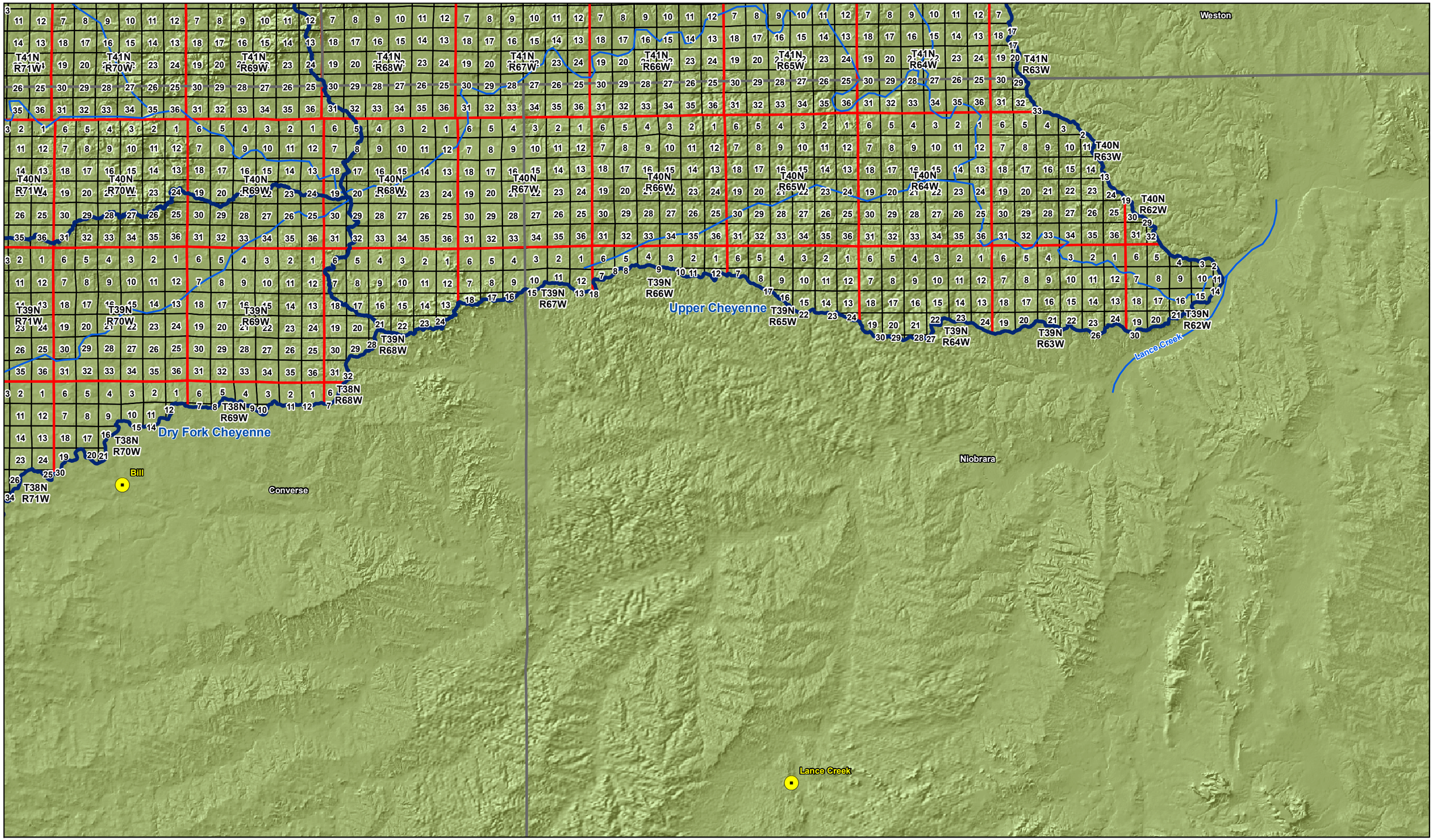

PROJECT: 008-1217 DRAWN BY: RD DATE: 11/18/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI;	2 0 2 4 6 Miles 1:253,440 N	STUDY AREA LOCATION (Southeast Quadrant) Thunder Basin Watershed Study Northeast Wyoming	OLSSON ASSOCIATES	MAP 1e

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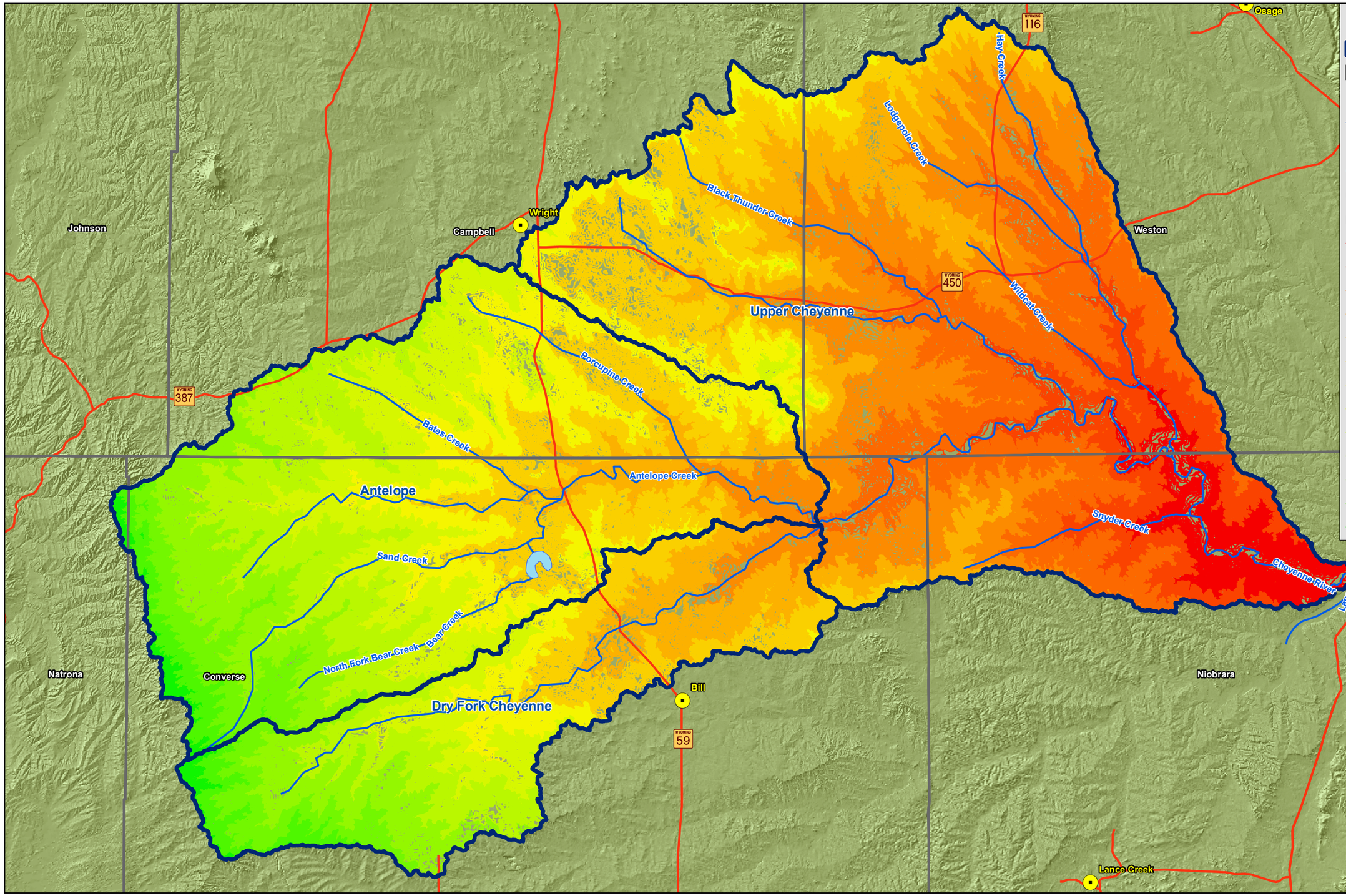

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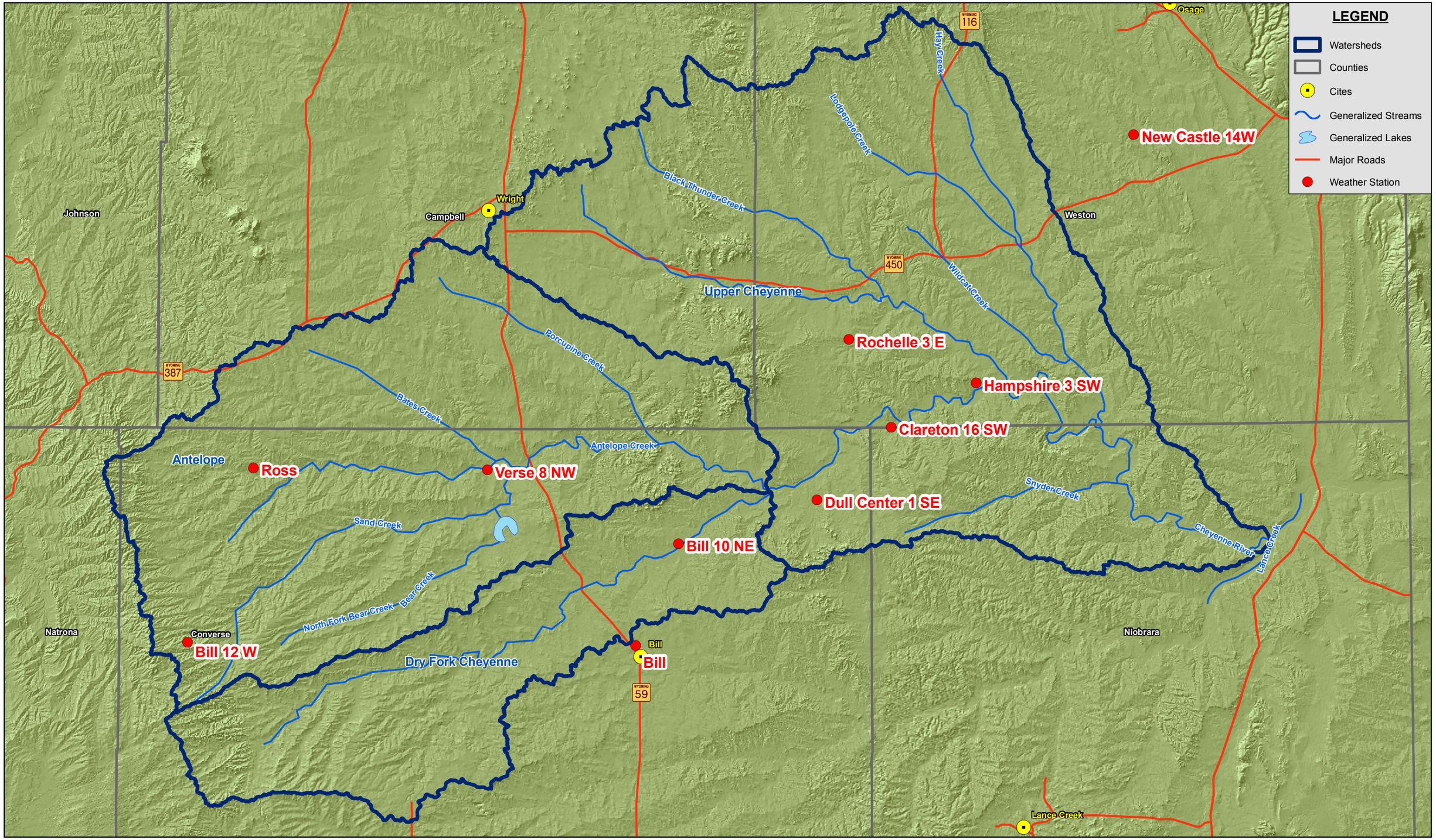
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**GROUND ELEVATION MAP** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 2



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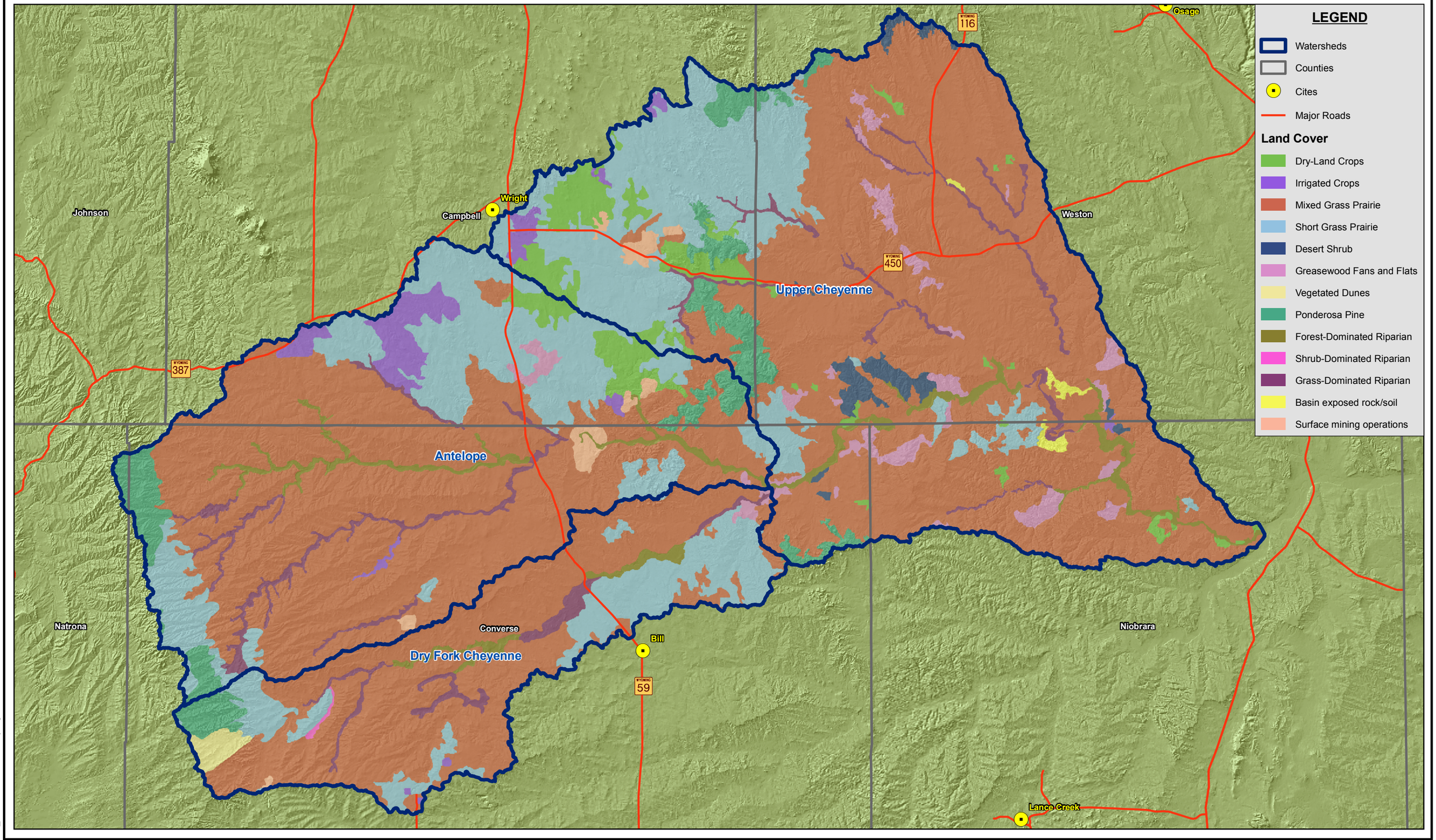

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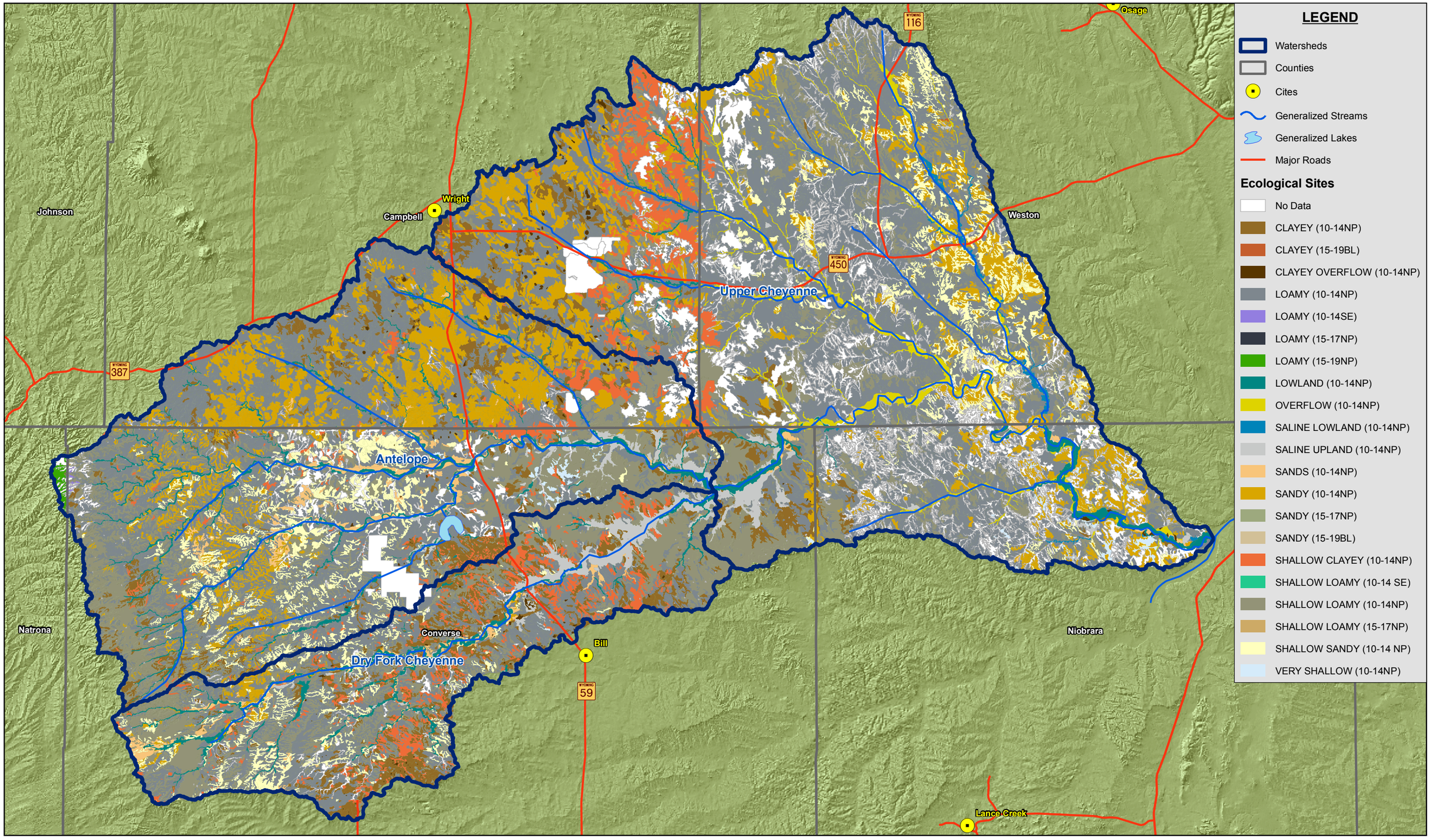
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Land Cover, 2007, USDA NRCS	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**LAND COVER/VEGETATION** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 4



LEGEND

- Watersheds
- Counties
- Cites
- Generalized Streams
- Generalized Lakes
- Major Roads

Ecological Sites

- No Data
- CLAYEY (10-14NP)
- CLAYEY (15-19BL)
- CLAYEY OVERFLOW (10-14NP)
- LOAMY (10-14NP)
- LOAMY (10-14SE)
- LOAMY (15-17NP)
- LOAMY (15-19NP)
- LOWLAND (10-14NP)
- OVERFLOW (10-14NP)
- SALINE LOWLAND (10-14NP)
- SALINE UPLAND (10-14NP)
- SANDS (10-14NP)
- SANDY (10-14NP)
- SANDY (15-17NP)
- SANDY (15-19BL)
- SHALLOW CLAYEY (10-14NP)
- SHALLOW LOAMY (10-14 SE)
- SHALLOW LOAMY (10-14NP)
- SHALLOW LOAMY (15-17NP)
- SHALLOW SANDY (10-14 NP)
- VERY SHALLOW (10-14NP)

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PROJECT: 008-1217

DRAWN BY: RD

DATE: 11/16/2009

Source: Streams, 2006, ESRI;
Watershed, 2002, WYGISC; DEM, 2008, USGS
Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI;
Watershed Boundaries, 2005, USGS

3.5 0 3.5 7 10.5 Miles

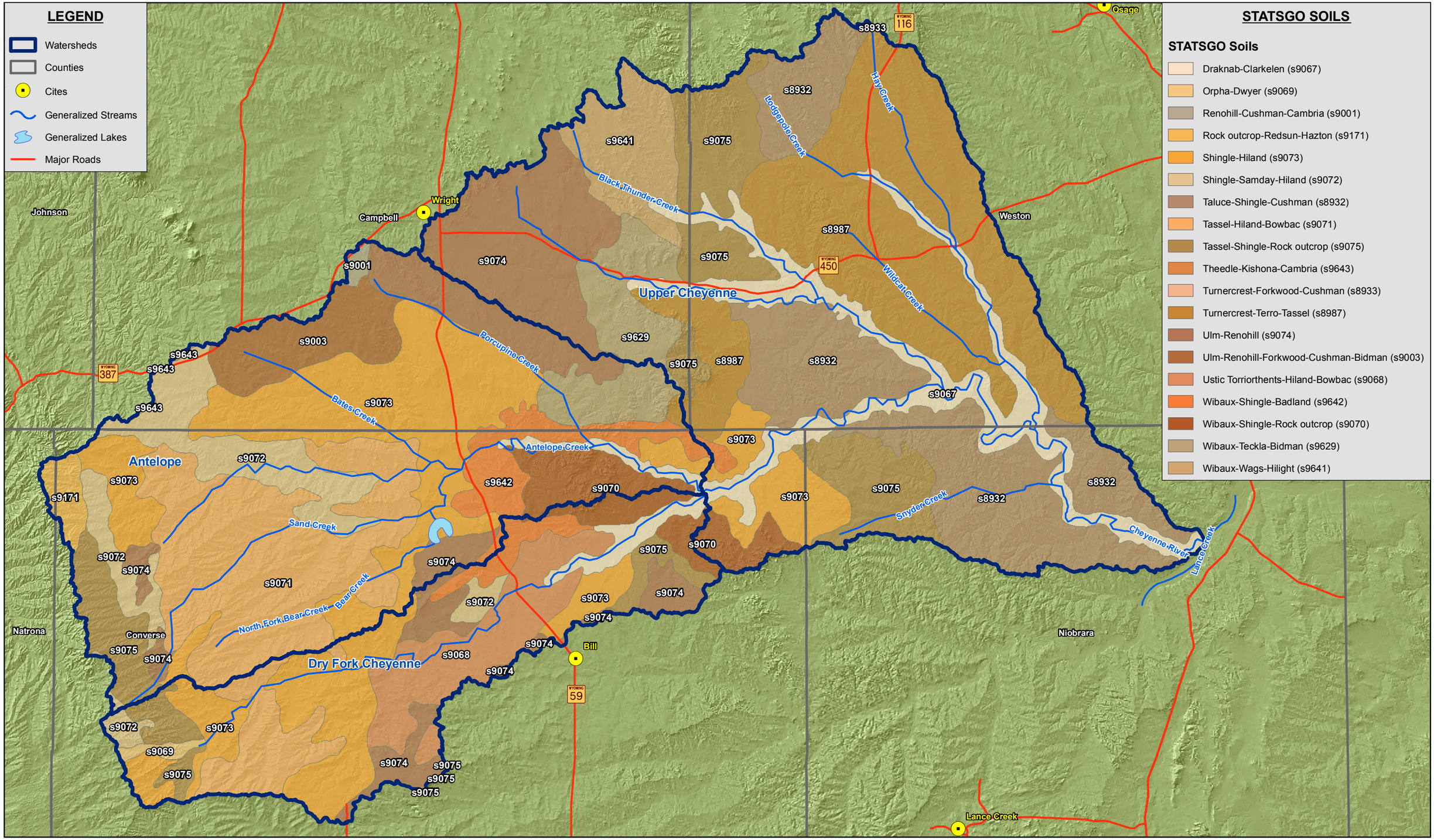
1:443,520

N

ECOLOGICAL SITES
Thunder Basin Watershed Study
Northeast Wyoming

OLSSON ASSOCIATES

MAP 5



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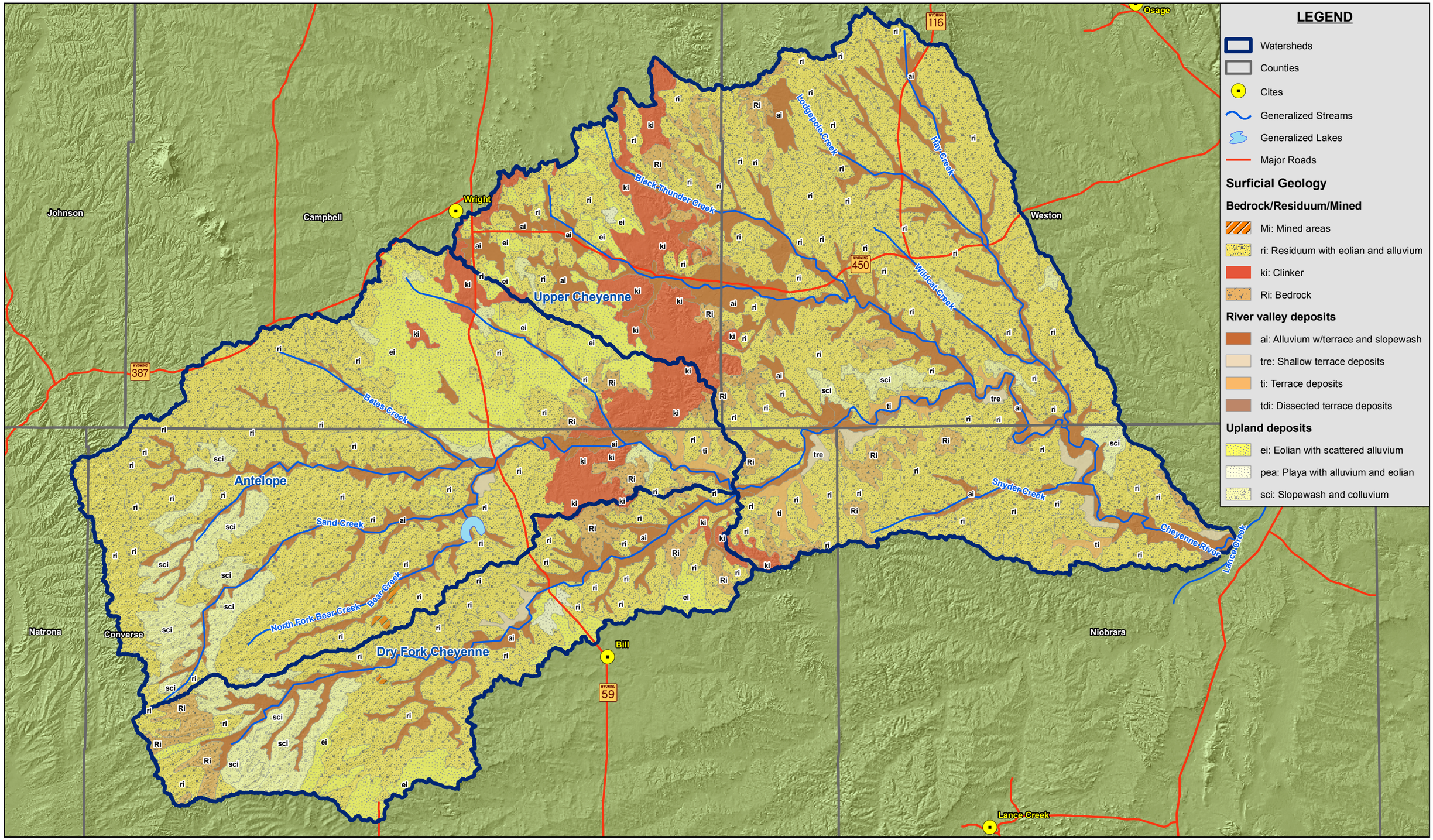
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; STATSGO Soils, 2007, USDA	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**STATSGO SOILS MAP** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES MAP 6



PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Surficial Geology, 2002, WWDC	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**SURFICIAL GEOLOGY** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 7

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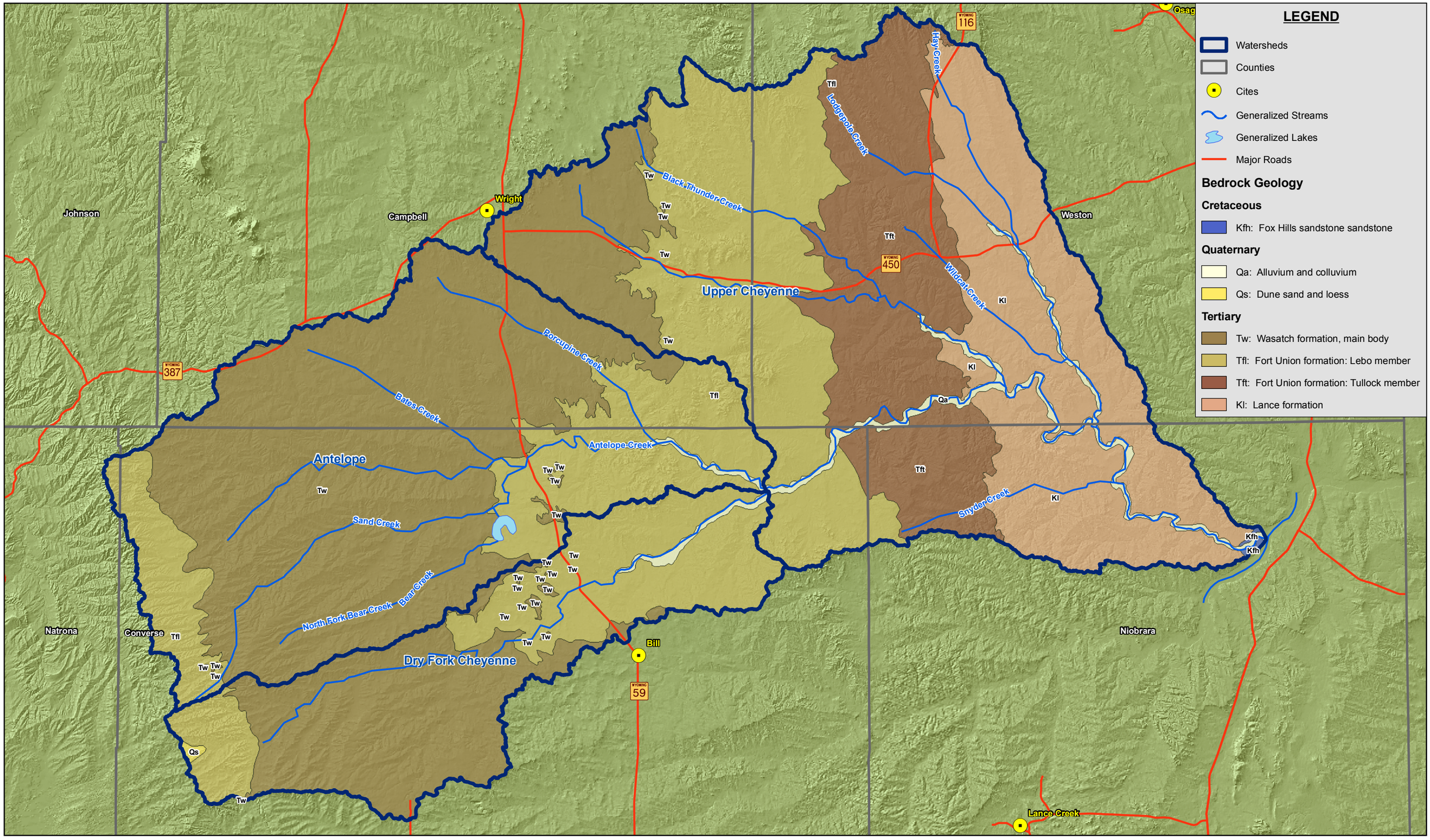

PROJECT: 008-1217	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Bedrock Geology, 2002, WWDC	3.5 0 3.5 7 10.5 Miles N 1:443,520	**BEDROCK GEOLOGY** **Thunder Basin Watershed Study** **Northeast Wyoming**	MAP 8
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DATE: 11/16/2009				

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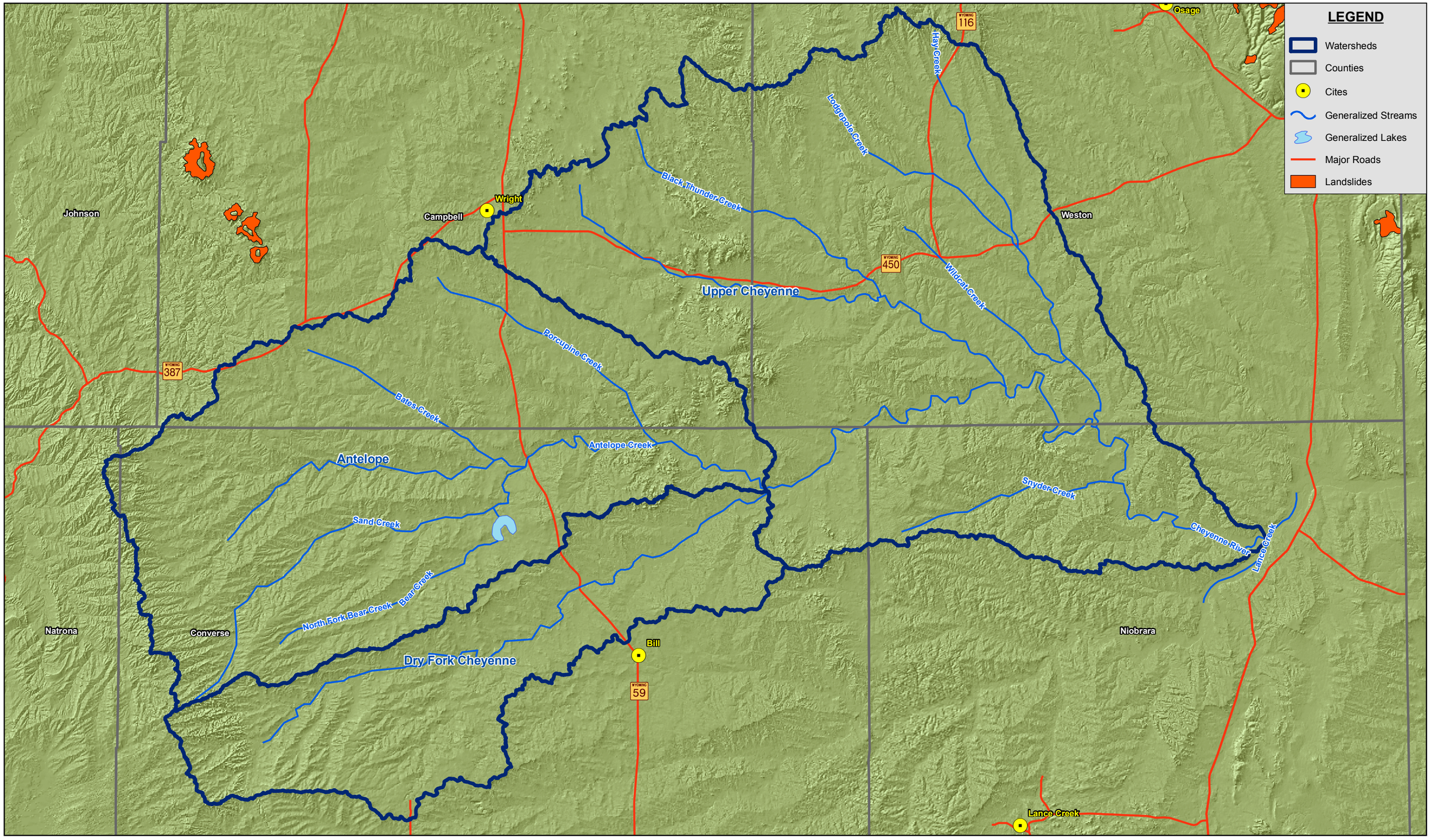

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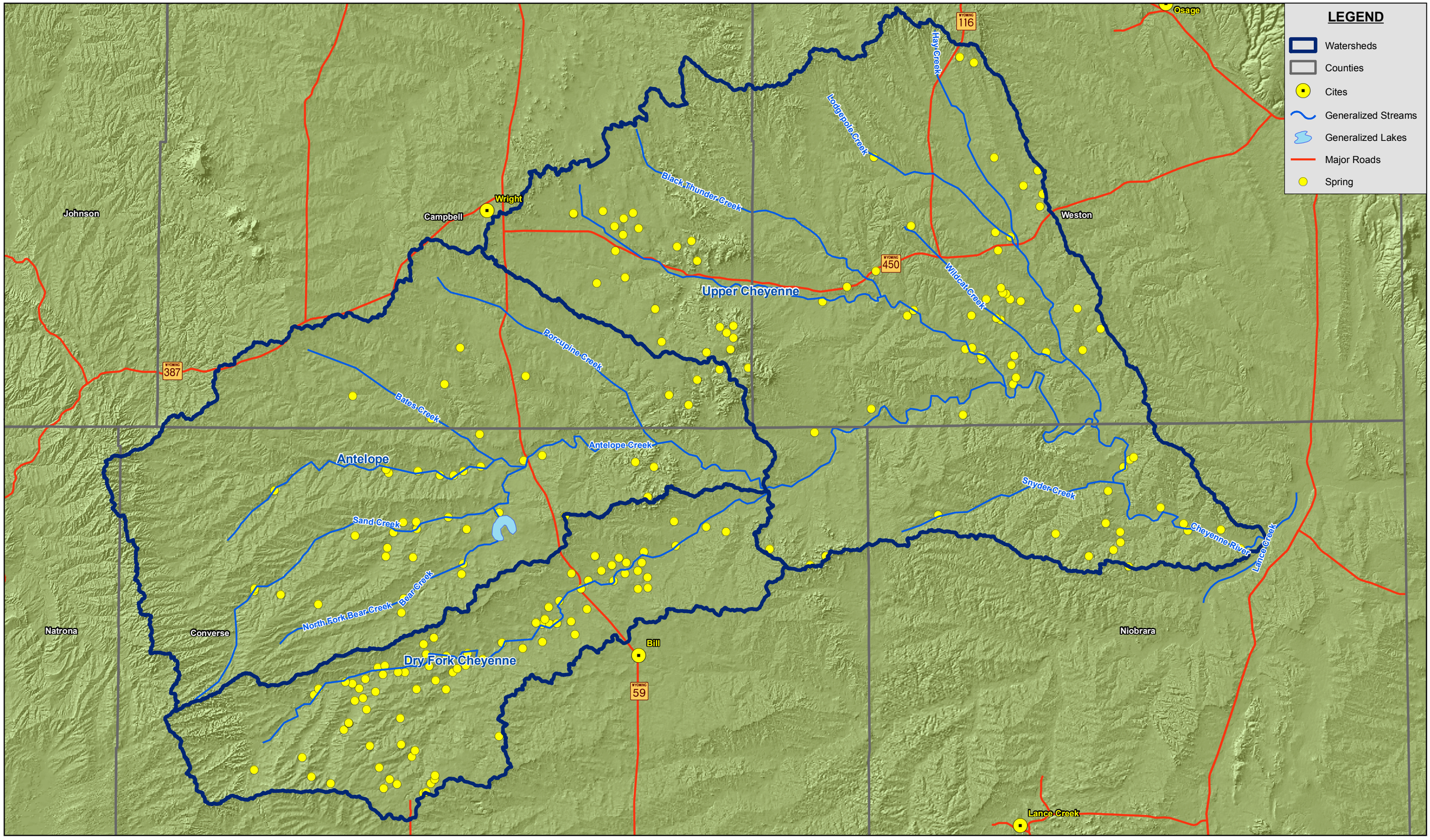
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Landslides, 2002, WWDC	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**LANDSLIDES** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 9



PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Springs, 2007, NHD	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**SPRINGS** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 10

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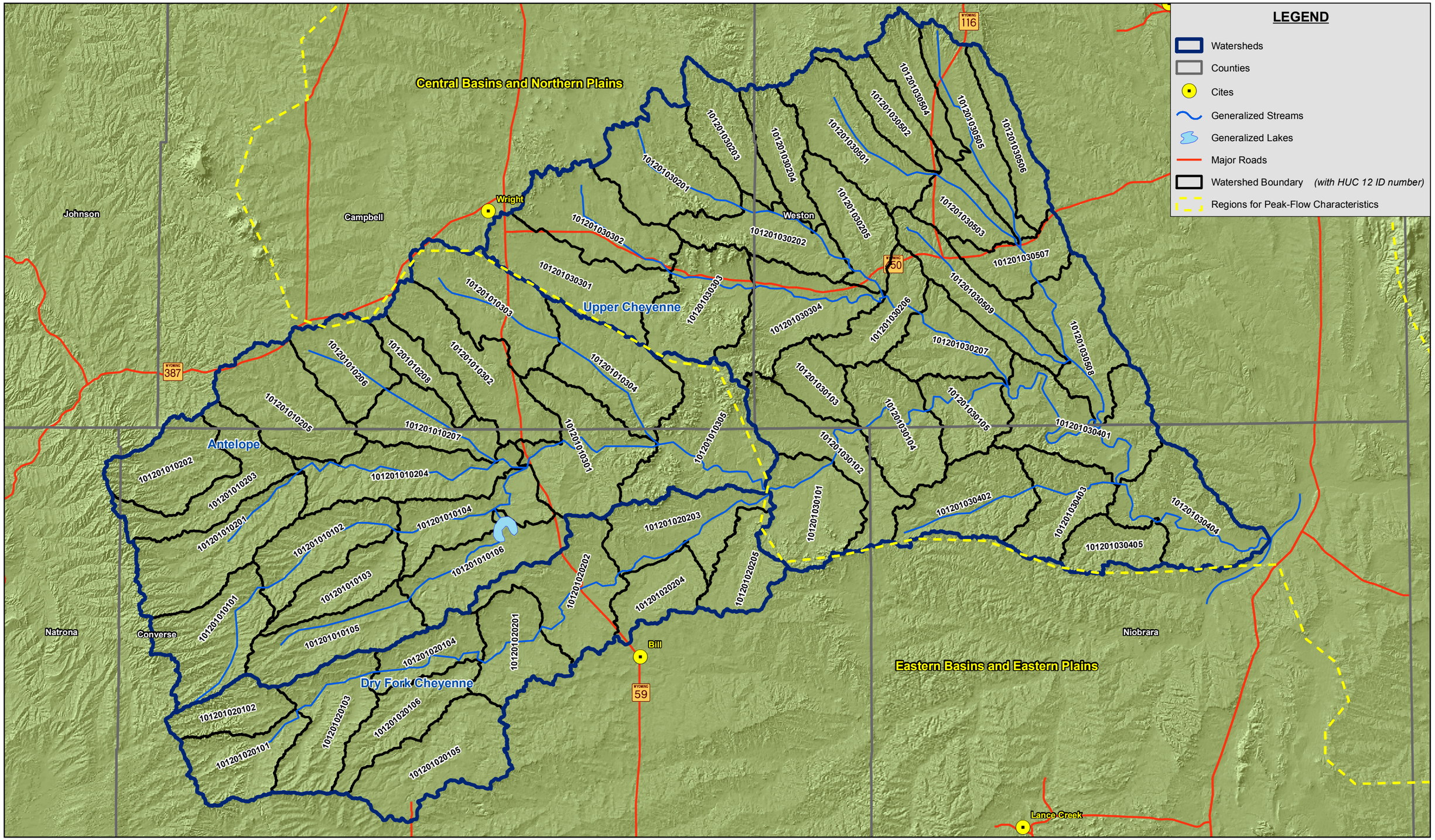

PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**WATERSHED HYDROLOGIC FEATURES** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 11

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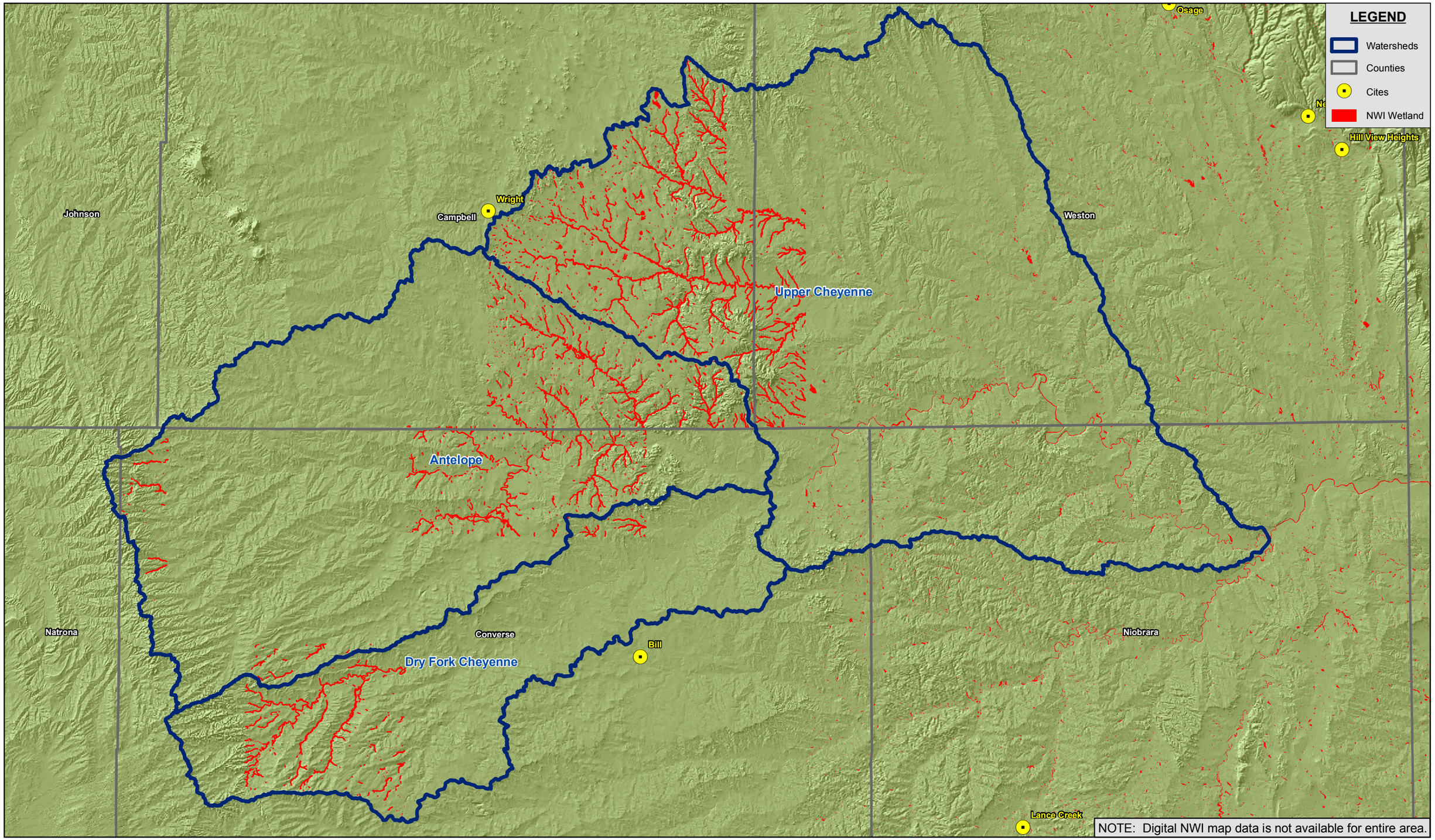

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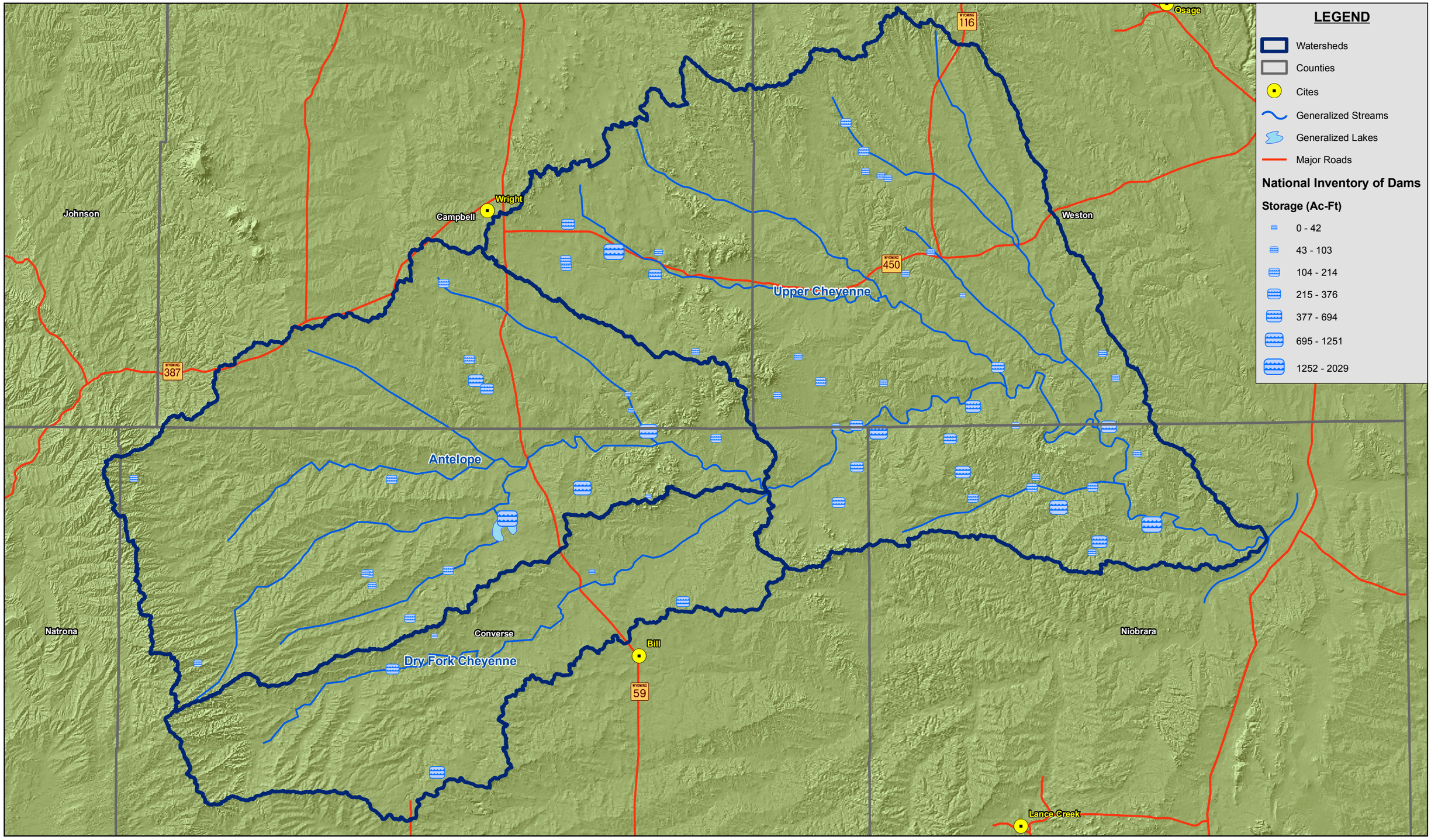
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; NWI, 2002, USFWS Note: Digital NWI Map Data is not Available for the Entire Area	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**NATIONAL WETLAND INVENTORY MAP** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 12



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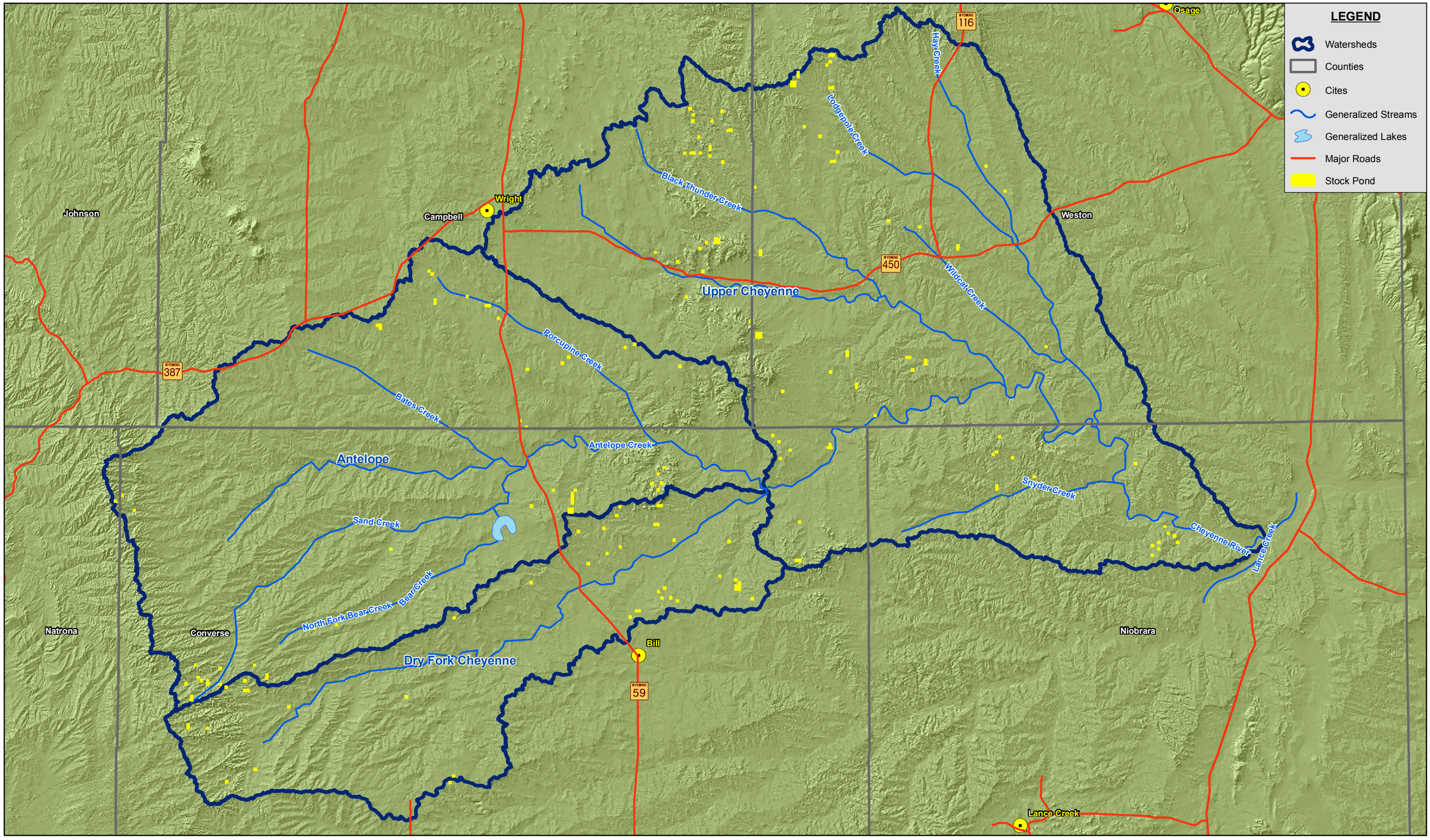
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**NATIONAL INVENTORY OF DAMS** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 13



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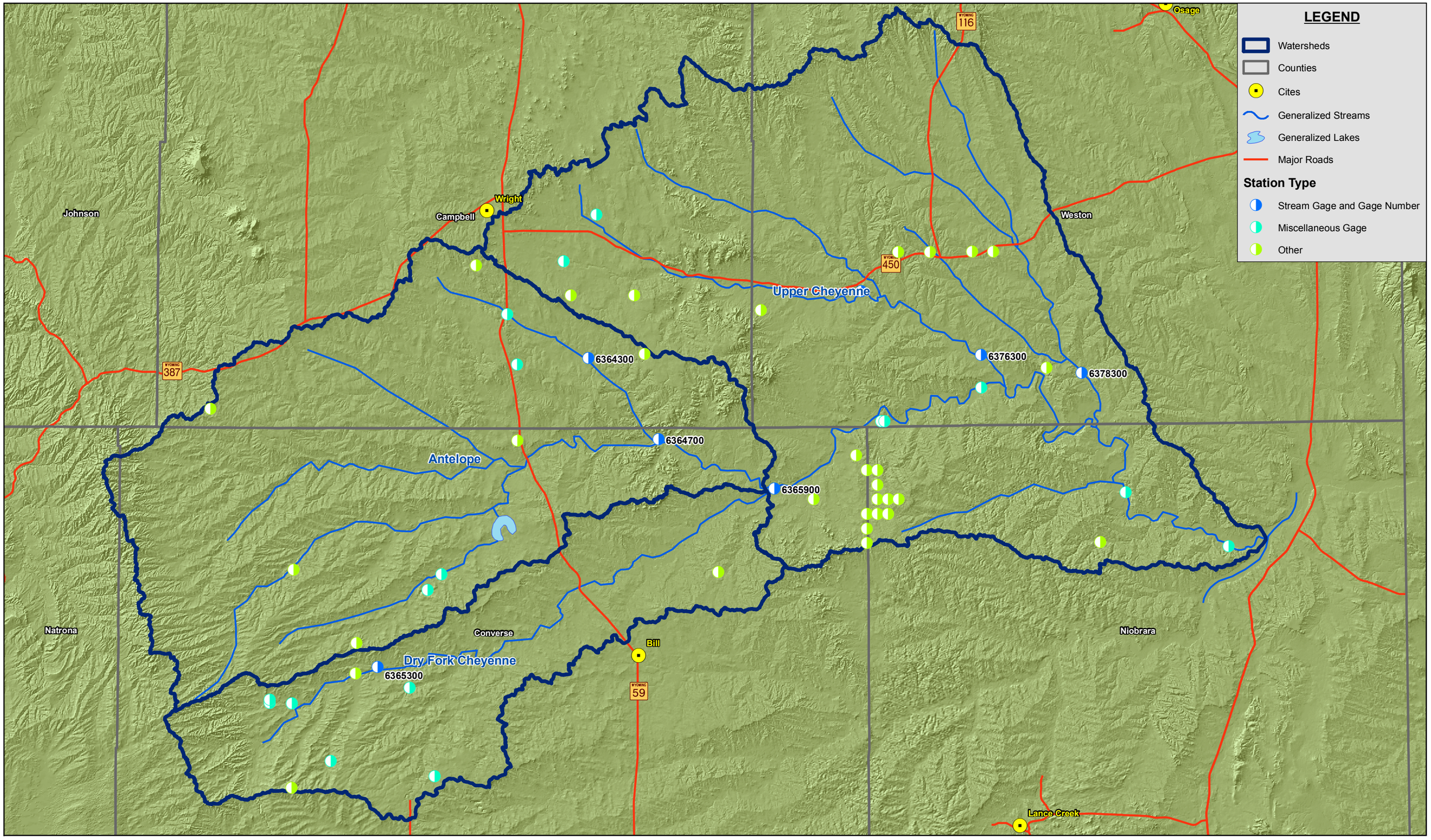
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI;	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**STOCK/WILDLIFE PONDS** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 14



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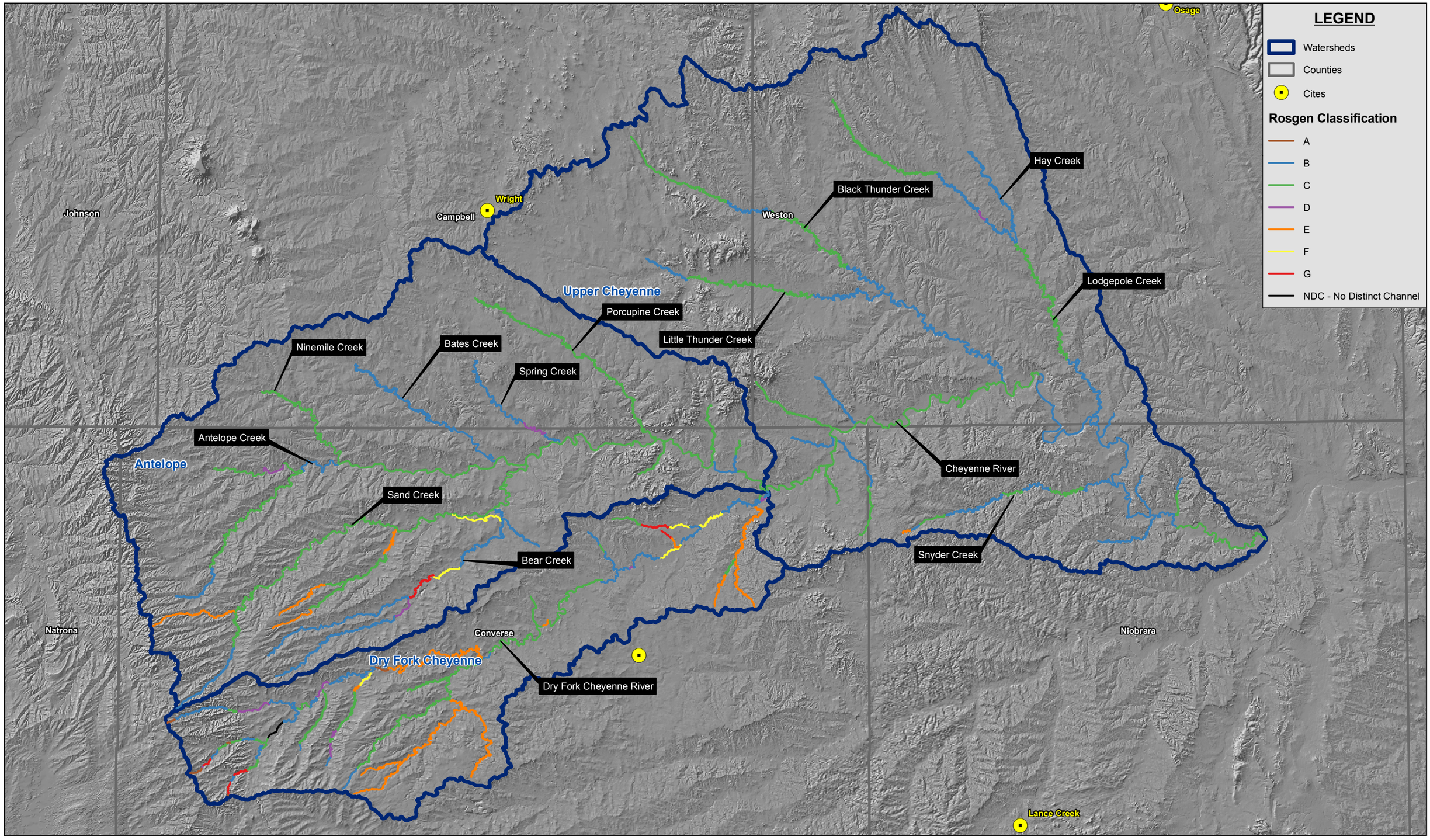
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/25/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Gauging Stations, 2008, USGS	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**GAGING STATIONS AND STREAMFLOW/SAMPLING SITES** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 15



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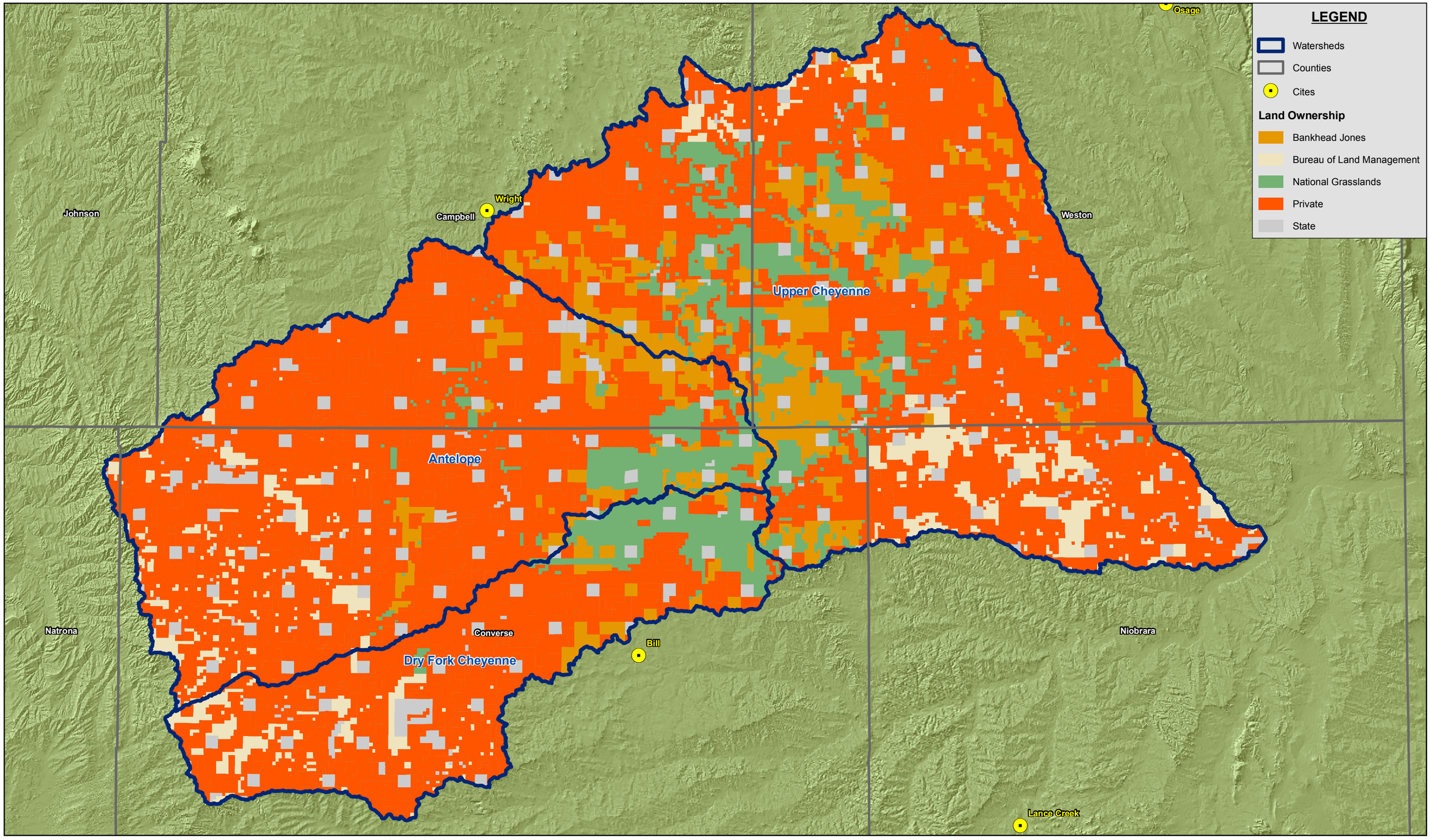
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**MAJOR STREAMS WITH ROSGEN CLASSIFICATION** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 16



PROJECT: 008-1217

DRAWN BY: RD

DATE: 11/16/2009

Source: Streams, 2006, ESRI;
Watershed, 2002, WYGISC; DEM, 2008, USGS
Roads, 1997, TIGER; Counties, 2007, SDVC;
Cities, 2006, ESRI; Land Ownership, 2003, BLM

3.5 0 3.5 7 10.5 Miles

1:443,520

N

LAND OWNERSHIP
Thunder Basin Watershed Study
Northeast Wyoming

OLSSON ASSOCIATES

MAP 17

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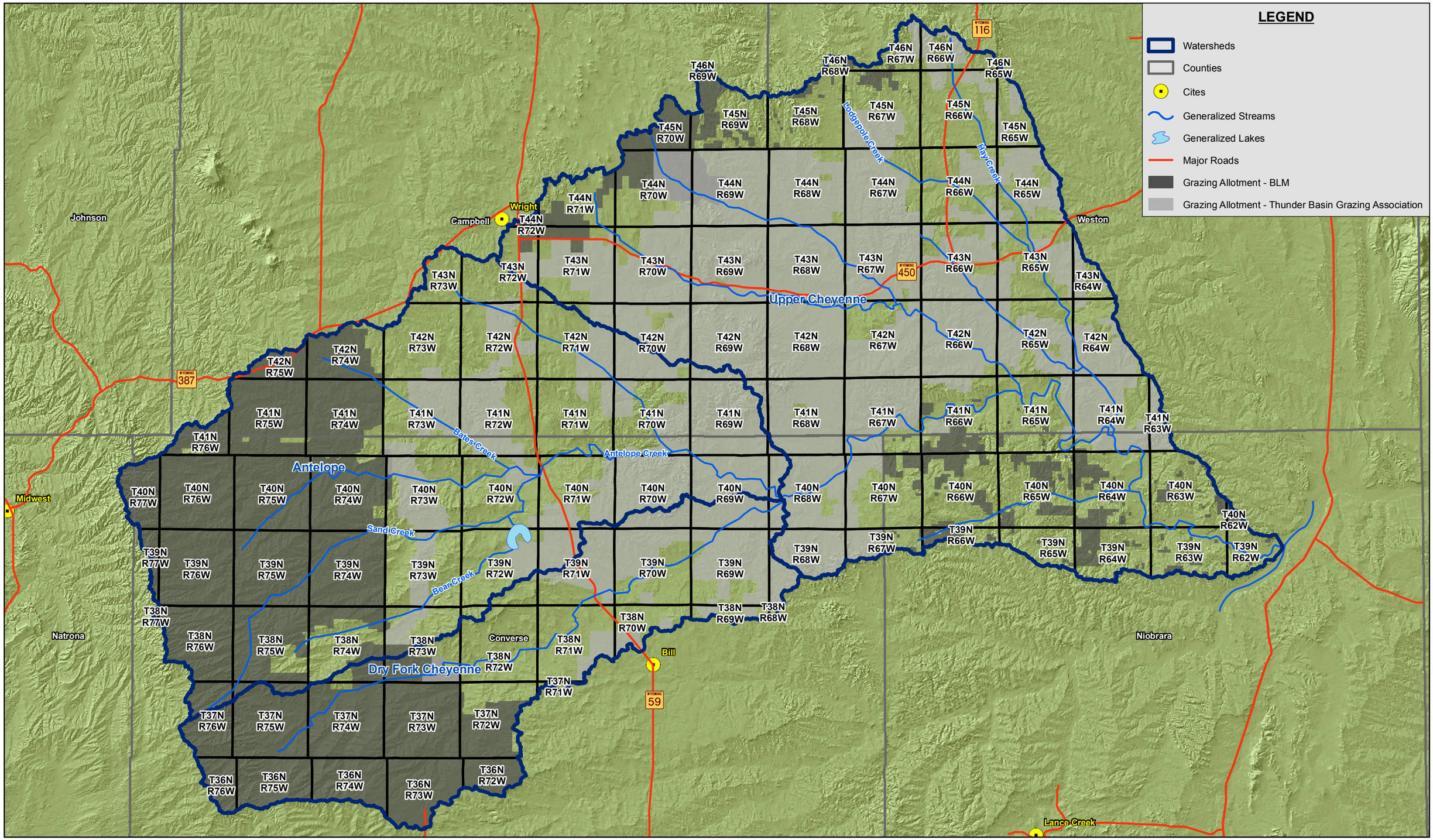

PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Allotments, 1998, BLM	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**GRAZING ALLOTMENTS** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 18

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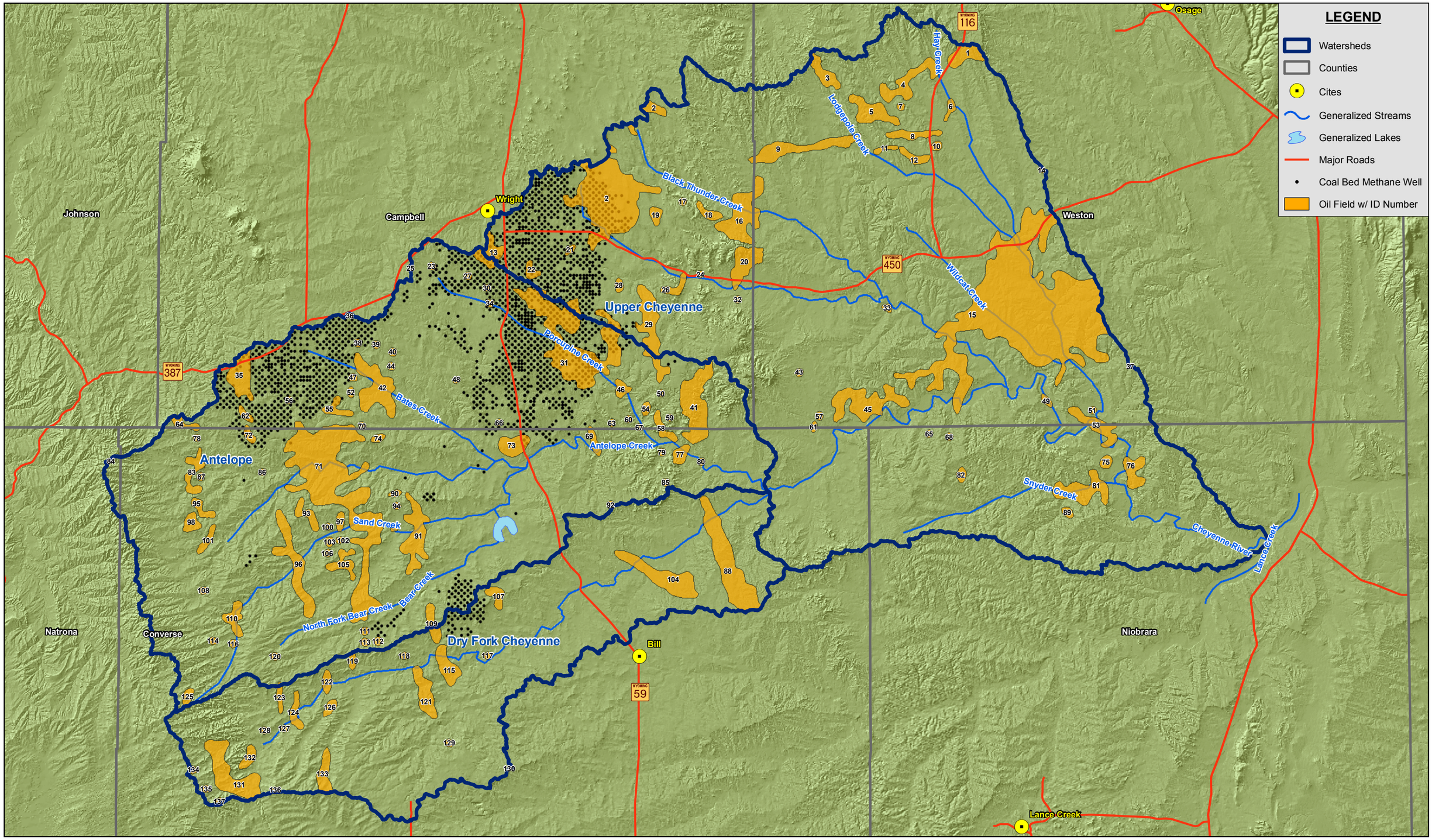

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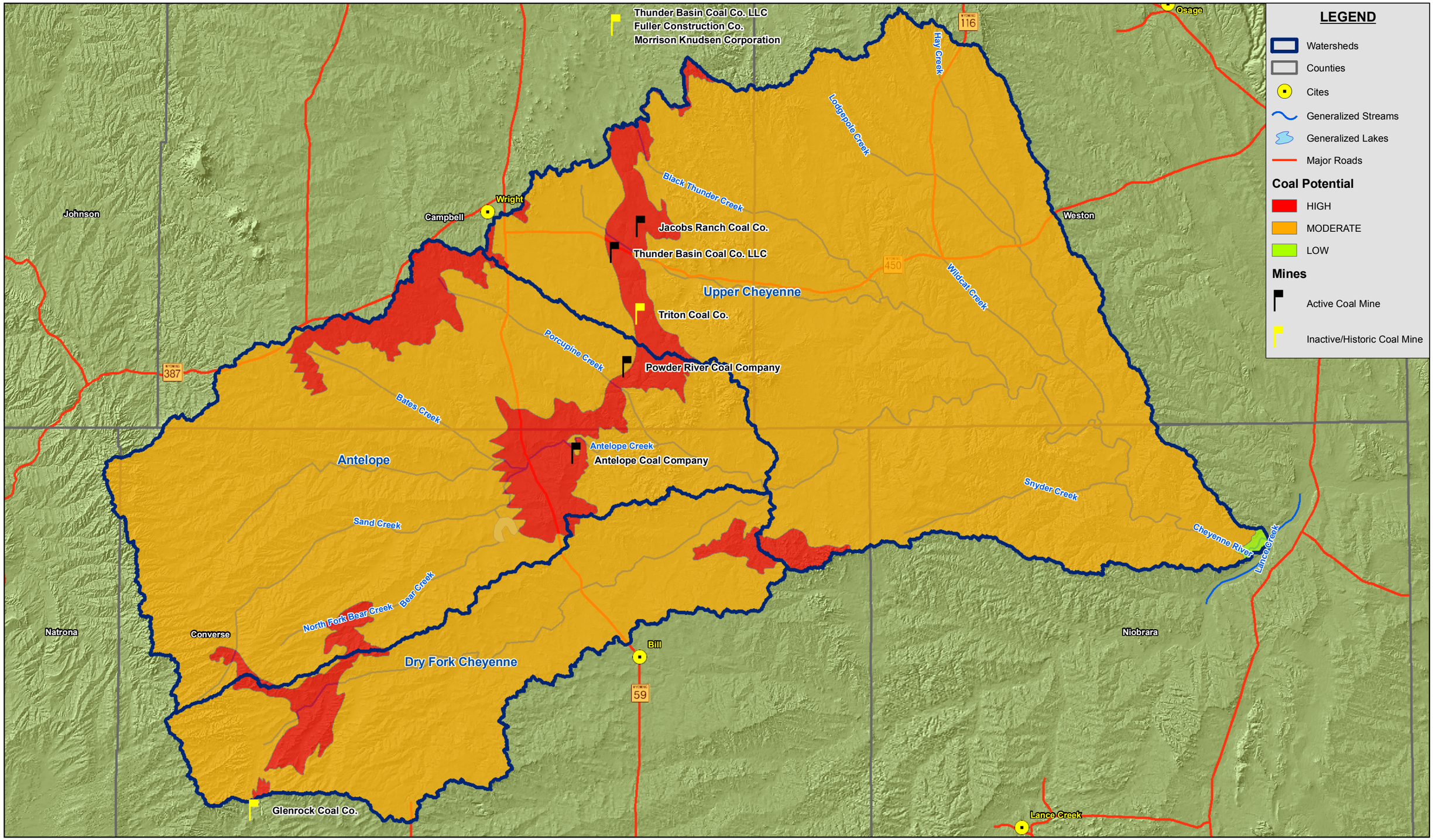
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Oil Fields, 1990, WyGISC	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**OIL AND GAS WELLS/FIELDS** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 19



LEGEND

- Watersheds
- Counties
- Cites
- Generalized Streams
- Generalized Lakes
- Major Roads

Coal Potential

- HIGH
- MODERATE
- LOW

Mines

- Active Coal Mine
- Inactive/Historic Coal Mine

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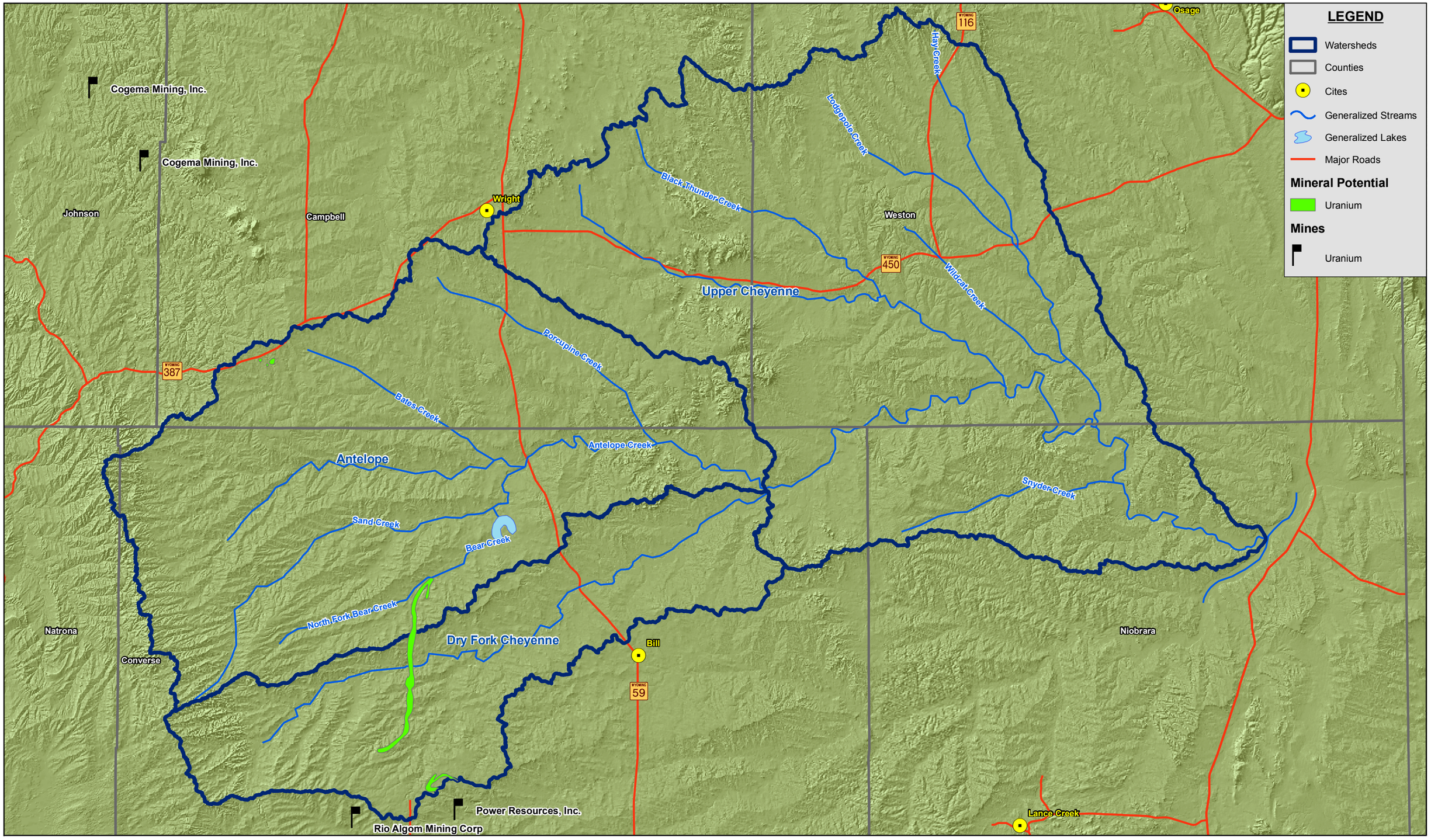
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Coal Mines, 1990, WYGISC; Coal Potential 1990, WYGISC	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**ACTIVE AND HISTORIC COAL MINES AND RESOURCE POTENTIAL Thunder Basin Watershed Study Northeast Wyoming**	OLSSON ASSOCIATES	MAP 20



PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Mines, 1990, WYGISC	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**OTHER MINE SITES AND MINERAL POTENTIAL** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES MAP 21

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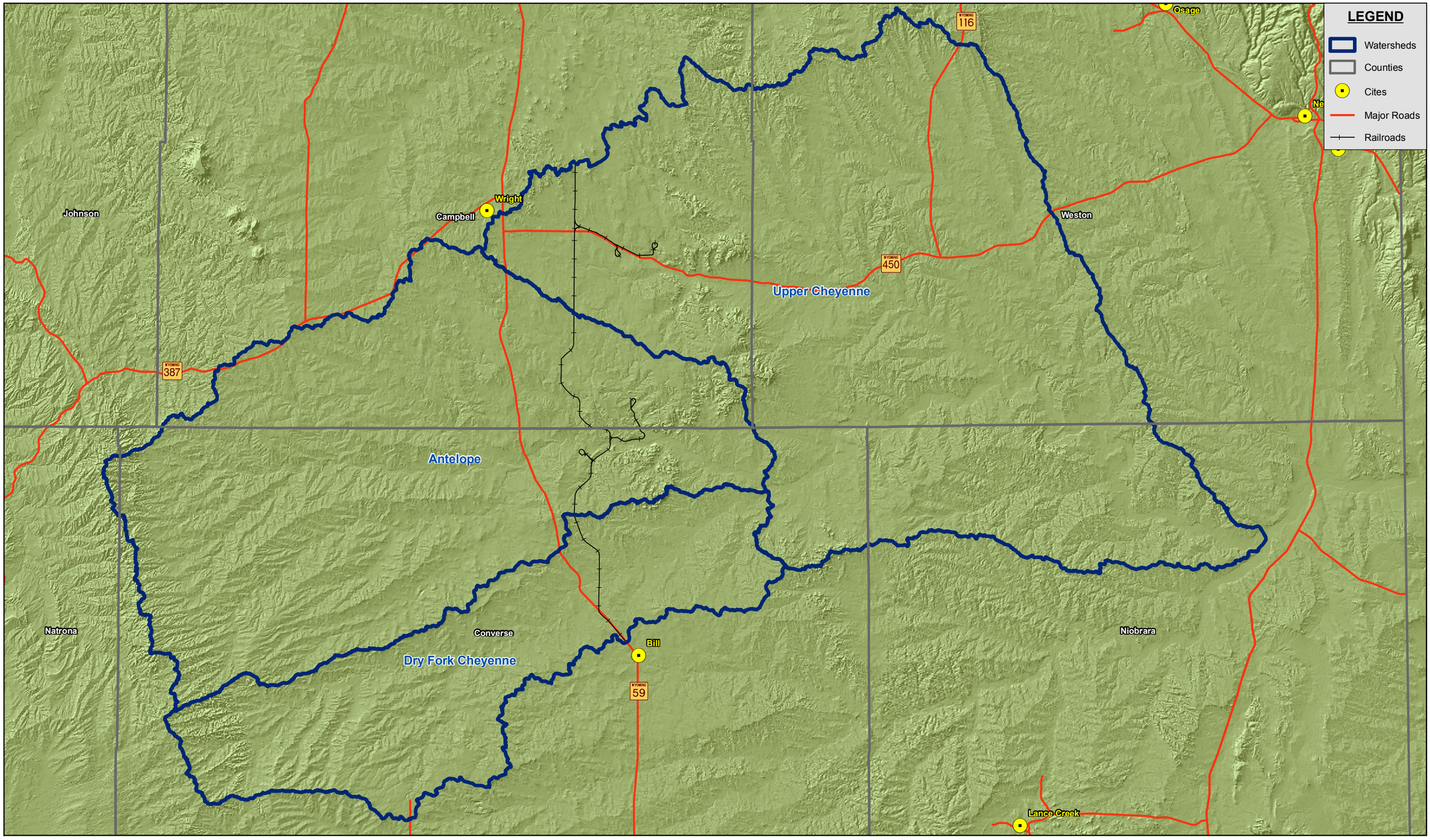

PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Railroads, 2002, WSGS	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**MAJOR ROADS AND RAILROADS** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 22

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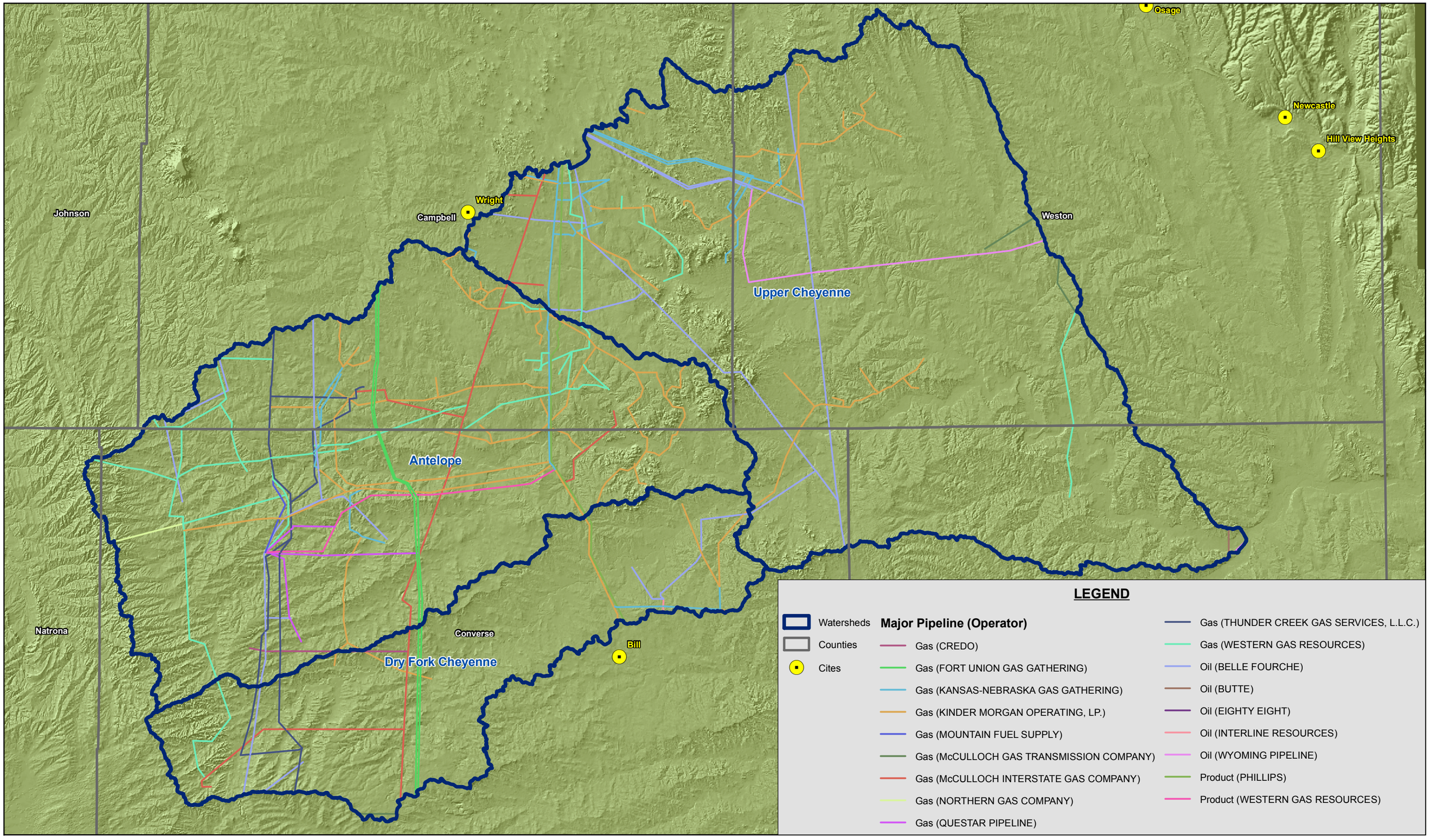

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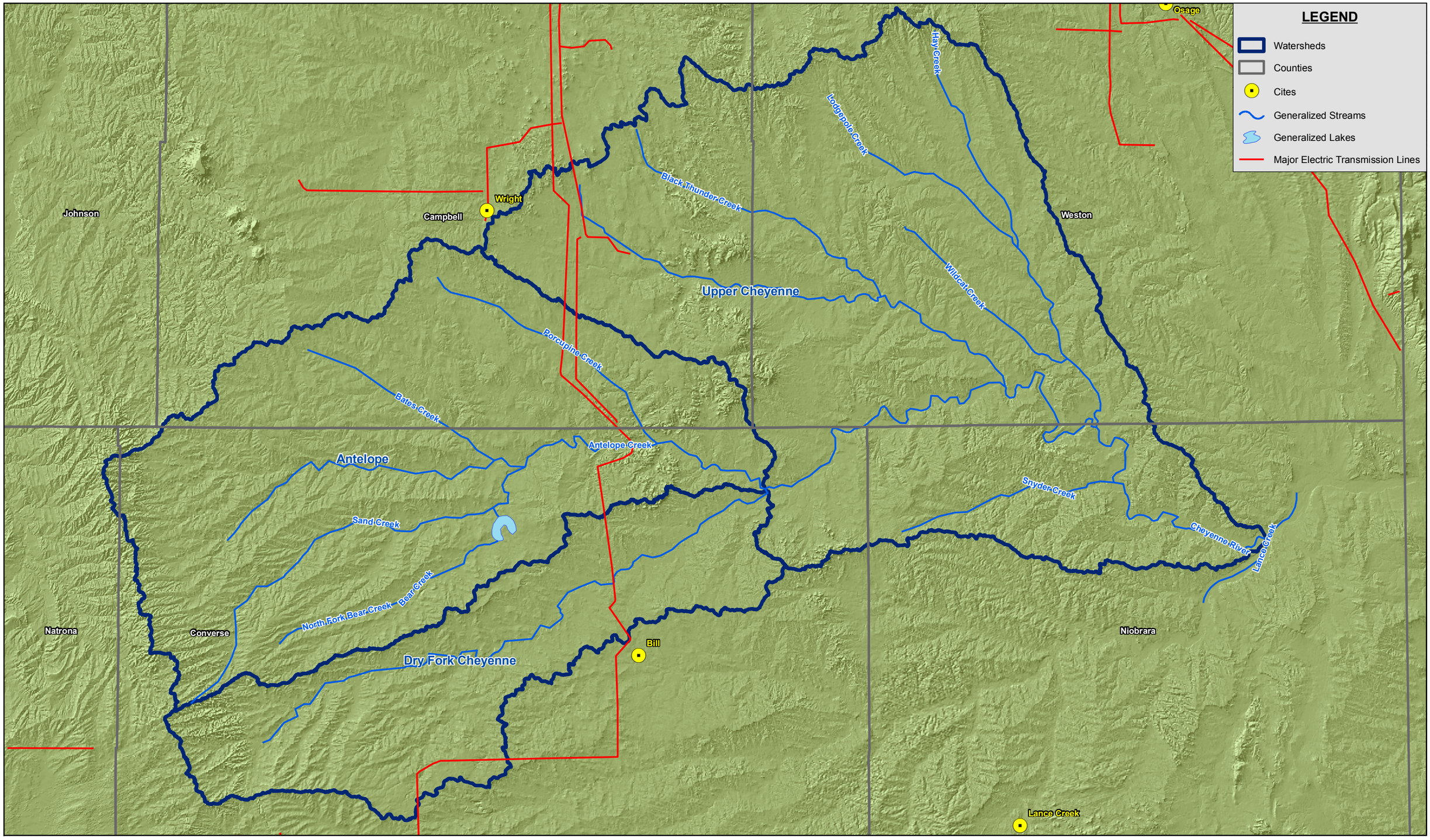
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Pipelines, 2002, WSGS	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**MAJOR PIPELINES** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 23



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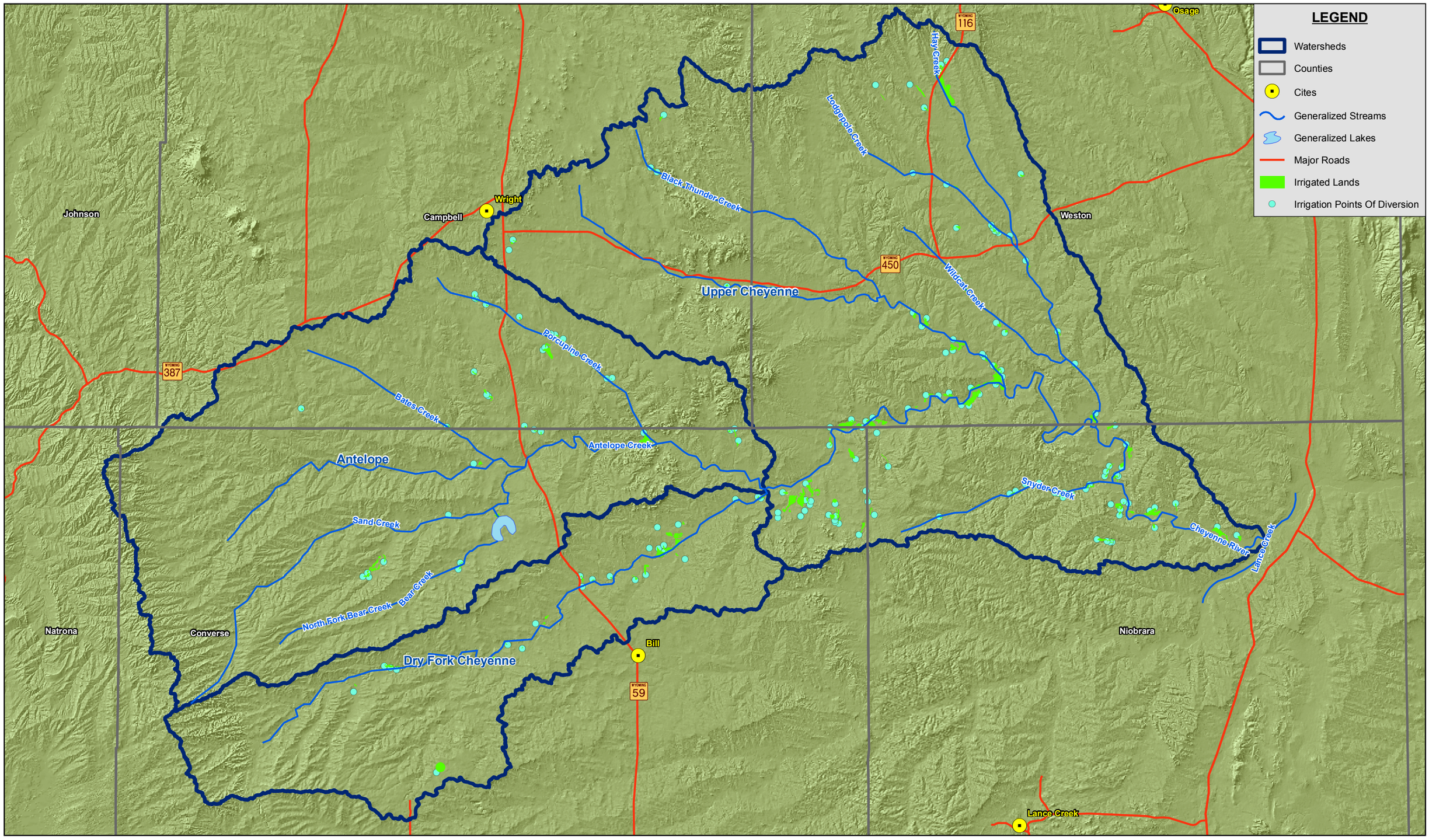
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Utilites, 1993, ESRI	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**MAJOR ELECTRIC TRANSMISSION LINES** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 24



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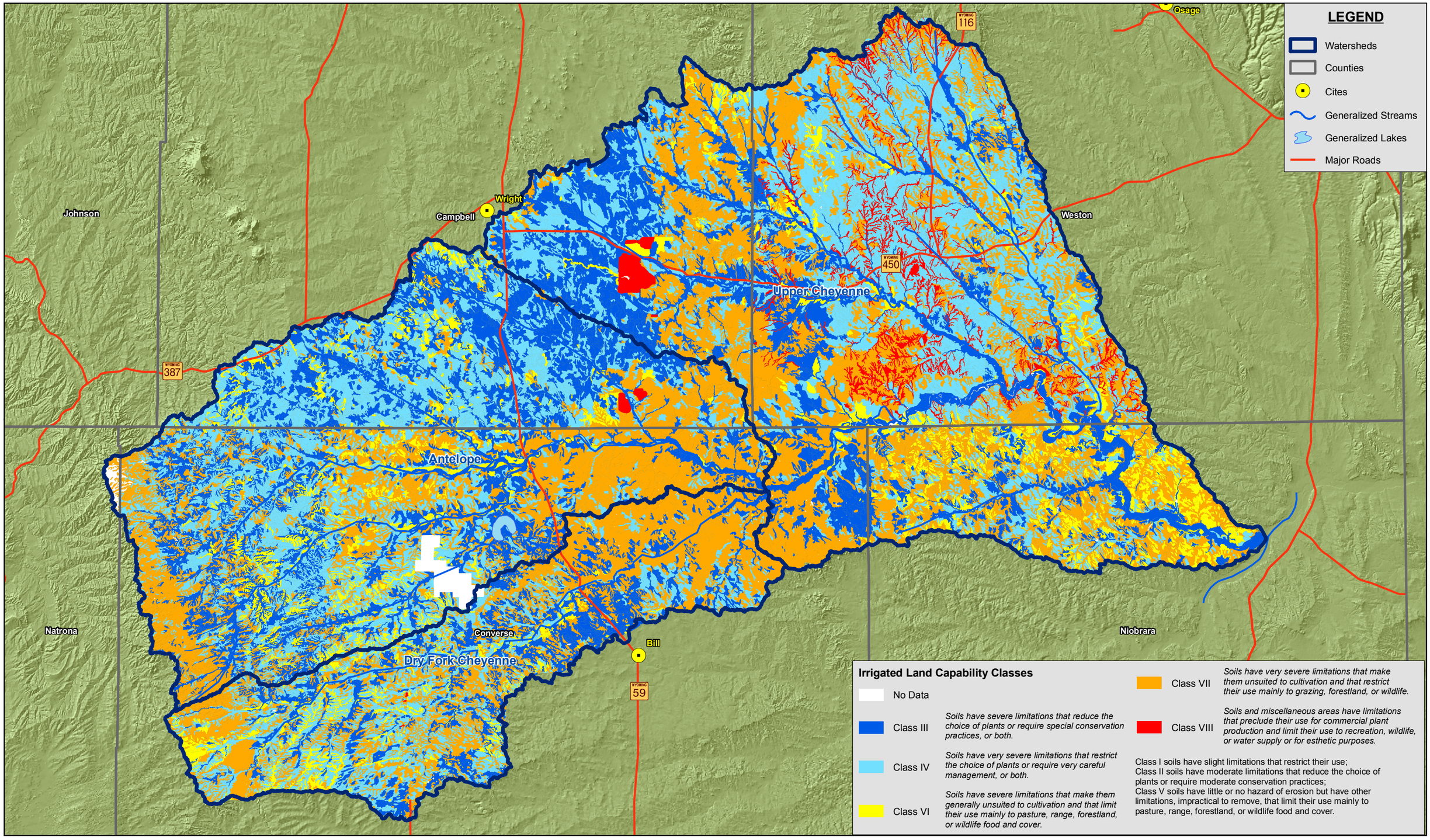
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Irrigated Lands, 2002, WWDC; Points of Diversion, 2002, WWDC	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**IRRIGATED LANDS** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 25



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PROJECT: 008-1217

DRAWN BY: RD

DATE: 11/16/2009

Source: Streams, 2006, ESRI;
Watershed, 2002, WYGISC; DEM, 2008, USGS
Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI;
Watershed Boundaries, 2005, USGS

3.5 0 3.5 7 10.5 Miles

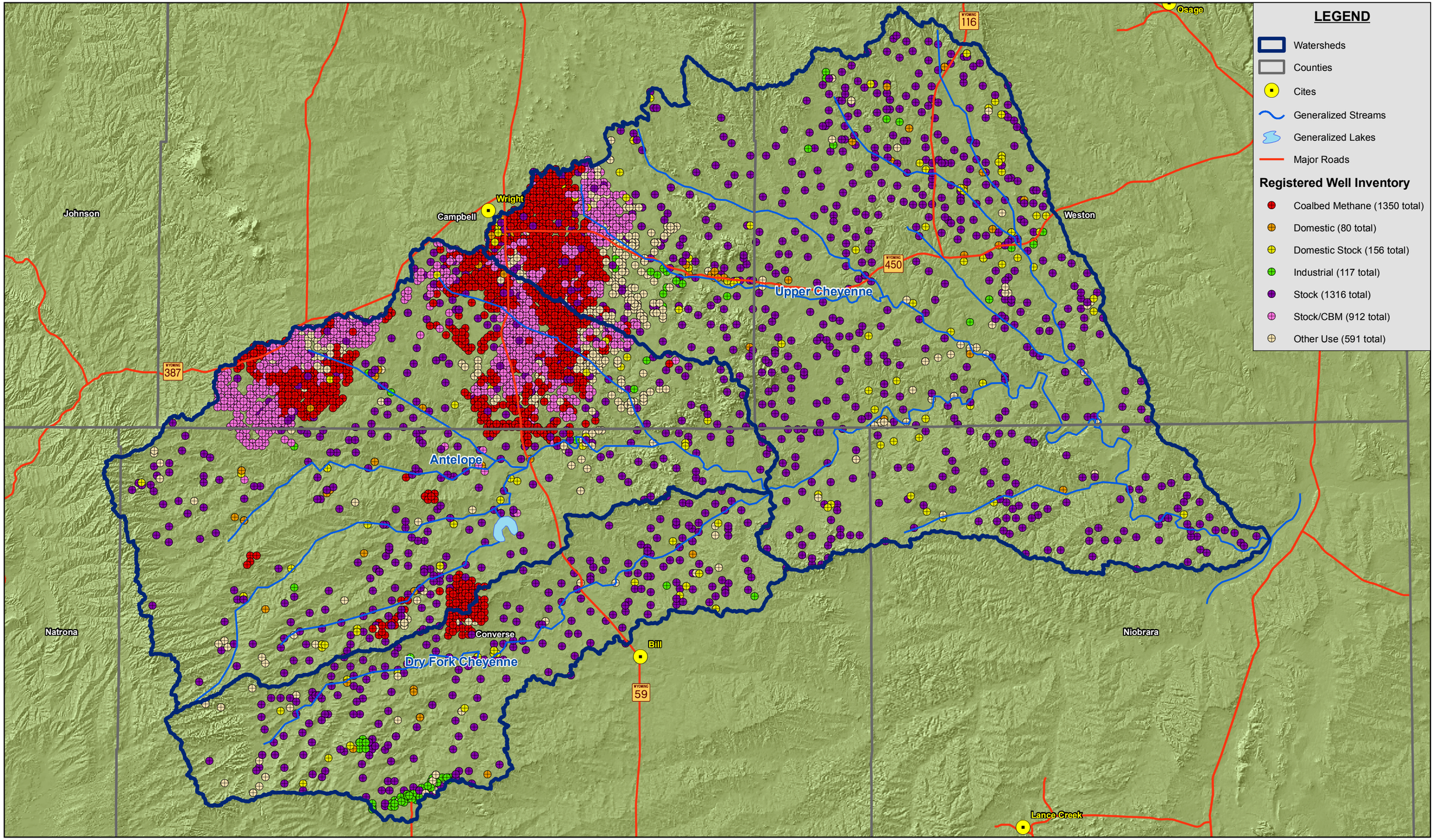
1:443,520

N

IRRIGATED LAND CAPABILITY CLASSES
Thunder Basin Watershed Study
Northeast Wyoming

OLSSON ASSOCIATES

MAP 26



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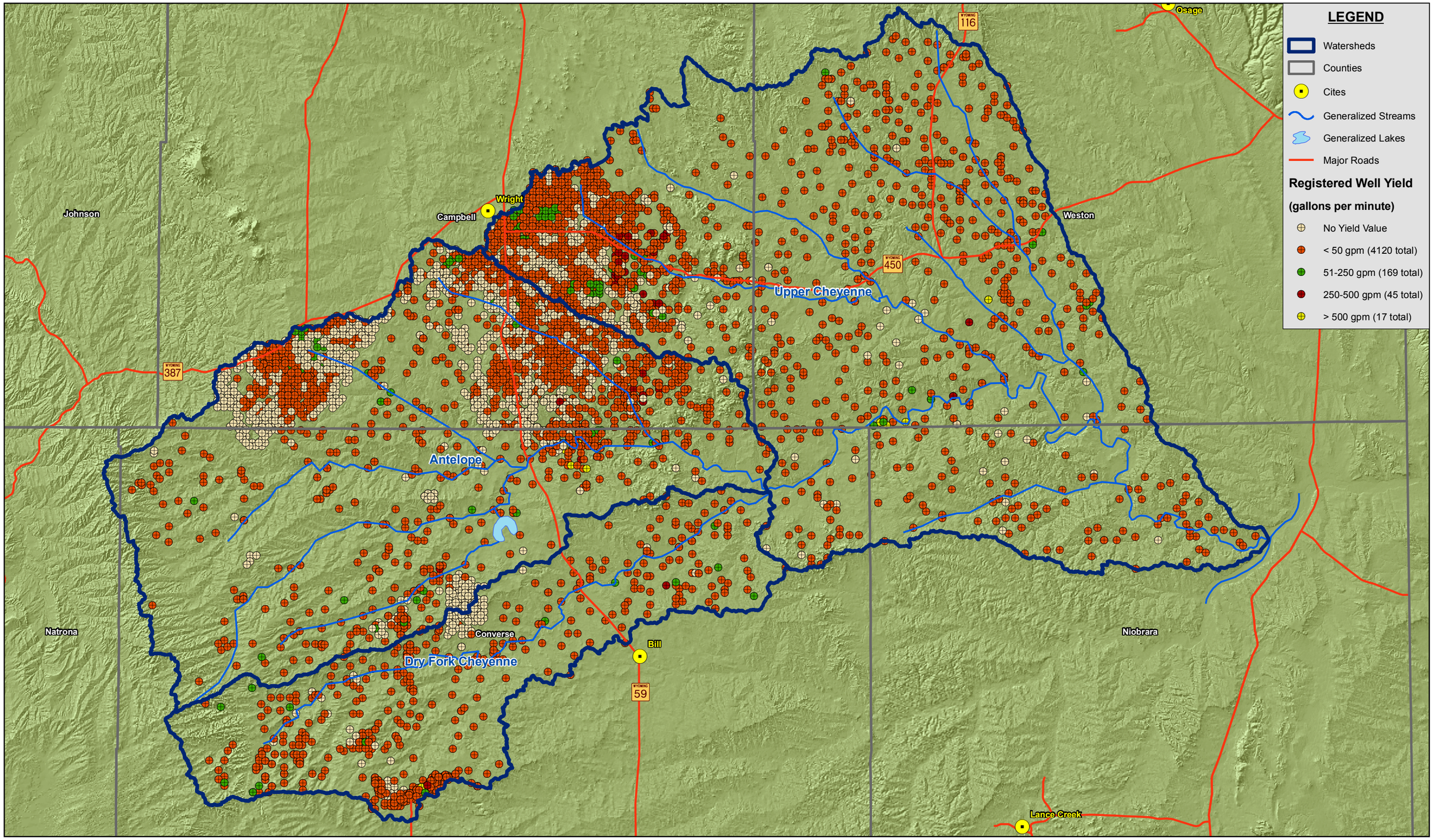
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**GROUNDWATER REGISTERED WELL INVENTORY MAP** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 27



PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**GROUNDWATER REGISTERED WELL YIELD MAP** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 28

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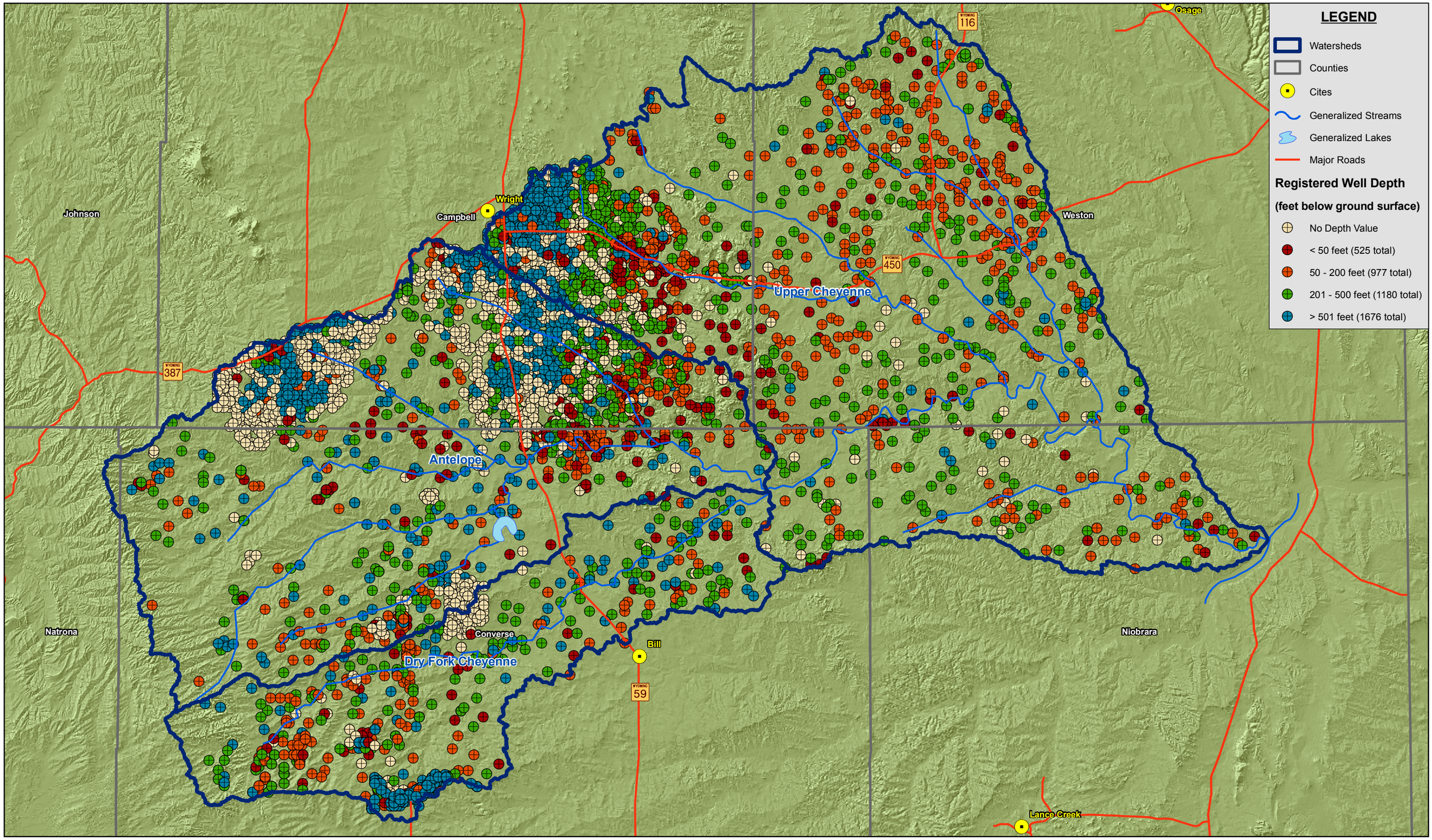

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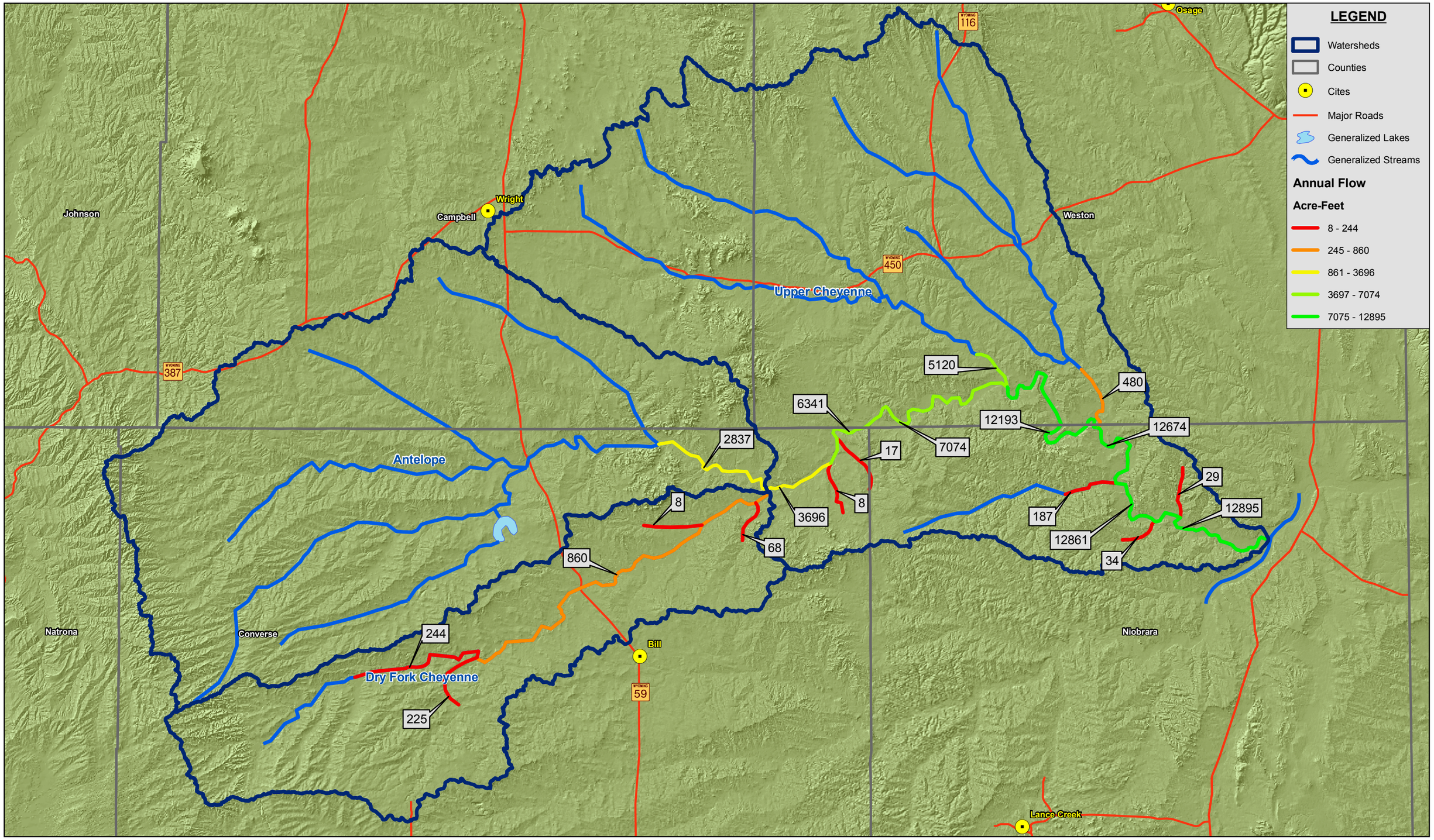
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**GROUNDWATER REGISTERED WELL DEPTH MAP** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 29



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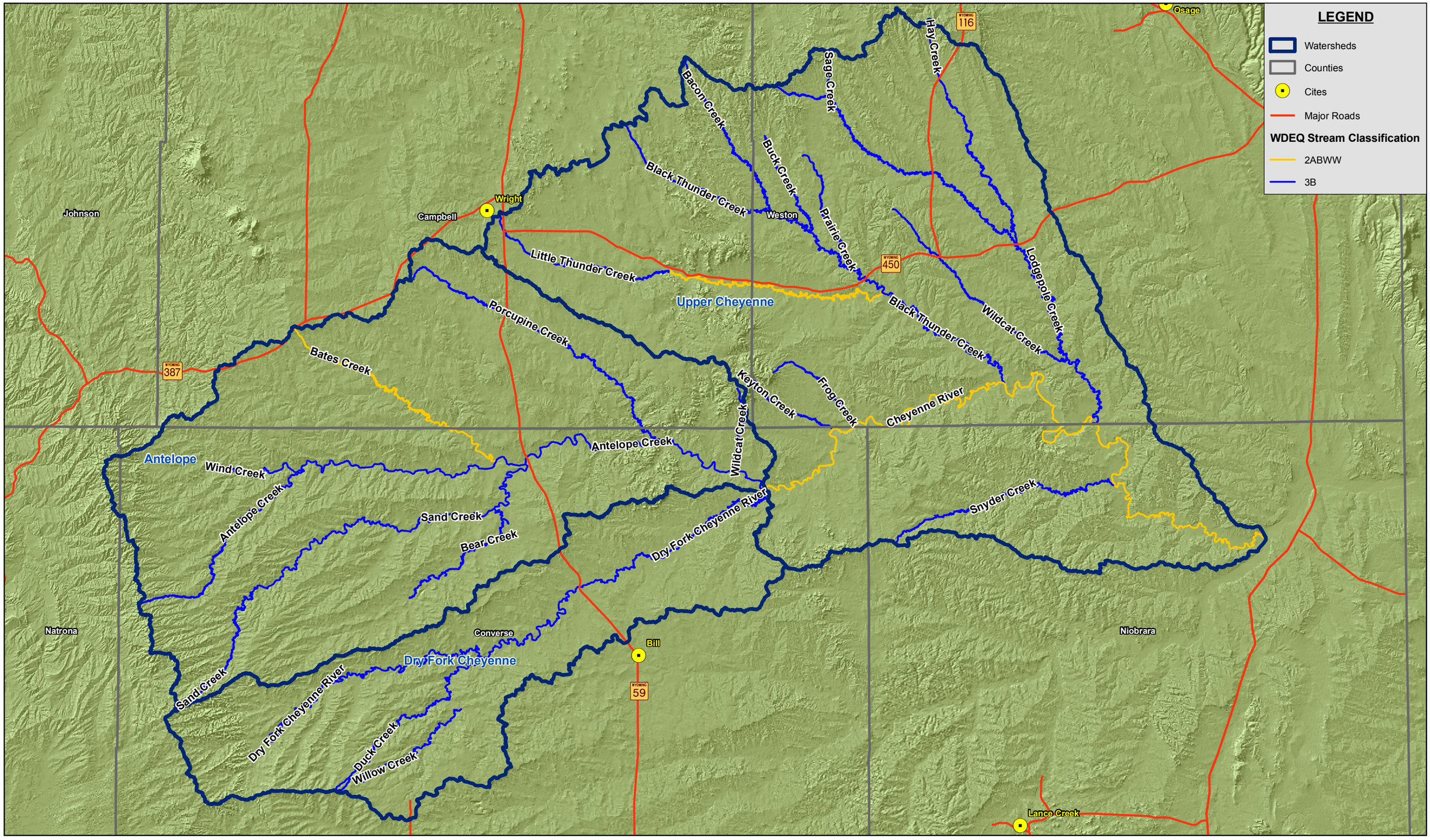
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**AVAILABLE SURFACE WATER** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 30



PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Oil Fields, 1990, WyGISC	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**WDEQ STREAM CLASSIFICATIONS** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES MAP 31

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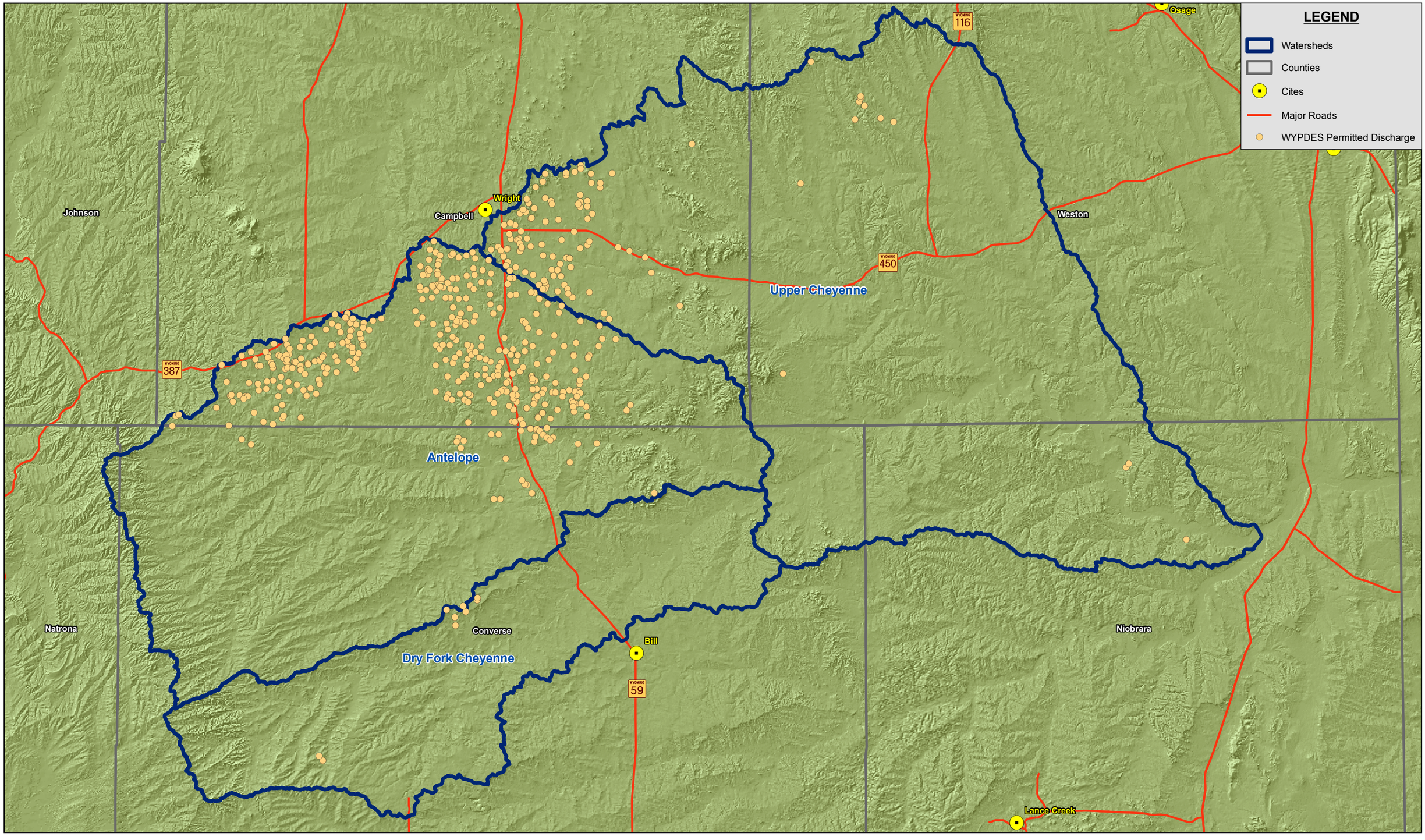

PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Oil Fields, 1990, WyGISC	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**WYPDES PERMITTED DISCHARGES** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 32

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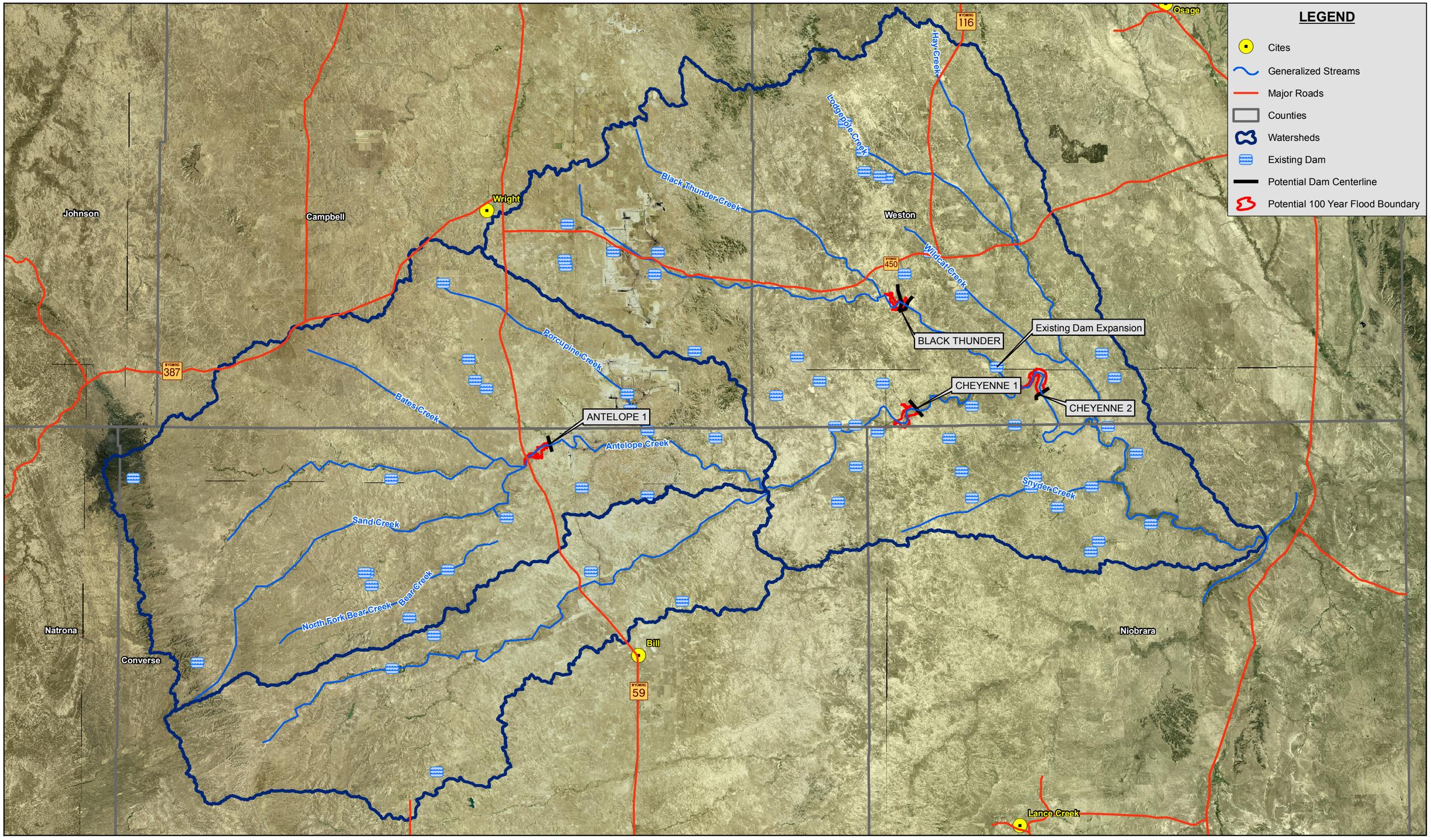

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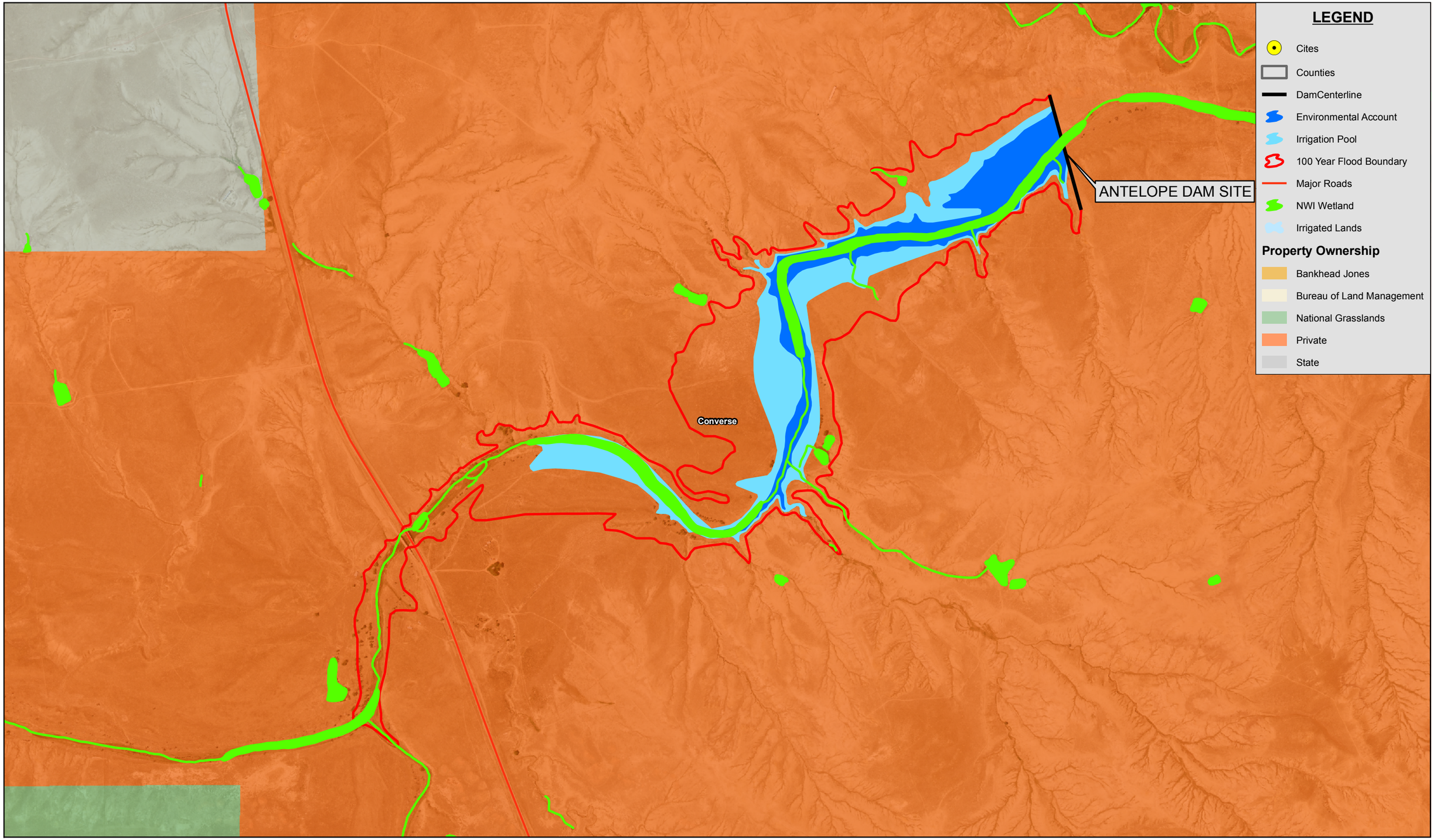
PROJECT: 008-1217 DRAWN BY: RD DATE: 7/31/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI;	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**POTENTIAL SURFACE WATER STORAGE SITES** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 33



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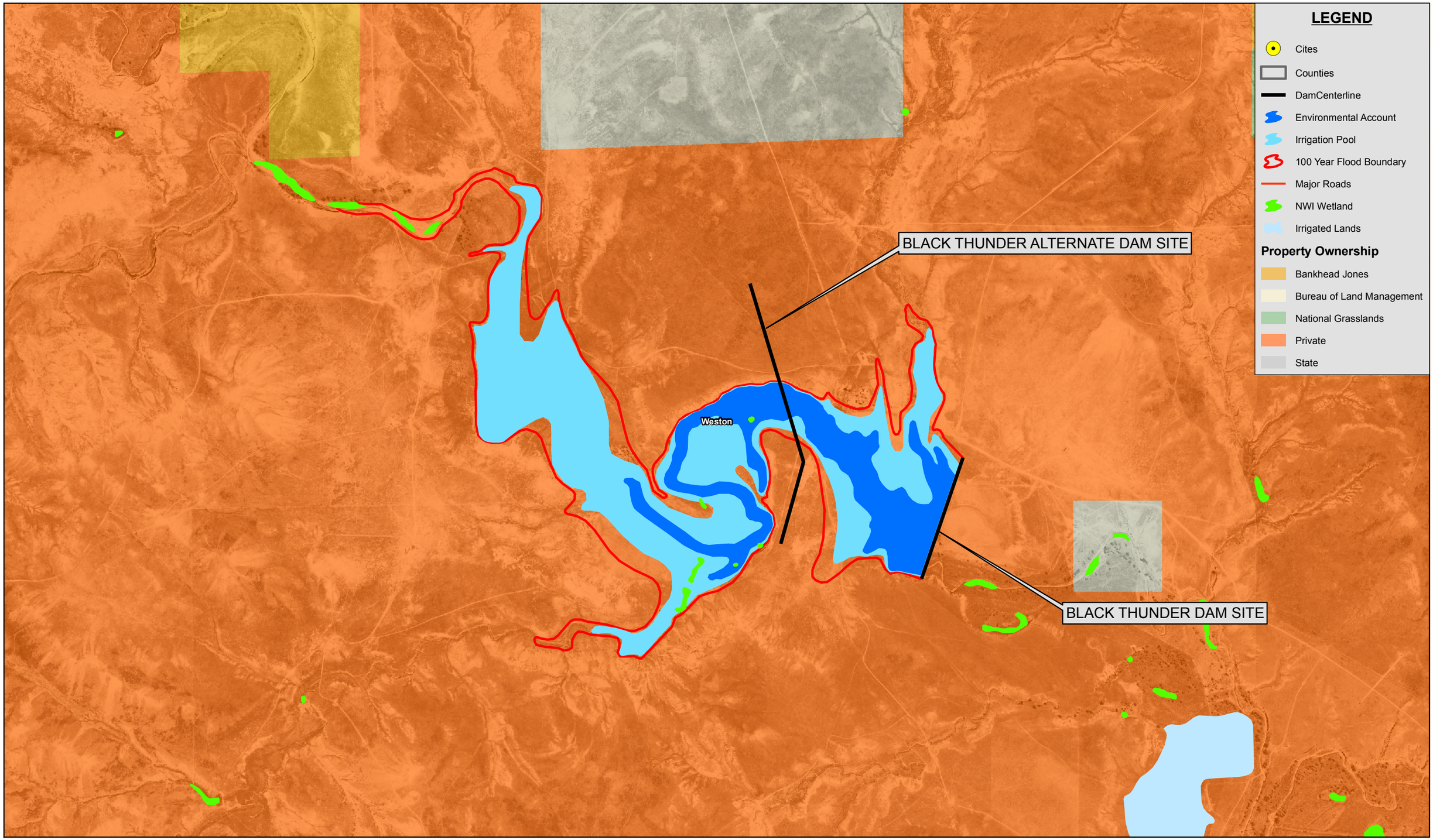
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/18/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI;	0.125 0 0.125 0.25 0.375 Miles 1:15,840 N	PROPOSED ANTELOPE DAM SITE Thunder Basin Watershed Study Northeast, Wyoming	OLSSON ASSOCIATES	MAP 34a



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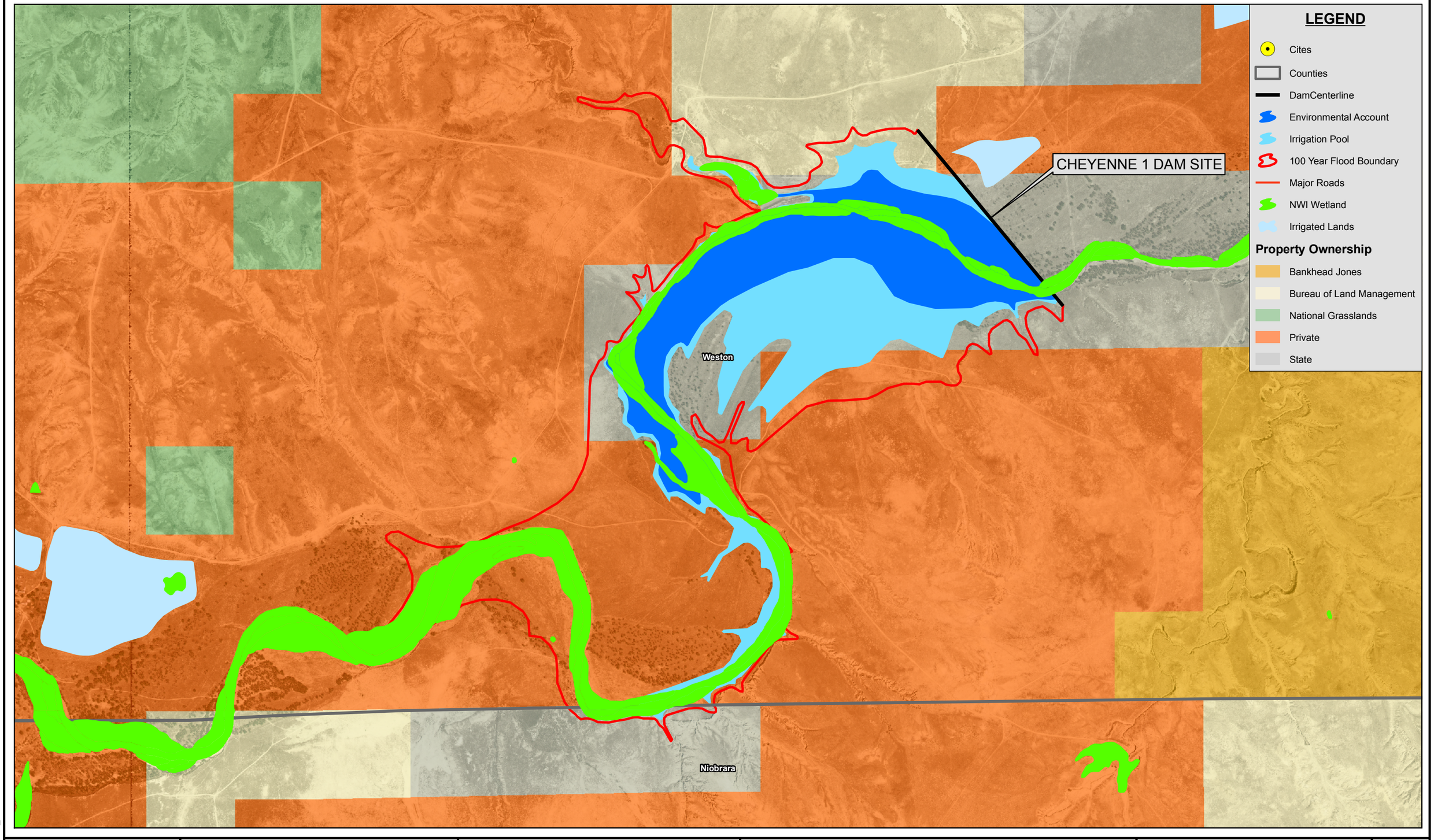
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/18/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI;	0.125 0 0.125 0.25 0.375 Miles 1:15,840 N	PROPOSED BLACK THUNDER DAM SITE Thunder Basin Watershed Study Northeast, Wyoming	OLSSON ASSOCIATES	MAP 34b



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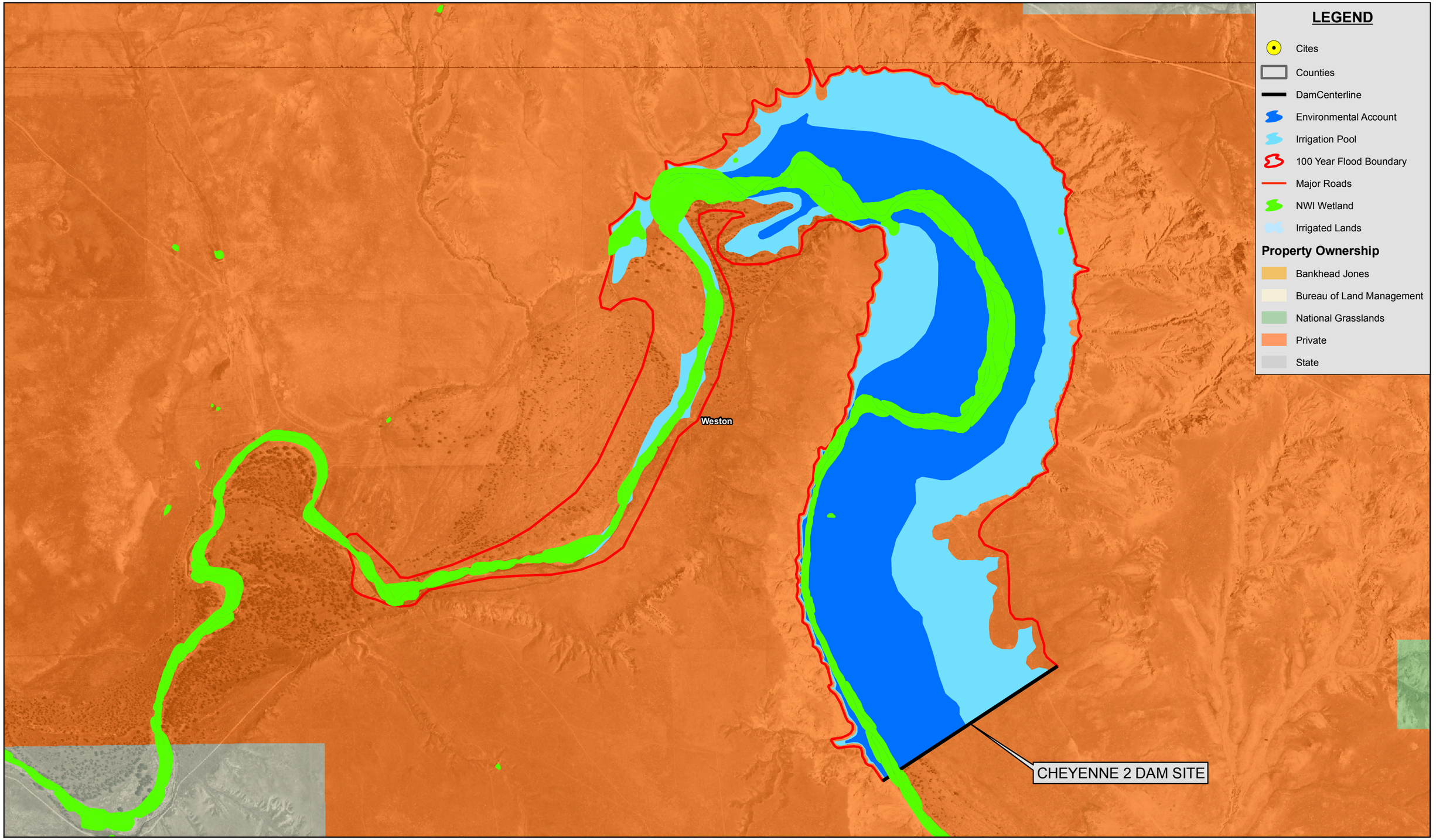
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/18/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI;	0.125 0 0.125 0.25 0.375 Miles 1:15,840 N	PROPOSED CHEYENNE 1 DAM SITE Thunder Basin Watershed Study Northeast, Wyoming	OLSSON ASSOCIATES	MAP 34c



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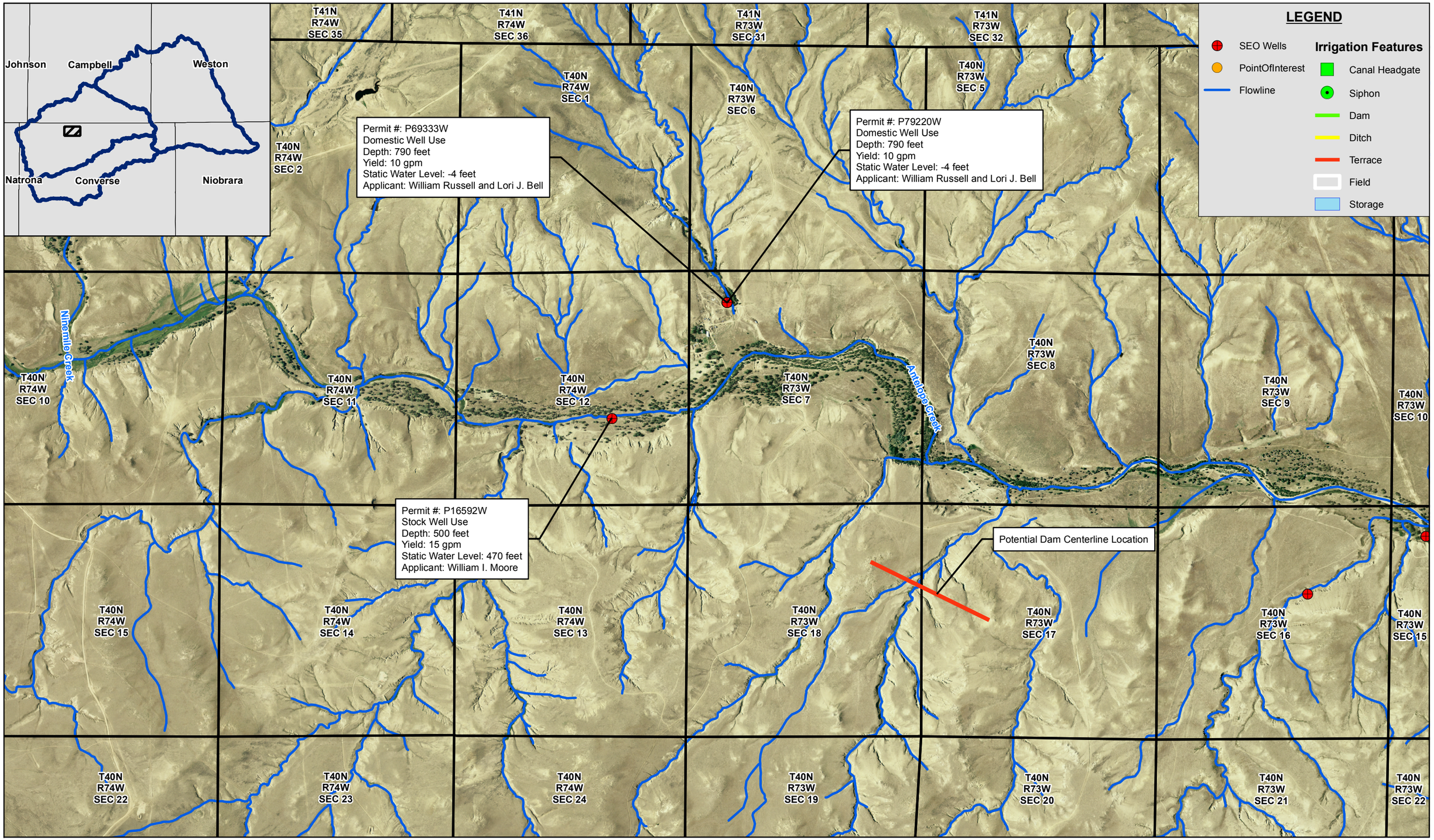
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/18/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI;	0.125 0 0.125 0.25 0.375 Miles 1:15,840 N	PROPOSED CHEYENNE 2 DAM SITE Thunder Basin Watershed Study Northeast, Wyoming	OLSSON ASSOCIATES	MAP 34d



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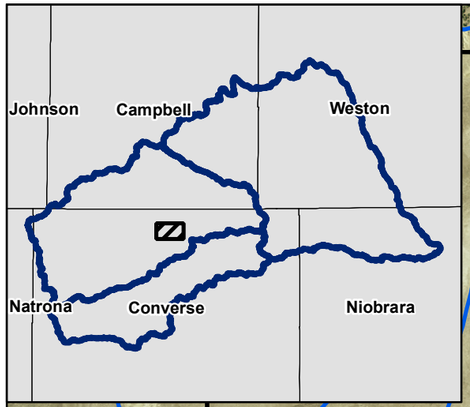
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/18/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	1,000 0 1,000 2,000 3,000 Feet 1:24,000 N	BELL RANCH Thunder Basin Watershed Study Northeast Wyoming	OLSSON ASSOCIATES	MAP 35a



Antelope Creek

T40N R72W SEC 10
T40N R72W SEC 11
T40N R72W SEC 12
T40N R72W SEC 15
T40N R72W SEC 13
T40N R72W SEC 14
T40N R72W SEC 20
T40N R72W SEC 21
T40N R72W SEC 22
T40N R72W SEC 23
T40N R72W SEC 24
T40N R71W SEC 19
T40N R71W SEC 20
T40N R72W SEC 27
T40N R72W SEC 26
T40N R72W SEC 29
T40N R72W SEC 28
T40N R72W SEC 25
T40N R71W SEC 30
T40N R71W SEC 29
T40N R72W SEC 32
T40N R72W SEC 33
T40N R72W SEC 34
T40N R72W SEC 35
T40N R72W SEC 36
T40N R71W SEC 31
T40N R71W SEC 32

Sand Creek

Permit #: P12478P
Domestic and Stock Well Use
Depth: 640 feet
Yield: 15 gpm
Static Water Level: -4 feet
Applicant: Duane and Chloe Haefele

Permit #: P12477P
Domestic and Stock Well Use
Depth: 880 feet
Yield: 10 gpm
Static Water Level: -4 feet
Applicant: Duane and Chloe Haefele

Permit #: P12479P
Stock Well Use
Depth: -1 feet
Yield: 20 gpm
Static Water Level: -4 feet
Applicant: Duane and Chloe Haefele

Permit #: P94280W
Domestic and Stock Well Use
Depth: 200 feet
Yield: 5 gpm
Static Water Level: 38 feet
Applicant: Haefele & Haefele

Location of Sand Creek Dam crossing discussed in Section 4.2.3.2. Actual Dam would be significantly larger.

LEGEND

- SEO Wells
- PointOfInterest
- Flowline

Irrigation Features

- Canal Headgate
- Siphon
- Dam
- Ditch
- Terrace
- Field
- Storage

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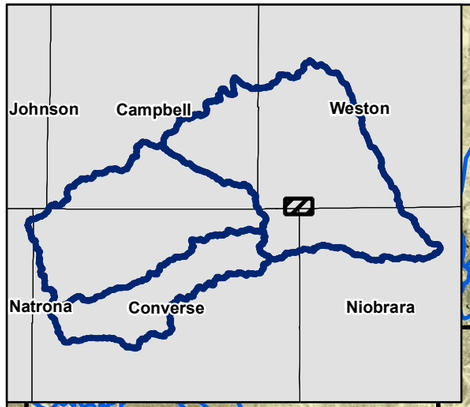
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/18/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	1,000 0 1,000 2,000 3,000 Feet 1:24,000 N	HAEFELE RANCH Thunder Basin Watershed Study Northeast Wyoming	OLSSON ASSOCIATES	MAP 35b



Permit #: P160276W
Stock Well Use
Depth: 175 feet
Yield: 10 gpm
Static Water Level: 70 feet
Applicant: Robert and Jean Harshbarger

Permit #: P12945P
Stock Well Use
Depth: 210 feet
Yield: 5 gpm
Static Water Level: 120 feet
Applicant: Robert and Jean Harshbarger

Permit #: P12947P
Stock Well Use
Depth: 160 feet
Yield: 20 gpm
Static Water Level: 60 feet
Applicant: Robert and Jean Harshbarger

Permit #: P155281W
Domestic and Stock Well Use
Depth: 160 feet
Yield: 0 gpm
Static Water Level: 60 feet
Applicant: Robert and Jean Harshbarger

Permit #: P140791W
Stock Well Use
Depth: 210 feet
Yield: 2 gpm
Static Water Level: 62 feet
Applicant: Robert and Jean Harshbarger

Permit #: P90835
Stock Well Use
Depth: 178 feet
Yield: 5 gpm
Static Water Level: 61 feet
Applicant: Jean Harshbarger

Potential Dam Centerline Location

Existing Stream Obstruction

Sherwin Dam

32 ACRES

87 ACRES

12.5 ACRES

Cheyenne River

T41N R67W SEC 16
T41N R67W SEC 15
T41N R67W SEC 14
T41N R67W SEC 17
T41N R67W SEC 20
T41N R68W SEC 24
T41N R67W SEC 19
T41N R67W SEC 22
T41N R67W SEC 23
T41N R67W SEC 24
T41N R67W SEC 21
T41N R67W SEC 30
T41N R67W SEC 29
T41N R67W SEC 28
T41N R67W SEC 27
T41N R67W SEC 26
T41N R67W SEC 25
T41N R68W SEC 36
T41N R67W SEC 31
T41N R67W SEC 32
T41N R67W SEC 33
T41N R67W SEC 34
T41N R67W SEC 35
T41N R67W SEC 36

LEGEND

- SEO Wells
- PointOfInterest
- Flowline

Irrigation Features

- Canal Headgate
- Siphon
- Dam
- Ditch
- Terrace
- Field
- Storage

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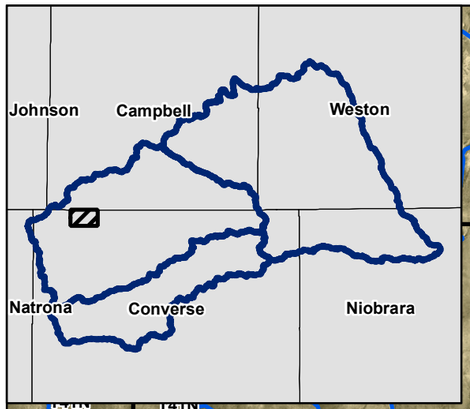
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/18/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	1,000 0 1,000 2,000 3,000 Feet 1:24,000 N	HARSHBARGER RANCH Thunder Basin Watershed Study Northeast Wyoming	OLSSON ASSOCIATES	MAP 35c



LEGEND

SEO Wells
PointOfInterest
Flowline

Irrigation Features

Canal Headgate
Siphon
Dam
Ditch
Terrace
Field
Storage

Permit #: 38/5/85W
Stock, Coal Bed Methane Well Use
Depth: Not Available
Yield: Not Available
Static Water Not Available
Applicant: Bill Barrett Corporation

Permit #: 38/4/86W
Stock, Coal Bed Methane Well Use
Depth: Not Available
Yield: Not Available
Static Water Not Available
Applicant: Bill Barrett Corporation

Permit #: 38/2/86W
Stock, Coal Bed Methane Well Use
Depth: Not Available
Yield: Not Available
Static Water Not Available
Applicant: Bill Barrett Corporation

Permit #: 38/10/85W
Stock, Coal Bed Methane Well Use
Depth: Not Available
Yield: Not Available
Static Water Not Available
Applicant: Bill Barrett Corporation

Permit #: 38/3/86W
Stock, Coal Bed Methane Well Use
Depth: Not Available
Yield: Not Available
Static Water Not Available
Applicant: Bill Barrett Corporation

Potential Dam Centerline Location

Permit #: 38/4/85W
Stock, Coal Bed Methane Well Use
Depth: Not Available
Yield: Not Available
Static Water Not Available
Applicant: Bill Barrett Corporation

Permit #: 38/1/86W
Stock, Coal Bed Methane Well Use
Depth: Not Available
Yield: Not Available
Static Water Not Available
Applicant: Bill Barrett Corporation

Permit #: 38/7/85W
Stock, Coal Bed Methane Well Use
Depth: Not Available
Yield: Not Available
Static Water Not Available
Applicant: Bill Barrett Corporation

Permit #: 38/6/85W
Stock, Coal Bed Methane Well Use
Depth: Not Available
Yield: Not Available
Static Water Not Available
Applicant: Bill Barrett Corporation

Permit #: 38/8/85W
Stock, Coal Bed Methane Well Use
Depth: Not Available
Yield: Not Available
Static Water Not Available
Applicant: Bill Barrett Corporation

Permit #: 38/9/85W
Stock, Coal Bed Methane Well Use
Depth: Not Available
Yield: Not Available
Static Water Not Available
Applicant: Bill Barrett Corporation

T41N R75W SEC 28
T41N R75W SEC 33
T41N R75W SEC 31
T41N R75W SEC 32
T41N R75W SEC 34
T41N R75W SEC 35
T41N R75W SEC 36
T41N R74W SEC 31
T40N R75W SEC 4
T40N R75W SEC 6
T40N R75W SEC 2
T40N R75W SEC 1
T40N R74W SEC 6
T40N R75W SEC 7
T40N R75W SEC 8
T40N R75W SEC 10
T40N R75W SEC 11
T40N R75W SEC 12
T40N R74W SEC 7
T40N R75W SEC 9
T40N R75W SEC 18
T40N R75W SEC 17
T40N R75W SEC 15
T40N R75W SEC 14
T40N R75W SEC 13
T40N R74W SEC 18

Wind Creek
Wind Creek
Wind Creek

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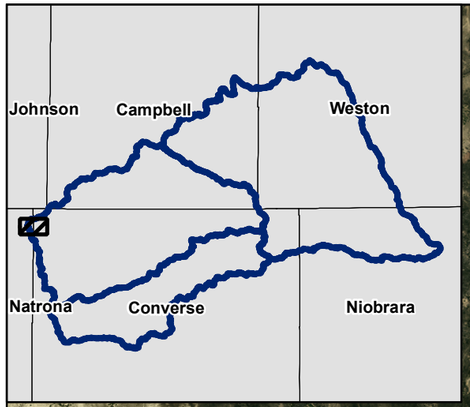
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/18/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	1,000 0 1,000 2,000 3,000 Feet 1:24,000 N	MOORE RANCH - EAST PROPERTY Thunder Basin Watershed Study Northeast Wyoming	OLSSON ASSOCIATES	MAP 35d



LEGEND

SEO Wells
PointOfInterest
Flowline

Irrigation Features

Canal Headgate
Siphon
Dam
Ditch
Terrace
Field
Storage

T40N R77W SEC 3
T40N R77W SEC 2
T40N R77W SEC 1
T40N R77W SEC 10
T40N R77W SEC 11
T40N R77W SEC 12
T40N R77W SEC 9
T40N R77W SEC 14
T40N R77W SEC 16
T40N R77W SEC 15
T40N R77W SEC 21
T40N R77W SEC 22
T40N R77W SEC 23
T40N R77W SEC 24
T40N R77W SEC 13
T40N R77W SEC 27
T40N R77W SEC 26
T40N R77W SEC 25
T40N R76W SEC 17
T40N R76W SEC 18
T40N R76W SEC 19
T40N R76W SEC 20
T40N R76W SEC 30
T40N R76W SEC 29

Permit #: P8387W
Domestic/Stock Well Use
Depth: 262 feet
Yield: 10 gpm
Static Water Level: 175 feet
Applicant: Brida Gafford

Permit #: P8385W
Stock Well Use
Depth: 20 feet
Yield: 5 gpm
Static Water Level: 10 feet
Applicant: Brida Gafford

Permit #: P8386W
Stock Well Use
Depth: 12 feet
Yield: 5 gpm
Static Water Level: 4 feet
Applicant: Brida Gafford

Permit #: P146419W
Stock Well Use
Depth: 1250 feet
Yield: 14 gpm
Static Water Level: 226 feet
Applicant: Ogalalla Land & Cattle, Ltd.

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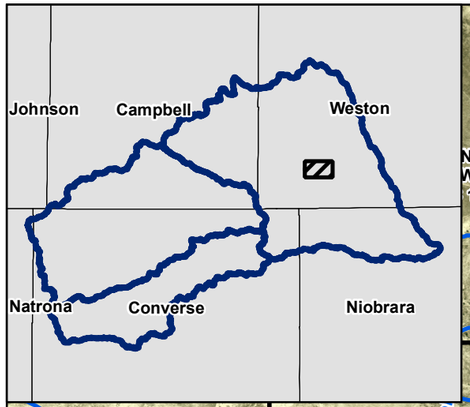
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/18/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	1,000 0 1,000 2,000 3,000 Feet 1:24,000 N	MOORE RANCH - WEST PROPERTY Thunder Basin Watershed Study Northeast Wyoming	OLSSON ASSOCIATES	MAP 35e



LEGEND

SEO Wells
PointOfInterest
Flowline

Irrigation Features

Canal Headgate
Siphon
Dam
Ditch
Terrace
Field
Storage

Permit #: P158993W
Miscellaneous Well Use
Depth: 190 feet
Yield: 20 gpm
Static Water Level: 150 feet
Applicant: Bryan Stroh

Permit #: P67541W
Stock Well Use
Depth: 400 feet
Yield: 4 gpm
Static Water Level: 130 feet
Applicant: U.S.D.A. Forest Service

62.5 ACRES

Permit #: P166516W
Domestic and Stock Well Use
Applicant: Bryan Stroh

Permit #: P160787W
Stock Well Use
Applicant: Bryan Stoh

Permit #: P160788W
Stock Well Use
Applicant: Bryan Stroh

65 ACRES

10 ACRES

17 ACRES

17 ACRES

23 ACRES

Permit #: P160785W
Stock Well Use
Depth: 105 feet
Static Water Level: 95 feet
Applicant: Bryan Stroh

Permit #: P15594W
Domestic and Stock Well Use
Depth: 206 feet
Yield: 25 gpm
Static Water Level: 65 feet
Applicant: Sammy Sewell

Permit #: P160047W
Miscellaneous Well Use
Applicant: Bruce Ranch Inc.

Permit #: P158718W
Stock Well Use
Depth: 189 feet
Yield: 25 gpm
Static Water Level: 60 feet
Applicant: Bruce Ranch Inc.

T42N R66W SEC 6
T42N R66W SEC 5
T42N R66W SEC 4
T42N R67W SEC 12
T42N R67W SEC 11
T42N R66W SEC 7
T42N R66W SEC 8
T42N R66W SEC 9
T42N R66W SEC 10
T42N R66W SEC 11
T42N R67W SEC 14
T42N R67W SEC 13
T42N R66W SEC 18
T42N R66W SEC 17
T42N R66W SEC 16
T42N R66W SEC 15
T42N R66W SEC 14
T42N R67W SEC 23
T42N R67W SEC 24
T42N R66W SEC 19
T42N R66W SEC 20
T42N R66W SEC 21
T42N R66W SEC 22
T42N R66W SEC 23

Lion Creek
Horse Creek

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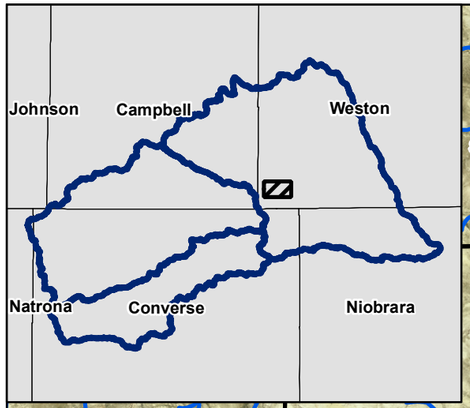
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/18/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	1,000 0 1,000 2,000 3,000 Feet 1:24,000 N	STROH RANCH Thunder Basin Watershed Study Northeast Wyoming	OLSSON ASSOCIATES	MAP 35f



T42N R68W SEC 28
T42N R68W SEC 27
T42N R68W SEC 26
T42N R68W SEC 25
T42N R67W SEC 30
T42N R68W SEC 32
T42N R68W SEC 33
T42N R68W SEC 34
T42N R68W SEC 35
T42N R68W SEC 36
T42N R67W SEC 31
T41N R68W SEC 2
T41N R68W SEC 3
T41N R68W SEC 1
T41N R67W SEC 6
T41N R67W SEC 5
T41N R68W SEC 5
T41N R68W SEC 4
T41N R68W SEC 10
T41N R68W SEC 8
T41N R68W SEC 9
T41N R68W SEC 11
T41N R68W SEC 12
T41N R67W SEC 7
T41N R67W SEC 8
Frog Creek

Permit #: P17193P
Stock Well Use
Depth: 150 feet
Yield: 5 gpm
Static Water Level: 55 feet
Applicant: Earl Lynch

Permit #: P60458W
Stock Well Use
Depth: 200 feet
Yield: 4 gpm
Static Water Level: 130 feet
Applicant: U.S.D.A. Forest Service

Permit #: P12943P
Stock Well Use
Depth: 296 feet
Yield: 10 gpm
Static Water Level: 180 feet
Applicant: Robert and Jean Harshbarger

Permit #: P12726P
Stock Well Use
Depth: 125 feet
Yield: 4 gpm
Static Water Level: -1 feet
Applicant: U.S.D.A. Forest Service

Permit #: P60459W
Stock Well Use
Depth: 240 feet
Yield: 4 gpm
Static Water Level: 165 feet
Applicant: U.S.D.A. Forest Service

Permit #: P67903W
Stock Well Use
Depth: 6 feet
Yield: 0 gpm
Static Water Level: 5 feet
Applicant: U.S.D.A. Forest Service

Permit #: P8990P
Stock Well Use
Depth: 270 feet
Yield: 4 gpm
Static Water Level: 110 feet
Applicant: U.S.D.A. Forest Service

Permit #: P56023W
Stock Well Use
Depth: 191 feet
Yield: 10 gpm
Static Water Level: 90 feet
Applicant: U.S.D.A. Forest Service

Permit #: P8964P
Stock Well Use
Depth: 302 feet
Yield: 4 gpm
Static Water Level: 110 feet
Applicant: U.S.D.A. Forest Service

Permit #: P9569W
Stock Well Use
Depth: 145 feet
Yield: 4 gpm
Static Water Level: 80 feet
Applicant: U.S.D.A. Forest Service

Permit #: P9570W
Stock Well Use
Depth: 700 feet
Yield: 5 gpm
Static Water Level: 120 feet
Applicant: U.S.D.A. Forest Service

LEGEND

SEO Wells
PointOfInterest
Flowline

Irrigation Features

Canal Headgate
Siphon
Dam
Ditch
Terrace
Field
Storage

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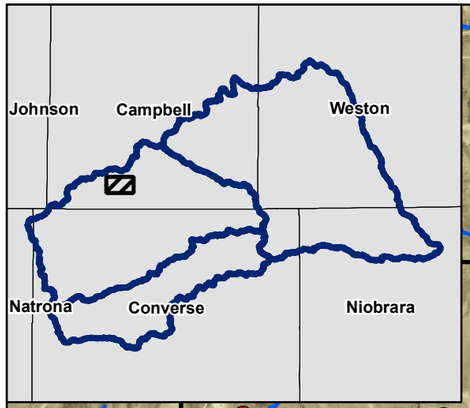
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/18/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	1,000 0 1,000 2,000 3,000 Feet 1:24,000 N	LYNCH RANCH Thunder Basin Watershed Study Northeast Wyoming	OLSSON ASSOCIATES	MAP 35g



LEGEND

- SEO Wells
- PointOfInterest
- Flowline

Irrigation Features

- Canal Headgate
- Siphon
- Dam
- Ditch
- Terrace
- Field
- Storage

T42N R74W SEC 23 | T42N R74W SEC 24 | T42N R73W SEC 19 | T42N R73W SEC 20

T42N R74W SEC 28 | T42N R74W SEC 27 | T42N R74W SEC 26 | T42N R74W SEC 25 | T42N R73W SEC 30 | T42N R73W SEC 29 | T42N R73W SEC 28

19 ACRES

T42N R74W SEC 33 | T42N R74W SEC 34 | T42N R74W SEC 35 | T42N R74W SEC 36 | T42N R73W SEC 31 | T42N R73W SEC 32 | T42N R73W SEC 33

19 ACRES

Bates Creek

T41N R74W SEC 4 | T41N R74W SEC 3 | T41N R74W SEC 2 | T41N R74W SEC 1 | T41N R73W SEC 6 | T41N R73W SEC 5 | T41N R73W SEC 4

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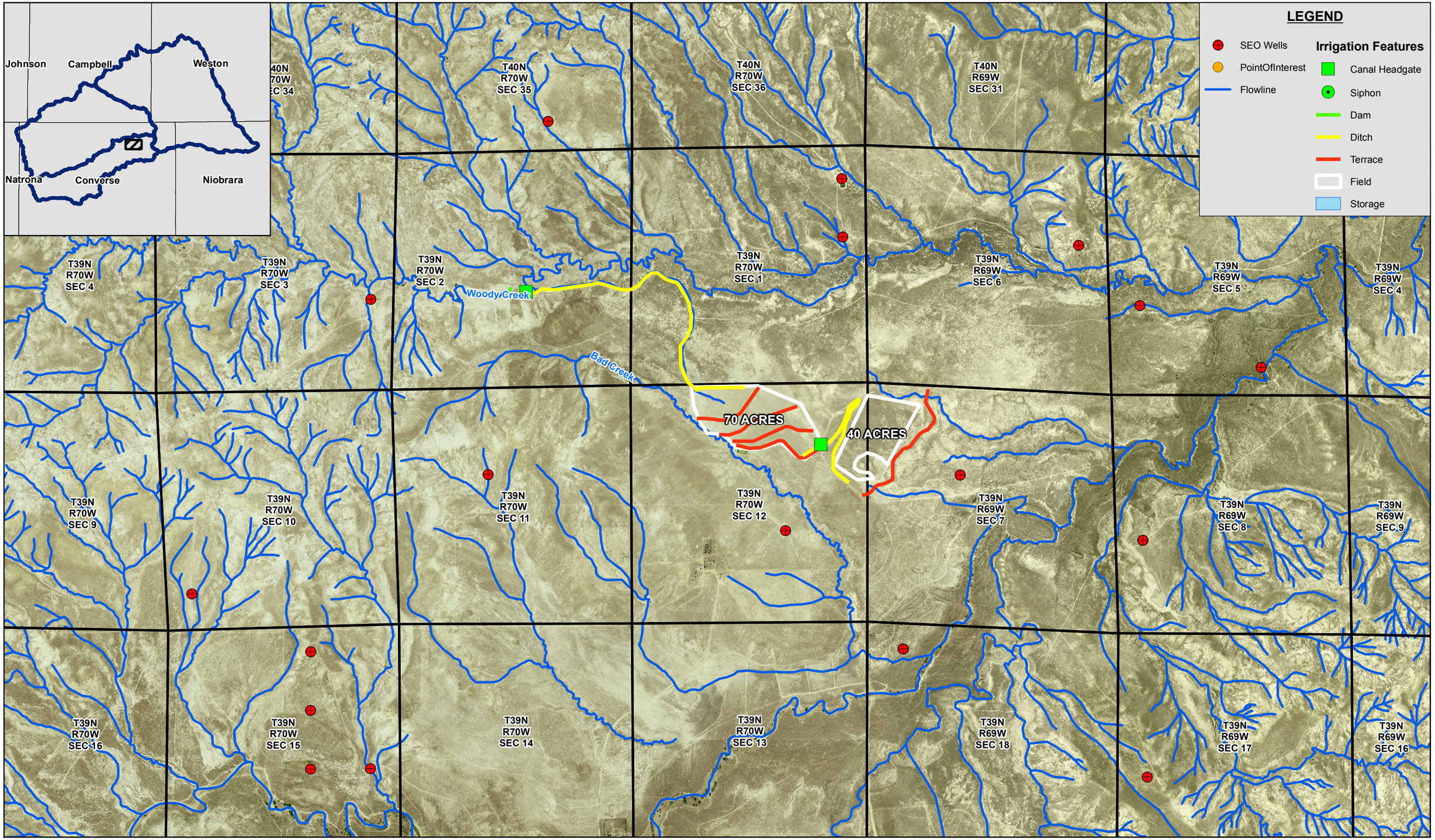
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/18/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	1,000 0 1,000 2,000 3,000 Feet 1:24,000 N	TURNER RANCH Thunder Basin Watershed Study Northeast Wyoming	OLSSON ASSOCIATES	MAP 35h



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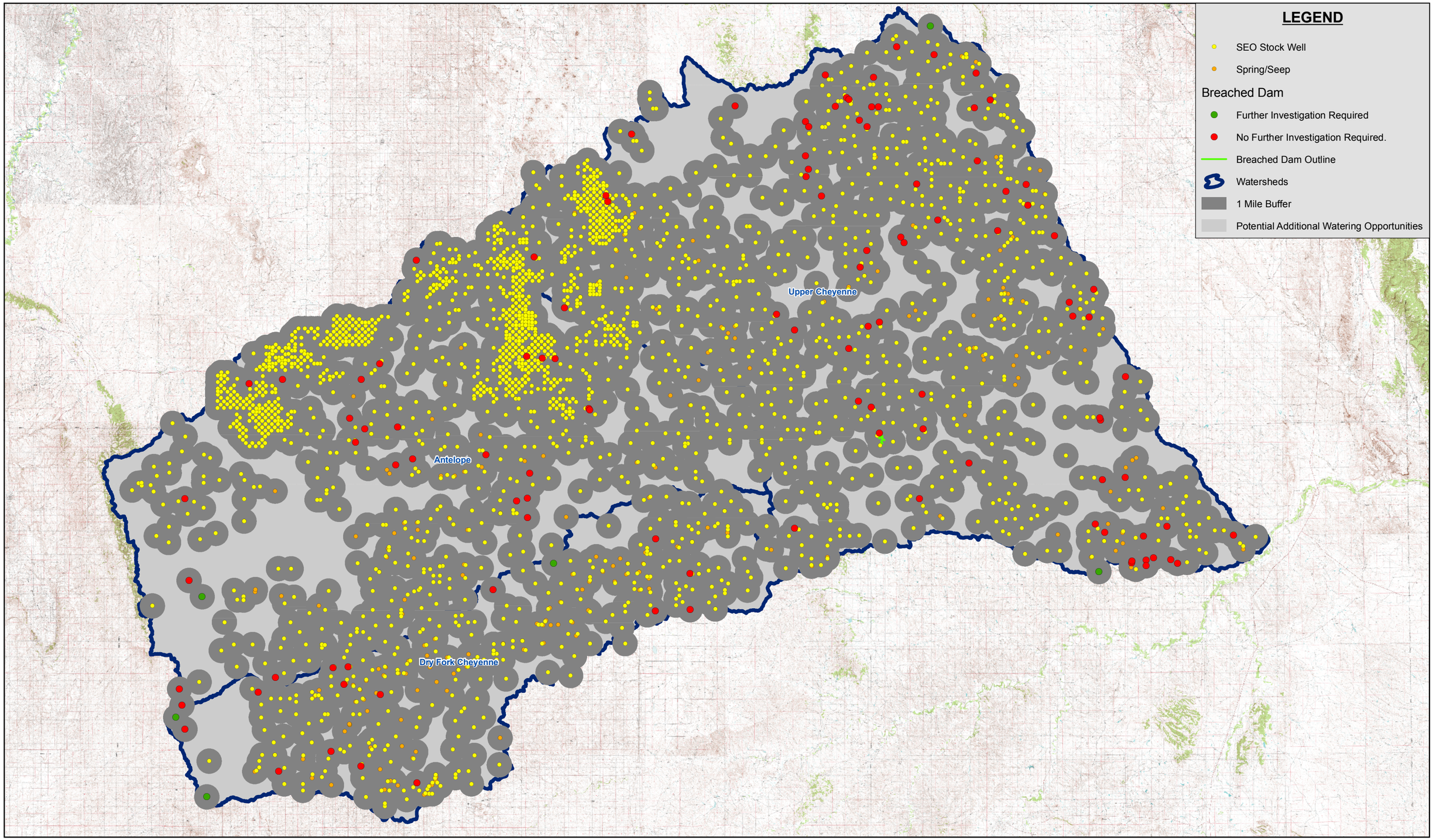
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/18/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	1,000 0 1,000 2,000 3,000 Feet 1:24,000 N	PELLATZ RANCH Thunder Basin Watershed Study Northeast Wyoming	OLSSON ASSOCIATES	MAP 35i



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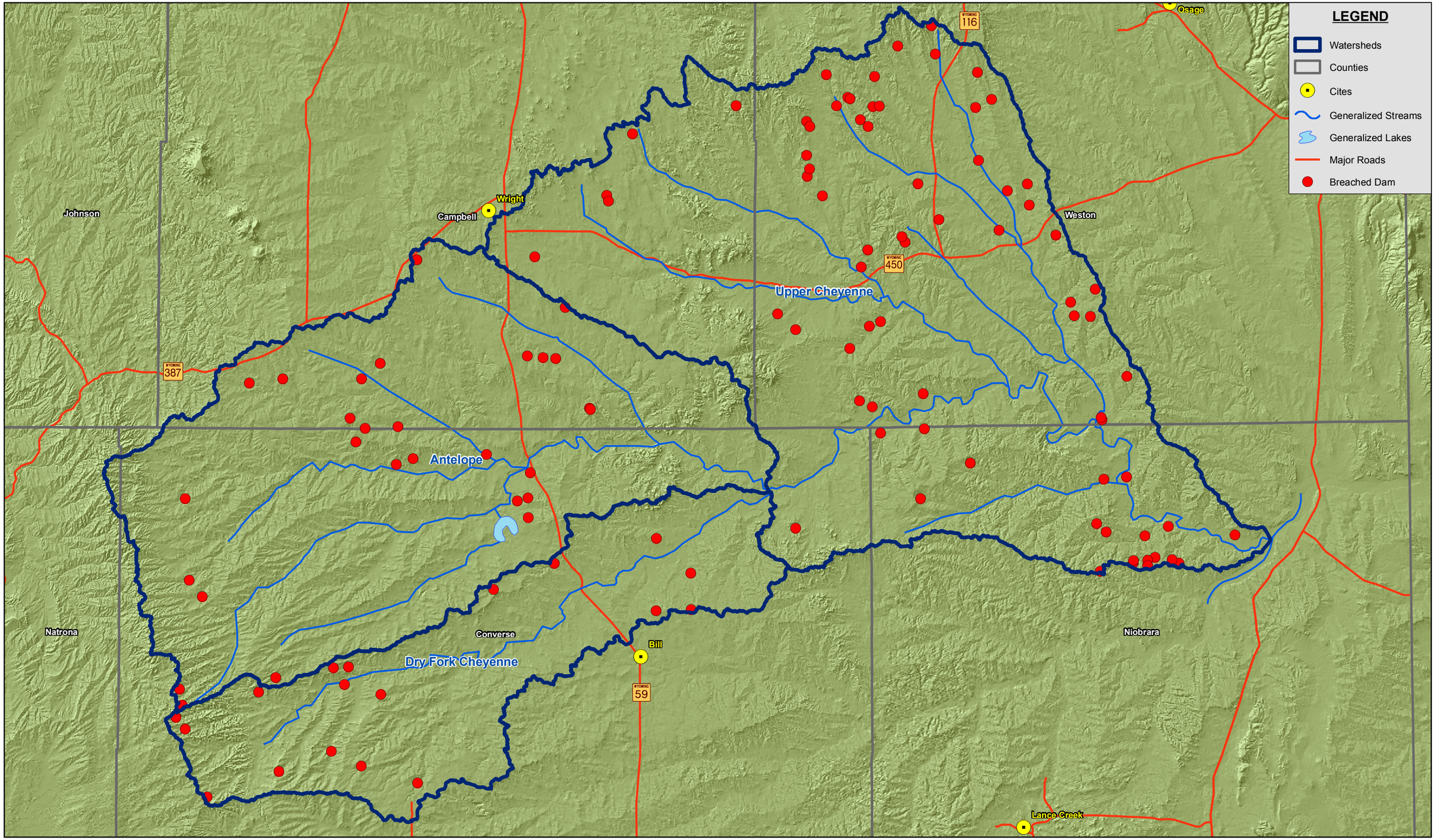
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI;	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**EXISTING WILDLIFE/LIVESTOCK WATERING OPPORTUNITIES** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 36



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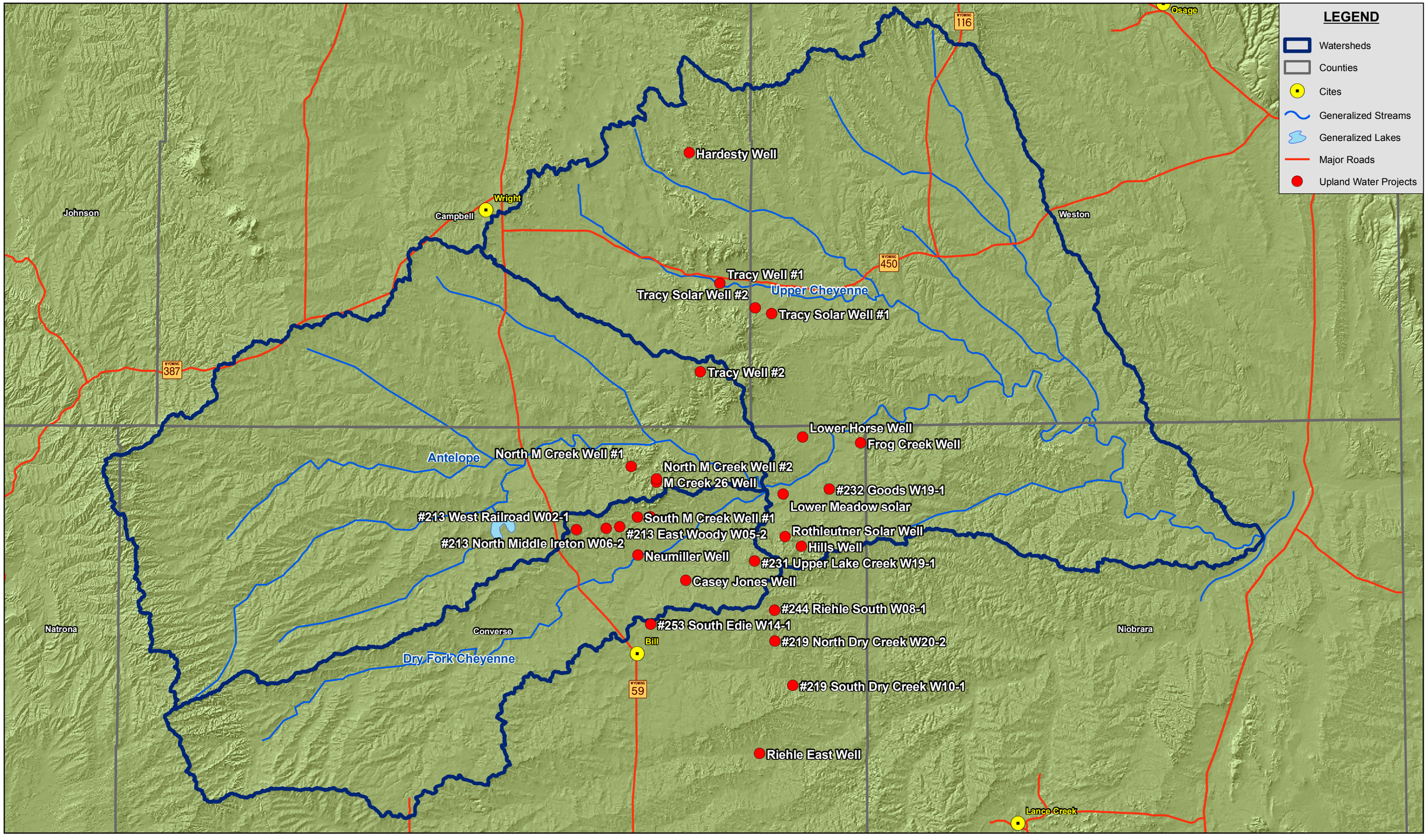
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**BREACHED DAM LOCATION MAP** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 37



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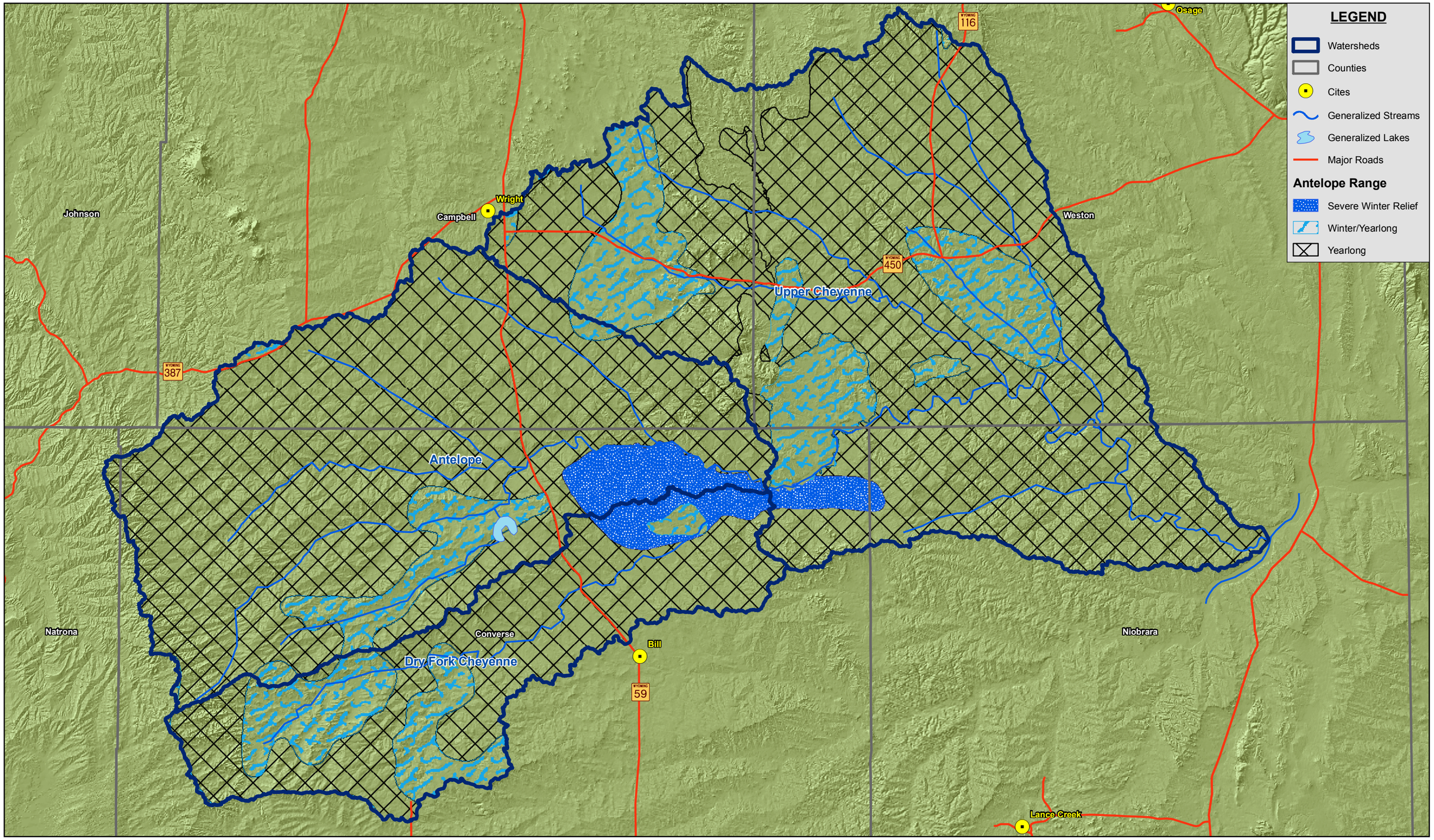
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Upland Water Projects, Thunder Basin Grazing Association (TBGA)	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**CURRENT WATER DEVELOPMENT PROJECTS** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 38



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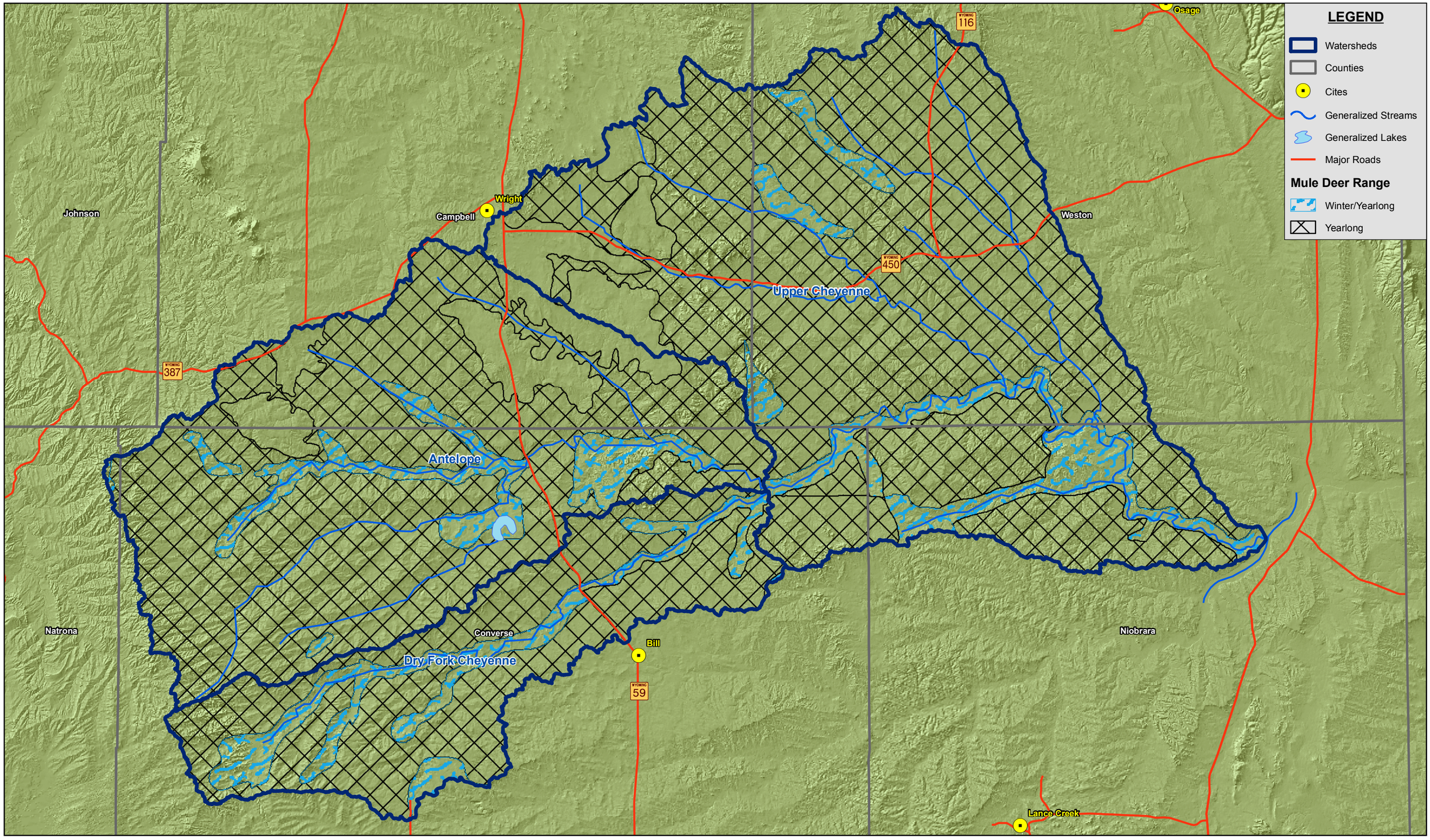
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Antelope Range, 2002, WY G&F	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**ANTELOPE RANGE** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 39



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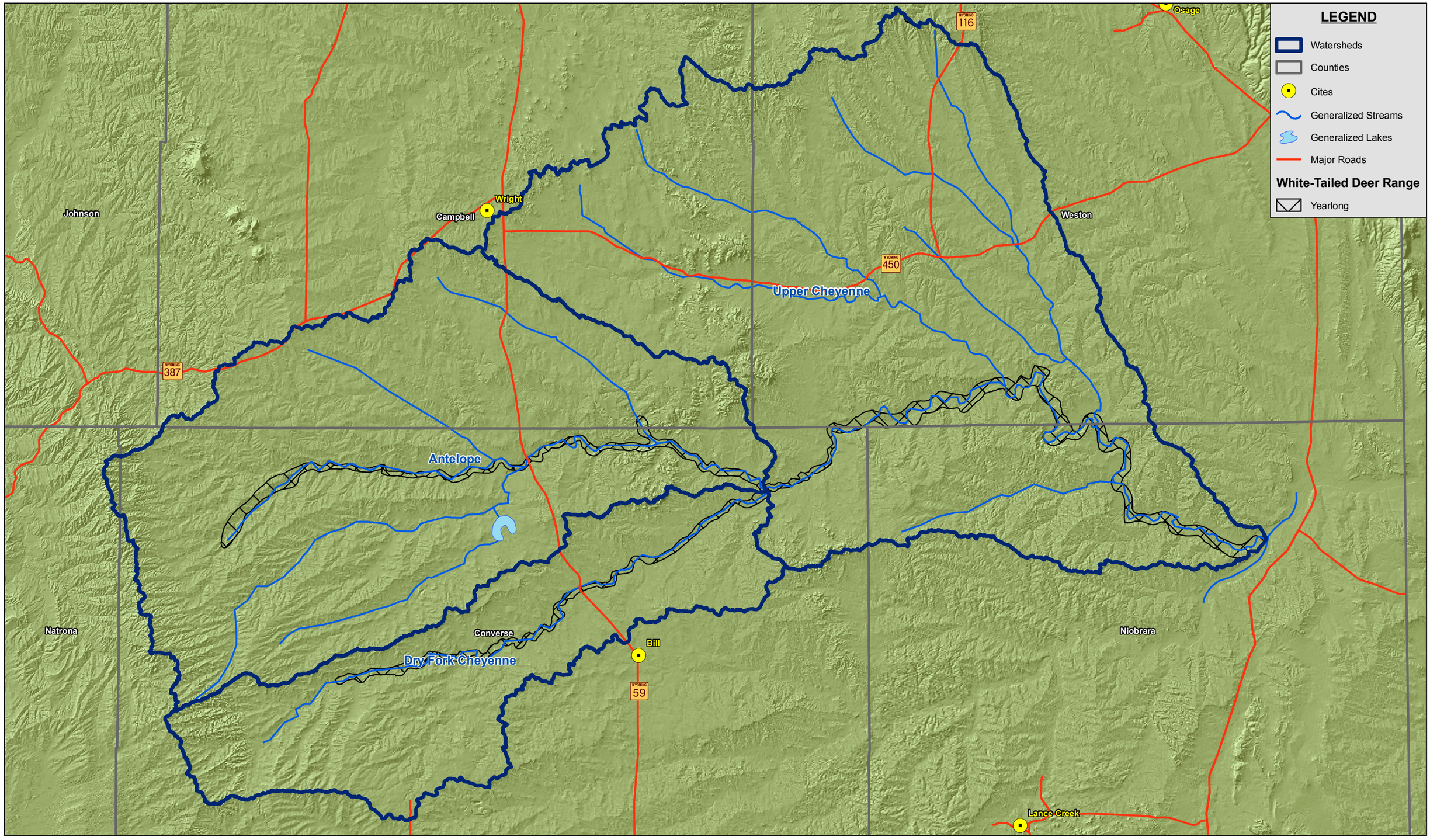
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Mule Deer Range, 2002, WY G&F	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**MULE DEER RANGE** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 40



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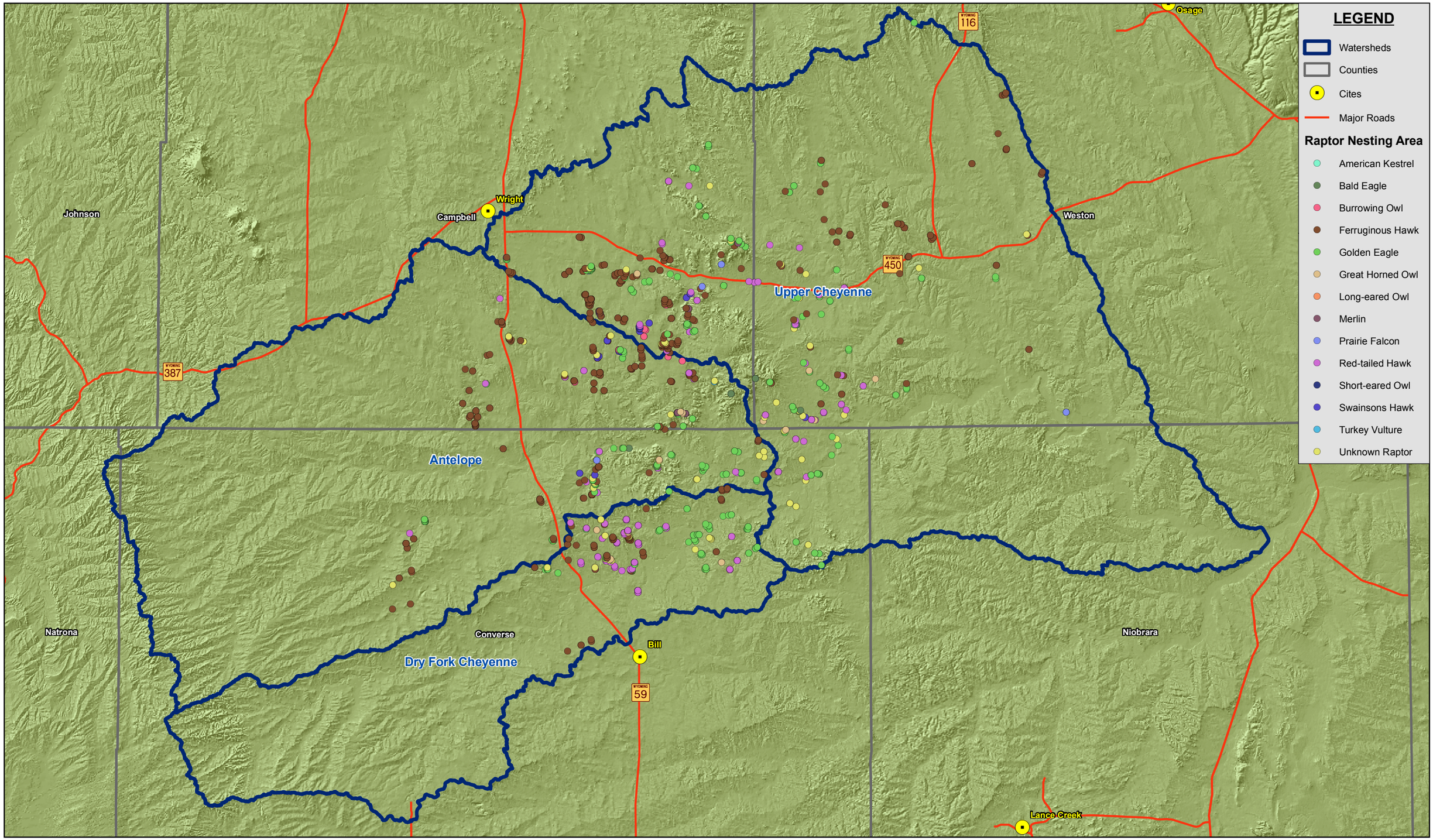
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Whitetail Deer, 2002, WY F&G	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**WHITETAIL DEER RANGE** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 41



PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Watershed Boundaries, 2005, USGS; Raptor Nesting Areas, 2009, USFWS	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**RAPTOR NESTING AREAS** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 42

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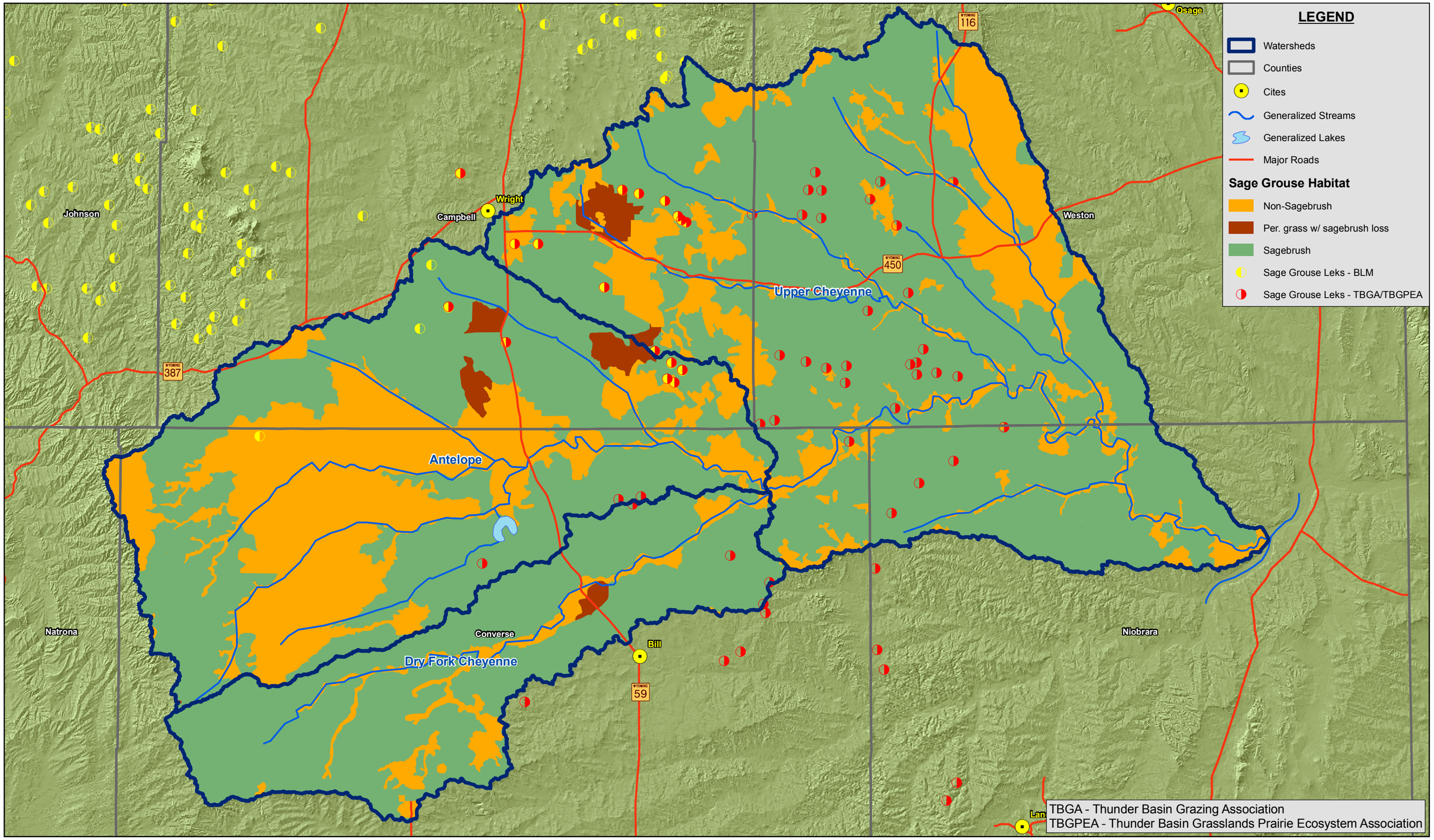

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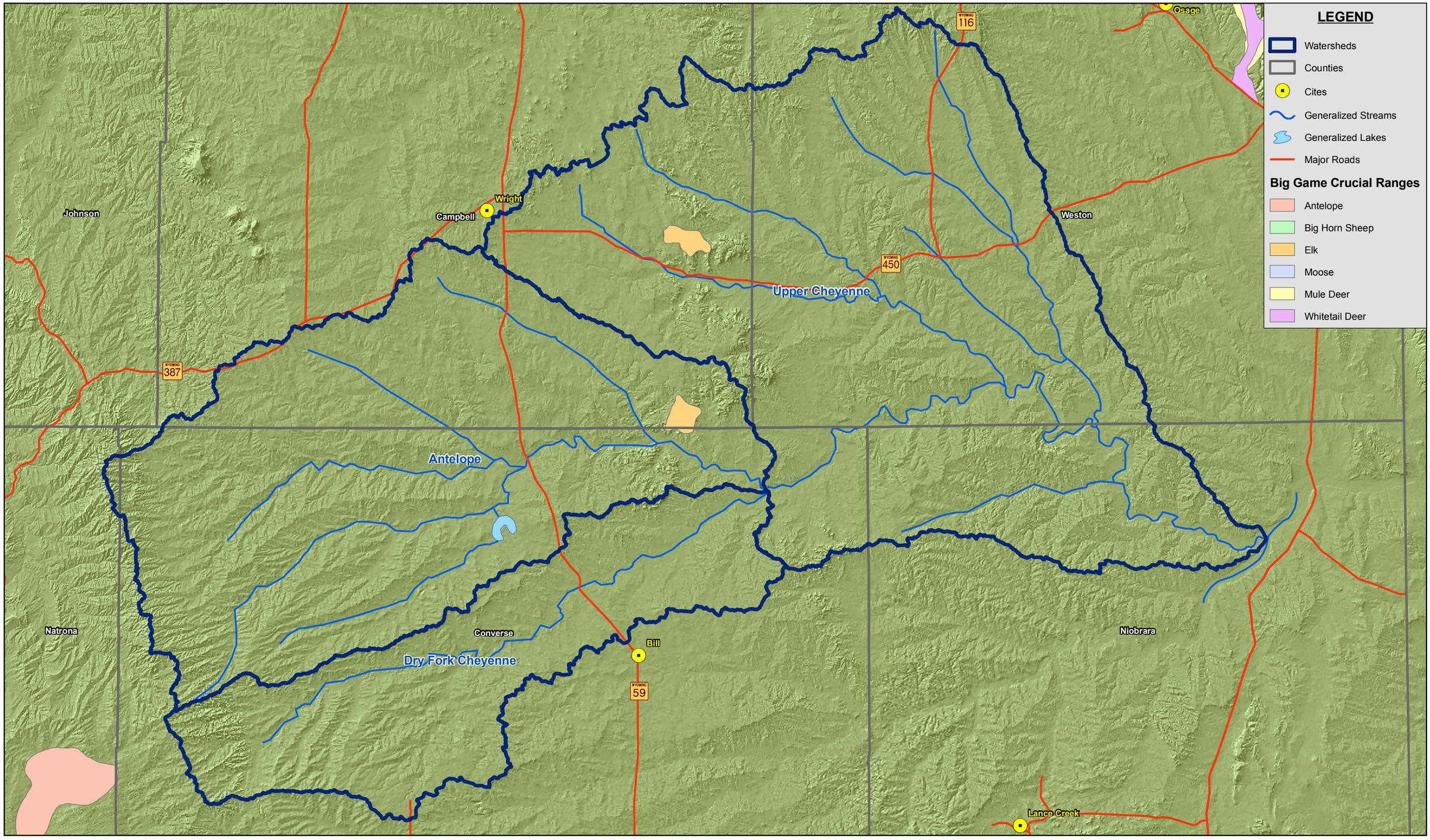
PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Sage Grouse, 2007, BLM and Thunder Basin Grazing Association (TBGA)	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**SAGE GROUSE LEKS** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 43



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PROJECT: 008-1217 DRAWN BY: RD DATE: 11/16/2009	Source: Streams, 2006, ESRI; Watershed, 2002, WYGISC; DEM, 2008, USGS Roads, 1997, TIGER; Counties, 2007, SDVC; Cities, 2006, ESRI; Big Game Crucial Ranges, 2002, WY F&G	3.5 0 3.5 7 10.5 Miles 1:443,520 N	**CRUCIAL BIG GAME HABITATS** **Thunder Basin Watershed Study** **Northeast Wyoming**	OLSSON ASSOCIATES	MAP 44