

Northeast Planning Region

REGIONAL DESCRIPTION

Fifteen counties form the Northeast Planning Region – Adair, Cherokee, Craig, Creek, Delaware, Mayes, Muskogee, Nowata, Okmulgee, Osage, Ottawa, Rogers, Tulsa, Wagoner and Washington (Figure 26). Stream and surface water sources are abundant in the region.

Encompassing some of the most scenic areas of the state, the region's terrain includes forested mountains, rolling plains and rich river basins. The Northeast Region has abundant oil and gas supplies and strong industrial development aided, in part, by barge traffic of the McClellan-Kerr Navigation System. The region is predicted to have the highest overall M&I and power demands for water by 2050. Major cities within the region include Tulsa, Bartlesville and Muskogee.

The region's climate is mild with annual mean temperatures varying from 59 to 61 degrees. Annual evaporation within the region ranges from 56 inches in the west to 46 along the Arkansas and Missouri borders. Rainfall averages 34 to 44 inches per year; May is the wettest month.

WATER RESOURCES

Stream Water

Table 20 summarizes the stream water resources of the Northeast Planning Region. The region's major streams include the Arkansas, Deep Fork, Illinois and Grand (Neosho) Rivers. Stream water quality in the region is generally good, with the exception of the Arkansas River and some streams in the western part of the region that contain water of poor quality which is unsuitable for most M&I uses due to high mineral content and man-made pollutants.

The Arkansas River is the major drainage basin in the region. Because the basin is underlain by shale, limestone and sandstone, the river water tends to experience unacceptable levels of sulfates and TDS. Elevated levels of chlordane and PCB's have also been detected upstream of Tulsa. Downstream, the water quality improves as flows from the Grand River join the Arkansas River at Webbers Falls.

The Deep Fork River within the region has poor quality water. The water is very hard with high turbidity and contains high levels of TDS, dissolved oxygen, sulfate, chloride and suspended sediment. The water is unsuitable for most M&I uses; however, impoundment tends to improve the quality.

The Grand (Neosho) and Illinois Rivers are located in the Ozark Mountain Plateaus. They flow through a series of impoundments, creating some of the state's most popular tourist attractions. The water is of excellent quality and suitable for all M&I uses. Development within the two river basins has led to increased water pollutants, including traces of heavy metals.

MAJOR RESERVOIRS

There are 10 major impoundments within the Northeast Planning Region. Birch Lake, completed in 1977, is the smallest Corps impoundment in the region. It is located on Birch Creek, a tributary of Bird Creek in Osage County. Authorized uses include flood control, water supply, water quality, recreation, and fish and wildlife conservation. The lake has conservation storage of 15,165 ac-ft, flood control storage of 39,805 ac-ft, and a dependable water supply yield of 6,700 af/yr (6 mgd). The water quality is considered good.

Copan Lake is a multipurpose Corps of Engineers reservoir on the Little Caney River in northern Washington County. The lake contains 184,300 ac-ft of flood control storage and 33,600 ac-ft of conservation storage (net of sediment storage) which yields 21,300 af/yr (19 mgd), including 17,900 af/yr of water quality control storage. Authorized uses of the reservoir include flood control, water supply, water quality control, recreation, and fish and wildlife conservation.

Fort Gibson Lake is located on the Grand (Neosho) River in northern Wagoner County. The lake was constructed by the Corps in 1953 for flood control and hydropower generation. The lake is operated by the Grand River Dam Authority and has 919,200 ac-ft of flood control storage along with 53,900 ac-ft of power pool storage. The dam has four 11,250 kW capacity hydroturbines installed with a dependable power output of 45,000 kW. The water is of excellent

quality and, although water supply is not an authorized use, several entities (including Muskogee) receive their water supply from Fort Gibson Lake.

Grand Lake O' The Cherokees, upstream of Fort Gibson, is another impoundment on the Grand (Neosho) River. The lake, located primarily in Delaware County in northeast Oklahoma, was completed in 1941 by GRDA. While flood control in the reservoir is operated by the Corps of Engineers, GRDA controls all other operations. The authorized purposes are hydroelectric power production and flood control. The reservoir has 525,000 ac-ft of flood control storage and 1,192,000 ac-ft of power storage. The powerhouse has six units capable of a total power output of 86,400 kW (14,400 kW each). Several entities contract with GRDA for water supply from Grand Lake.

Heyburn Lake is a flood control, water supply, recreation, and fish and wildlife conservation reservoir on Polecat Creek in Creek County. The lake was completed by the Corps of Engineers in 1950 and contains 48,290 ac-ft of flood control storage. Of the 4,140 ac-ft of conservation storage, 2,340 ac-ft is available for water supply which yields 1,900 af/yr (1.7 mgd).

Lake Hudson is the middle impoundment of the three lakes on the Grand (Neosho) River. Located in Mayes County, the lake was completed in 1964 by the GRDA who controls most reservoir operations. The Corps of Engineers operates the flood control storage. As with the other GRDA impoundments, authorized purposes are hydroelectric power and flood control. The lake contains 244,200 ac-ft of flood control storage and 200,300 ac-ft of power pool storage. The powerhouse contains a total capacity of 100,000 kW (four 25,000 kW units).

Hulah Lake is a Corps project on the Caney River in Osage County. Authorized purposes include flood control, water supply and low-flow regulation. The project was completed in 1951 and provides 257,900 ac-ft of flood control storage and 26,960 ac-ft of conservation storage yielding 18,900 af/yr (16.9 mgd) of water supply. The water quality is excellent.

Oologah Lake is located on the Verdigris River in northern Rogers County and southern Nowata County. The reservoir was built by the Corps of Engineers for

Table 20
STREAM WATER DEVELOPMENT
Northeast Planning Region

PROJECT	STREAM	PURPOSE*	FLOOD CONTROL STORAGE (acre-feet)	WATER SUPPLY STORAGE (acre-feet)	WATER SUPPLY YIELD (ac-ft/year)
EXISTING OR UNDER CONSTRUCTION					
Birch	Birch Creek	ws, fc, wq, r, fw	39,805	15,165	6,700 ¹
Copan	Little Caney River	ws, fc, wq, r, fw	184,300	33,600 ²	21,300
Dripping Springs	Salt Creek	ws, fc, r	---	16,200	7,412
Eucha & Spavinaw	Spavinaw Creek	ws, r	---	110,167	84,000 ³
Fort Gibson	Grand (Neosho) River	fc, p	919,200	---	66,600 ⁴
Grand	Grand (Neosho) River	fc, p	525,000	---	21,400 ⁴
Heyburn	Polecat Creek	ws, fc, r, fw	48,290	2,340	1,900
Hudson (Markham Ferry)	Grand (Neosho) River	fc, p	244,200	---	3,000 ⁴
Hulah	Caney River	ws, fc, flow	257,900	26,960 ⁵	18,900
Keystone	Arkansas River	ws, fc, p, fw	----	----	22,400 ⁶
Oologah	Verdigris River	ws, fc, r, fw, n	1,007,060	342,600	172,500
Skiatook	Hominy Creek	ws, fc, wq, r, fw	176,100 ⁷	280,200	85,100 ⁷
Tenkiller (Water Supply Allocations)	Illinois River	fc, p	----	345,600 ⁸	18,800 ⁸
Webbers Falls	Arkansas River	p, n	---	---	---
TOTAL			3,401,855	1,172,832	530,012
AUTHORIZED					
Candy ⁹	Candy Creek	ws, fc, r	31,260	43,110	8,620
Sand ¹⁰	Sand Creek	ws, fc, wq, r, fw	51,700	35,000	15,450
Shidler ¹¹	Salt Creek	ws, fc, r, fw	49,050	57,880	16,800
TOTAL			132,010	135,990	40,870
POTENTIAL					
Big Creek	Big Creek	ws, r	---	---	32,500
Boynton	Cloud Creek	ws, r	65,000	116,000	44,800
Chelsea	Pryor Creek	ws, r	47,000	65,000	21,300
Eldon	Baron Fork Creek	ws, r	---	280,000	157,900
Fort Gibson Power & Inactive Storage	Grand (Neosho) River	ws, fc, p, r	---	---	223,80
Grand Lake Power & Inactive Storage	Grand (Neosho) River	ws, fc, p	---	---	203,300
Greasy	Greasy Creek	ws, fc, p	9,900	16,350	6,700
Heyburn Modification	Polecat Creek	ws, fc, r	70,500	101,500	18,800
Nuyaka	Deep Fork River	ws, fc, r	700,000	1,400,000	224,000
Peggs	Spring Creek	ws, r	---	88,000	20,000
Salina	Saline Creek	ws, r	---	73,000	16,000
Sid	Spavinaw Creek	ws, r	---	95,000	20,000
Tahlequah	Illinois River	ws, fc, r	200,000	1,500,000	350,000
Tenkiller (Power Pool Allocations)	Illinois River	ws, fc, p, r	---	---	392,050 ¹²
Welty	Deep Fork River	ws, r, fw	---	816,000	207,200
TOTAL			1,092,400	4,550,850	1,938,350
TOTAL YIELD					2,509,232

*ws-municipal water supply, fc-flood control, wq-water quality, p-power, r-recreation, fw-fish and wildlife, n-navigation, flow-low flow augmentation.

¹ Water supply yield includes 7,600 ac-ft for water quality control (3,350 af/yr yield).

² Water supply storage includes 26,100 ac-ft for water quality control (17,920 af/yr yield).

³ Combined yield of both lakes. All yield goes to City of Tulsa.

⁴ Reallocation from hydropower pool.

⁵ Water supply storage includes 7,100 ac-ft (4.5 mgd yield) for water quality control.

⁶ Located in and allocated from North Central Planning Region.

⁷ Flood control storage after 100-year sediment. Yield includes water quality control storage of 240,000 ac-ft which yields 69,440 af/yr.

⁸ Located on boundary with East Central Planning Region. Total water supply yield is 29,792 af/yr, of which 10,992 is allocated to East Central Planning Region.

⁹ Construction halted at 15% completion, with deferred status since 1984. COE has recommended project for deauthorization.

¹⁰ Project status is Inactive.

¹¹ Project status is Deferred.

¹² Also considered as potential source for East Central Planning Region.

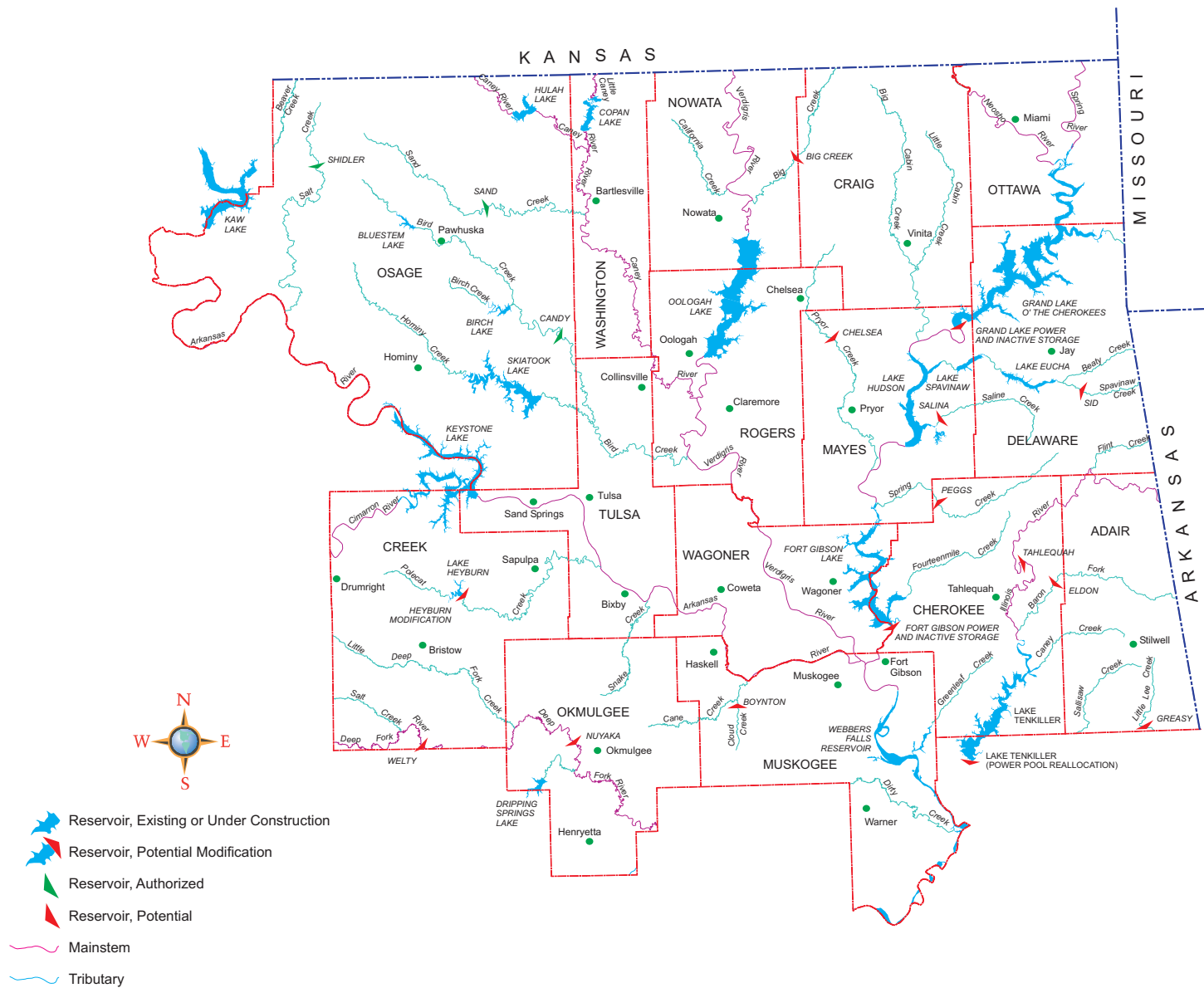
OKLAHOMA COMPREHENSIVE
WATER PLAN

Figure 26
NORTHEAST
PLANNING REGION

flood control, water supply, navigation, recreation, and fish and wildlife conservation. Construction was performed in several phases with completion of the initial phase in 1963. The lake contains 1,007,060 ac-ft of flood control storage and 342,600 ac-ft of water supply storage; it reserves 168,000 ac-ft for navigation. The dependable water supply yield is 172,500 af/yr (154 mgd). The City of Tulsa is the major water user.

Skiatook Lake, a Corps impoundment completed in 1984, is located on Hominy

Creek in Osage County. The project provides flood control, water supply, water quality control, recreation, and fish and wildlife conservation benefits. The lake contains 176,100 ac-ft of flood control storage, 62,900 ac-ft of water supply storage, 233,000 ac-ft for water quality control, and 15,700 ac-ft for sedimentation. The water supply and water quality storage combine to provide 85,100 af/yr (76 mgd) of fair quality water.

Webbers Falls Lock & Dam is on the Arkansas River approximately five miles

northwest of the Town of Webbers Falls in Muskogee County. The primary purposes of the project are navigation and hydroelectric power. The lock and dam, important components of the McClellan-Kerr Navigation System, became operational in 1970; power generation began in 1973. The powerhouse contains three 20 megawatt units.

MUNICIPAL LAKES

There are three large municipal lakes within the Northeast Planning Region:

Table 21
WATER RIGHTS
Northeast Planning Region

STREAM WATER ALLOCATIONS (acre-feet)

COUNTY	Municipal	Industrial	Agricultural	Commercial	Rec, F&W	Power	Other	TOTAL
Adair	13,265	53	22,597	1,166	4	---	---	37,085
Cherokee	29,258	56,110	8,833	90	450	---	20	94,761
Craig	3,620	---	---	---	---	---	---	3,620
Creek	9,341	32	4,167	---	515	---	---	14,055
Delaware	868	---	2,806	---	---	---	---	3,674
Mayes	183,382	---	160	---	---	---	---	183,542
Muskogee	61,823	16,019	8,664	---	---	149,084	---	235,590
Nowata	1,730	509	886	---	240	---	---	3,365
Okmulgee	19,694	1	2,694	---	2,246	---	---	24,635
Osage	88,089	632	12,112	---	122	25,000	---	125,955
Ottawa	---	---	280	---	---	---	---	280
Rogers	179,552	405	12,213	---	1,531	35,565	---	229,266
Tulsa	1,120	33	1,459	10	13	18,613	---	21,248
Wagoner	39,635	2,213	10,374	---	677	---	---	52,899
Washington	25,813	---	10,812	---	215	---	---	36,840
TOTAL	657,190	76,007	98,057	1,266	6,013	228,262	20	1,066,815

GROUNDWATER ALLOCATIONS (acre-feet)

COUNTY	Municipal	Industrial	Agricultural	Commercial	Rec, F&W	Power	Other	TOTAL
Adair	581	---	1,214	25	---	---	5	1,825
Cherokee	337	---	166	34	10	---	20	567
Craig	908	---	40	---	---	---	---	948
Creek	3,748	685	881	30	---	---	---	5,344
Delaware	2,928	---	3,176	151	6	---	23	6,283
Mayes	112	---	4	23	---	---	---	139
Muskogee	740	---	8,281	50	---	382	---	9,453
Nowata	---	---	---	---	---	---	---	---
Okmulgee	---	---	---	---	---	---	---	---
Osage	2,668	12,369	7,078	13	---	---	---	22,128
Ottawa	16,935	1,825	536	---	---	---	---	19,296
Rogers	---	---	160	---	30	45	---	235
Tulsa	1,371	8,942	5,885	---	8	---	---	16,206
Wagoner	---	87	2,338	---	10	---	720	3,155
Washington	---	---	---	---	---	---	---	---
TOTAL	30,327	23,908	29,759	326	64	427	768	85,578

Note: Agricultural allocations include Irrigation. Mining included in Industrial.
Source of data: Oklahoma Water Resource Board printout, June 23, 1994.

Dripping Springs, Eucha and Spavinaw. Dripping Springs Lake is a NRCS-constructed project on Salt Creek in southern Okmulgee County. Owned by the City of Okmulgee, the lake provides flood control, water supply and recreational opportunities. Constructed in 1976 as Okfuskee Tributaries Site 1, the impoundment has conservation storage of 16,200 ac-ft and provides a dependable yield of 7,412 af/yr (6.6 mgd).

Eucha Lake is a large impoundment located on Spavinaw Creek in Delaware County. It was constructed in 1952 by the City of Tulsa for the primary purposes of water supply and recreation. With conservation storage of 79,567 ac-ft, the lake has a dependable yield of 84,000 af/yr (75 mgd) of excellent quality water. The impoundment is located approximately three miles upstream of the third major municipal

lake in the region, Spavinaw Lake.

Spavinaw Lake, located on Spavinaw Creek in Delaware and Mayes Counties, is also owned by the City of Tulsa. The lake has conservation storage of 38,000 ac-ft, although it has little dependable yield of its own, acting primarily as terminal storage for releases from Eucha Lake. Spavinaw was built in 1924 and was Oklahoma's first major transbasin water supply project.

Table 22
SURPLUS WATER AVAILABILITY
Northeast Planning Region
(1,000 ACRE-FEET/YEAR)

SOURCE	TOTAL YIELD	LOCAL ALLOCATION	OUT OF REGION ALLOCATION	POTENTIAL SURPLUS
Birch	6.7	6.7	---	---
Copan	21.3	7.5	---	13.8
Eucha & Spavinaw ¹	84.0	84.0	---	---
Fort Gibson ²	66.6	66.6	---	---
Grand ²	21.4	21.4	---	---
Hudson	3.0	3.0	---	---
Hulah	18.9	13.9	---	5.0
Oologah ³	172.5	172.5	---	---
Skiatook	85.1	46.6	---	38.5
SCS & Municipal Lakes	372.5	372.5	---	---
Groundwater	85.2	85.2	---	---
TOTAL	937.2	879.9	---	57.3
Authorized Sources				
Candy	8.6	---	---	8.6
Sand	15.5	---	---	15.5
Shidler	16.8	---	---	16.8
TOTAL	40.9	---	---	40.9
Other Potential Sources				
Big Creek	32.5	---	---	32.5
Boynton	44.8	---	---	44.8
Chelsea	21.3	---	---	21.3
Eldon	157.9	---	---	157.9
Fort Gibson Power & Inactive Storage	223.8	---	---	223.8
Grand Power & Inactive Storage	203.3	---	---	203.3
Greasy	6.7	---	---	6.7
Heyburn (Modification)	18.8	---	---	18.8
Nuyaka	224.0	---	---	224.0
Peggs	20.0	---	---	20.0
Salina	16.0	---	---	16.0
Sid	20.0	---	---	20.0
Tahlequah	350.0	---	---	350.0
Tenkiller (Power Pool Allocations) ⁴	392.1	---	---	392.1
Welty	207.2	---	---	207.2
TOTAL	1,861.1	---	---	1,861.1
TOTAL SURPLUS WATER AVAILABILITY	2,839.1	879.9	---	1,959.2

¹ All water allocated to City of Tulsa.

² Additional yield may be available from reallocation of power storage.

³ Term permits not included in analysis.

⁴ Also considered as potential source for East Central Planning Region.

OTHER IMPOUNDMENTS

There are numerous other NRCS projects, small municipal lakes and private reservoirs within the Northeast Planning Region. These small lakes provide municipal supply, irrigation water and recreational opportunities. Bluestem Lake (17,000 ac-ft of approximate conservation storage), Claremore Lake (7,900 ac-ft), Hominy Lake (5,000 ac-ft), Hudson Lake (4,000 ac-ft), Sahoma Lake (4,850 ac-ft), Waxoma Lake (2,000 ac-ft), Shell Lake (9,500 ac-ft), Yahola Lake (6,645 ac-ft) and Fairfax Lake (1,795 ac-ft) are some of the larger impoundments in this category.

AUTHORIZED DEVELOPMENT

There are three authorized water supply projects within the Northeast Planning Region, all in Osage County.

Candy Lake is an authorized impoundment for water supply, flood control and recreation on Candy Creek in Osage County. The project is authorized for 31,260 ac-ft of flood control storage and 44,160 ac-ft of conservation storage yielding 8,625 af/yr (7.7 mgd) of municipal water supply. Construction began in 1976 but the project was halted at 15 percent completion when the U.S. Justice Department withdrew condemnation proceedings to acquire mineral rights from the Osage Indian Nation. The project has been in deferred status since 1984 and has been recommended for deauthorization.

Sand Lake, on Sand Creek, is another proposed project in Osage County. Authorized uses include water supply, flood control, water quality control, recreation, and fish and wildlife conservation. The project is anticipated to have 51,700 ac-ft of flood control storage and 35,000 ac-ft of conservation storage. The anticipated water supply yield is 8,740 af/yr (7.8 mgd). The project is currently classified as inactive.

Shidler Lake is the third authorized project in the Northeast Planning Region. The proposed project would contain 49,900 ac-ft of flood control storage and 58,200 ac-ft of conservation storage yielding 16,000 af/yr (15 mgd) for water supply (13.7 mgd) and fish and wildlife mitigation (1.3 mgd). The project status is currently deferred.

POTENTIAL DEVELOPMENT

Numerous sites within the Northeast Planning Region have potential for the development of new water supply projects, primarily due to the abundance of rainfall and suitable sites within the region. Of the 10 most likely sites identified in Table 20, several have been extensively studied.

Boynton Lake is a potential impoundment on Cloud Creek in Muskogee County. The lake, at full conservation pool, is anticipated to cover 7,300 acres and provide 116,000 ac-ft of conservation storage and 65,000 ac-ft of flood control storage. The dependable yield is estimated to be 44,800 af/yr (40 mgd) and the water should be suitable for all uses.

Chelsea Lake is a potential project on Pryor Creek in Mayes County. With an estimated drainage area of 104 square miles, the lake would cover 4,500 acres at full conservation pool and provide 65,000 ac-ft of conservation storage, along with 47,000 ac-ft of flood control storage. The dependable yield is estimated to be 21,300 af/yr (19 mgd). The water is anticipated to be suitable for all uses.

Welty Lake is proposed on the Deep Fork River in Creek County. At full conservation pool, the lake would cover an estimated 35,100 acres and provide 816,000 ac-ft of conservation storage. The dependable yield from the 1,299-square-mile drainage area is estimated to be 350,000 af/yr (185 mgd). The water should be suitable for all uses.

STREAM WATER RIGHTS

As of June 1994, the OWRB had issued stream water allocation permits totaling 1,066,815 ac-ft per year from lakes, rivers and streams in the Northeast Planning Region (Table 21).

Groundwater

Four major groundwater basins exist in the Northeast Planning region -- the Ada-Vamoosa Formation, alluvium and terrace deposits of the Arkansas River, the Roubidoux Aquifer and the Keokuk-Reed Springs Aquifer. The Ada-Vamoosa Formation consists of a fine-to very fine-grained sandstone with siltstone and interbedded limestone which occurs in portions of Creek and Osage Counties. It has a maximum thickness

of 550 feet with a saturated thickness of 100 to 200 feet. Wells are generally 100 to 500 feet deep and commonly yield 100 to 300 gpm, although they may exceed 500 gpm in some locations. Water from the Vamoosa is generally of a sodium bicarbonate or sodium calcium bicarbonate type. Dissolved solids are usually less than 500 mg/L.

Wells in the Arkansas River alluvium deposits range from 200 to 500 gpm while wells in the terrace deposits range from 100 to 200 gpm. Formation deposits are commonly 50 to 100 feet in depth with saturated thickness averaging 25 to 75 feet. The formation consists of clays, sand, silt and gravels. Hardness is the major water quality problem and TDS values are usually less than 500 mg/L. The water is generally suitable for most M&I uses, although heavy pumping can cause chloride intrusion into the formation.

The Roubidoux is a fractured dolomite aquifer found in Ottawa and Delaware Counties. The formation usually contains two or three confined sandy zones with depths ranging between 800 and 1,200 feet. Yields from the aquifer average 150 gpm with some wells exceeding 600 gpm. The water is moderately hard but suitable for most M&I uses.

The Keokuk-Reed Springs is a minor aquifer found in portions of Ottawa, Delaware, Mayes, Cherokee and Adair Counties. The formation consists of weathered residual chert and clay in the upper portions and very cherty limestone in the lower portions. The maximum thickness of the formation is 500 feet with average well depths of 50 to 300 feet. Wells from this formation yield from 1 to 10 gpm with some occasionally approaching 80 gpm. Surface springs from the formation can yield from 600 to 3,500 gpm. Water from this aquifer is very hard with high concentrations of calcium bicarbonate. This formation is susceptible to surface contamination.

GROUNDWATER DEVELOPMENT

Despite the presence of abundant surface water, groundwater development is an essential resource to many communities in the Northeast Region. The Roubidoux Aquifer is the major supply source for the cities of Miami, Afton, Quapaw and Picher. Alluvium and terrace deposits in Muskogee, Wagoner, Tulsa and Osage

Counties are also heavily utilized. Within Osage County, the Vamoosa Formation is used extensively where surface water is not readily available.

GROUNDWATER RIGHTS

As of June 1994, the OWRB had issued groundwater allocation permits totaling 85,578 ac-ft per year from aquifers within the Northeast Planning Region (Table 21).

fers within the Northeast Planning Region (Table 21).

SUPPLY AND DEMAND ANALYSIS

Table 22 indicates the availability of water from existing sources. When the potential reallocation of water quality and some hydroelectric power storage

is included, most, if not all, demands can be satisfied. The long-range projection for M&I water demand in the year 2050 is 361,800 af/yr (323 mgd). As shown in Table 23, current supplies should satisfy anticipated demands. Local areas may experience deficits, although ample supply from proposed projects in the region would likely meet these needs.

Table 23
SUPPLY AND DEMAND ANALYSIS
Northeast Planning Region
(1,000 ACRE-FEET/YEAR)

	COUNTY																
SOURCE	Adair	Cherokee	Craig	Creek	Delaware	Mayes	Muskogee	Nowata	Okmulgee	Osage	Ottawa	Rogers	Tulsa	Wagoner	Washington	TOTAL	
MUNICIPAL AND INDUSTRIAL COMPONENT																	
Birch	---	---	---	---	---	---	---	---	---	1.9	---	4.8	---	---	---	6.7	
Copan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	7.5	7.5	
Dripping Springs	---	---	---	---	---	---	---	---	7.4	---	---	---	---	---	---	7.4	
Eucha & Spavinaw	---	---	---	---	---	---	---	---	---	---	---	---	84.0	---	---	84.0	
Fort Gibson	---	---	---	---	---	---	34.4	---	---	---	---	---	---	---	---	34.4	
Grand	---	---	3.1	---	4.3	14.0	---	---	---	---	---	---	---	---	---	21.4	
Heyburn	---	---	---	1.9	---	---	---	---	---	---	---	---	---	---	---	1.9	
Hudson	---	---	---	---	---	3.0	---	---	---	---	---	---	---	---	---	3.0	
Hulah	---	---	---	---	---	---	---	---	---	---	---	---	---	---	13.9	13.9	
Oologah	---	---	---	---	---	---	---	2.7	---	---	---	16.2	140.9	---	2.1	161.9	
Skiatook	---	---	---	17.6	---	---	---	---	---	8.8	---	2.5	16.8	---	1.0	46.6	
Tenkiller	2.2	13.8	---	---	---	---	---	---	---	---	---	---	---	---	---	16.0	
SCS & Municipal Lakes	2.7	---	---	12.2	---	---	7.4	---	13.2	24.0	---	6.9	4.4	1.6	---	72.2	
Groundwater	0.6	0.4	0.9	4.5	3.1	0.1	0.8	---	---	15.1	18.8	---	10.3	0.8	---	55.3	
M&I Supply	5.5	14.2	4.0	36.1	7.4	17.1	42.6	2.7	20.6	49.7	18.8	30.4	256.4	2.4	24.5	532.2	
2050 M&I Demand	5.2	14.2	4.0	22.7	7.4	17.1	34.4	2.7	10.0	11.8	8.3	13.3	181.1	11.6	18.0	361.8	
M&I Surplus/(Deficit)	0.3	---	---	13.4	---	---	8.2	---	10.6	37.9	10.5	17.1	75.3	(9.2)	6.5	170.5	
AGRICULTURAL COMPONENT																	
Tenkiller	---	2.8	---	---	---	---	---	---	---	---	---	---	---	---	---	2.8	
SCS & Municipal Lakes	3.9	0.3	0.3	9.8	0.7	24.6	4.8	0.7	7.4	15.8	0.2	2.8	1.6	0.9	4.4	78.1	
Groundwater	1.2	0.2	---	0.9	3.2	---	8.3	---	---	7.1	0.5	0.2	5.9	2.3	---	29.8	
Agricultural Supply	5.1	3.2	0.3	10.7	3.8	24.6	13.1	0.7	7.4	22.9	0.8	2.9	7.5	3.2	4.4	110.7	
2050 Agricultural Demand	3.4	2.8	3.2	1.4	1.7	2.8	8.7	1.8	1.6	3.3	1.7	2.3	5.9	3.5	2.5	46.6	
Agricultural Surplus/(Deficit)	1.7	0.4	(2.9)	9.3	2.1	21.8	4.4	(1.1)	5.8	19.6	(0.9)	0.6	1.6	(0.3)	1.9	64.1	
POWER COMPONENT																	
Fort Gibson	---	---	---	---	---	32.2	---	---	---	---	---	---	---	---	---	32.2	
Keystone	---	---	---	---	---	---	22.4	---	---	---	---	---	---	---	---	22.4	
Oologah	---	---	---	---	---	---	---	---	---	---	---	10.6	---	---	---	10.6	
Stream Water Allocations	---	---	---	---	---	---	149.1	---	---	25.0	---	35.6	18.6	---	---	228.3	
Groundwater	---	---	---	---	---	---	0.4	---	---	---	---	---	---	---	---	0.4	
Power Supply	---	---	---	---	---	32.2	171.9	---	---	25.0	---	46.2	18.6	---	---	293.9	
2050 Power Demand	---	---	---	---	---	32.2	145.4	---	---	---	---	34.6	12.5	---	---	224.7	
Power Surplus/(Deficit)	---	---	---	---	---	---	26.5	---	---	25.0	---	11.6	6.1	---	---	69.2	
TOTALS																	
Total Local Supply	10.6	17.4	4.3	46.8	11.2	73.9	227.5	3.4	28.0	97.6	19.5	79.5	282.5	5.6	28.9	936.8	
Total 2050 Demand	8.6	17.0	7.2	24.1	9.1	52.1	188.3	4.5	11.6	15.1	10.0	50.2	199.5	15.1	20.5	633.1	
Net Surplus/(Deficit)	2.0	0.4	(2.9)	22.7	2.1	21.8	39.2	(1.1)	16.4	82.5	9.5	29.3	83.0	(9.5)	8.4	303.7	