APPENDIX 12.10 - POPULATION TOMORROW

(1) Methodology: Population projections is a science. There are a number of methods to project population. A summary of some methods, as applied to the region, is set out below.

Different Projection Methodology
(extracted from "Population Projections Without Trying," Data Users Conference, September 24, 2002, Adelamar N. Alcantara, Ph.D.)

1. Linear Extrapolation Method (Line)
assumes that the population will increase (decrease) by the same number in each future year as the average annual increase (decrease) observed over the base period.

a. average annual absolute change can be computed as AAAC = (Pl– Pb)/n, where Pl is the population in the launch year, Pb is the population in the base year, and n is the period of time.

Example: Sandoval County from 1990 to 2000
1990 = 63,319; 2000 = 89,908
89,908-63,319/10 years = 2,659

b. population projections based on LINE method can be expressed as Pt = Pl + z * (AAAC) where Pt is the population in the target year, and z is the number of years in the projection horizon.

Extrapolation to 2010
89,908 + (2,659*10) = 116,497

c. applied to Jemez Springs
1990 = 359, 2000 = 375
(375-359)10 = 1.6

375+ (1.6*10) = 391 in 2010

2. Geometric Extrapolation Method (Geo)
   assumes that a population will increase (decrease) at the same annual percentage rate during the projection horizon as during the base period. Growth rates estimated using GEO assumes compounding at discrete time intervals, e.g. one year.

a. To calculate the average annual geometric rate use the following formula r = (Pl /Pb)1/y – 1.

Example: Sandoval County from 1990 to 2000
((89,908/ 63,319)^1/10)-1 = 0.0357

b. Given this formula a population projection using the GEO method can be expressed as $Pt = Pl * (1+ r)^z$

Extrapolation to 2010 = 89,908 * (1+ 0.0357)^ 10) = 127,662

c. applied to Jemez Springs
((375/359)^.1)-1 = 0.0044
375 * (1+0.0044)^10) = 392 in 2010

3. Exponential Extrapolation Method (Expo)
   assumes that a population will increase (decrease) at the same annual percentage rate during the projection horizon as during the base period. The difference from GEO is that population growth is assumed to occur continuously rather than at discrete intervals.

a. To calculate the average annual exponential rate use the formula r =ln (Pl /Pb)/y, where ln is the natural logarithm.

Example: Sandoval County from 1990 to 2000
ln (89,908/ 63,319) * 1/10 = 0.035

b. Given this formula a population projection using the EXPO method can be expressed as $Pt = Pl * e^{rz}$.

Extrapolation to 2010 = 89,908 * exp(10*0.035) = 127,662

c. applied to Jemez Springs
ln (375/359) * 0.1 = 0.00436
375 *exp(10*.00436) = 392 in 2010

4. Ratio Method
   the population (or population change) of a smaller area is expressed as a proportion of the population (or population change) of a larger area in which the smaller area is

located.

Jemez Springs / Sandoval County = 375 / 89,908 = 0.00417
BBER projects Sandoval County's population to equal 126,294 in 2010
Sandoval County's 2010 population, 126,294 * 0.00417 = 527 for Jemez Springs

5. Linear Trend applying GEO method

Example applying GEO method: Sandoval County 1990 = 63,319; 2000 = 89,908
((89,908/ 63,319) * 1/10)-1 = 0.0357
Extrapolation to 2010 = 89,908 * (1+ 0.0357)^ 10) = 127,662
Jemez Springs 1990 = 359, 2000 = 375
375 * (1+ 0.0357)^ 10) = 533 in 2010

6. Linear Trend applying growth rate

BBER projects Sandoval County to have a population of 126,216 in 2010. This growth rate of 1.39 could be applied to Jemez Springs (375 * 1.39) to attain a projected population of 522 in 2010. If this method were followed for the thirty year projection horizon which BBER provides, Sandoval County's population is expected to more than double the 2000 population of 90,775 to 197,182 in 2030. Applying this rate, 2.17, to Jemez Springs, shows a population projection to 814.

Summarizing the above Table 12.10A-1:

Table 12.10A-1 Summary of population projection methods

	Sandoval County	Jemez Springs
Method	2010	2010
Linear Extrapolation Method (Line)	116,497	391
Geometric Extrapolation Method (Geo)	127,662	392
Exponential Extrapolation Method (Expo)	127,662	392
Ratio Method (using BBER)	126,294	527
Linear Trend (using Geo)	127,662	533
Linear Trend using growth rate	126,216	522

(2) Demographic Presentation

Dr. Adelamar N. Alcantara
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UNM Bureau of Business and Economic Research
October 16, 2002

Summary of Presentation
Middle Rio Grande Water Assembly

- Population Estimation: Population Balancing Equation
- Historical Demographic Data
- Projection Outcomes
- Some Conclusions

Population Estimation: Population Balancing Equation

The overall growth or decline of a population is determined by its **mortality**, **fertility** and **migration**.

$$\mathbf{Pt - P(t\text{-}n) = (B - D) + (IM - OM)}$$

Where:

Pt = population at the end of the time period
P(t-n) = population at the beginning of the time period
B = births during time period
D = deaths during time period
IM = number of inmigrants during time period
OM = number of outmigrants during time period
(B-D) = natural increase
(IM-OM) = net migration

Uses of Population Balancing Equation

Population Estimation

$$\mathbf{Pt = P(t\text{-}n) + (B - D) + (IM - OM)}$$

Migration Estimation (residual)

$$\mathbf{+ (IM - OM) = (Pt - P(t\text{-}n)\ ) + (B - D)}$$

New Mexico and MRG Components of Change: 1990 - 2000						
	Census 1990	Census 2000	Total Change	Natural Increase	Residual or Net Migrant	Share of Migration in Total Change
New Mexico	1,515,041	1,819,046	304,005	158,212	145,793	48%
Bernalillo	480,577	556,678	76,101	44,770	31,331	41%
Sandoval	63,319	89,908	26,589	7,832	18,757	71%

Valencia	45,235	66,152	20,917	4,982	15,935	76%
	589,131	712,738	123,607	57,584	66,023	53%

How Historical Average Annual Growth Rate is calculated

p 123 of *Applied Demography*, Murdock & Ellis

exponential rate of change

Pt2=Pt1ern

r = log10((pt2/pt1))/nlog10e

where:

Pt2 = pop at time 2
Pt1 = pop at time 1
e = a constant (2.71828)
r = rate of change
n = time between t1 and t2

Pt_1 = 248709873

Pt_2 = 226545805

LOG10(2.71828) = 0.4342942

r =

LOG10(248709873 / 226545805) = 0.040537 = 0.040537 = 0.009334

10*(0.4342942) = 4.342942 = 4.342942

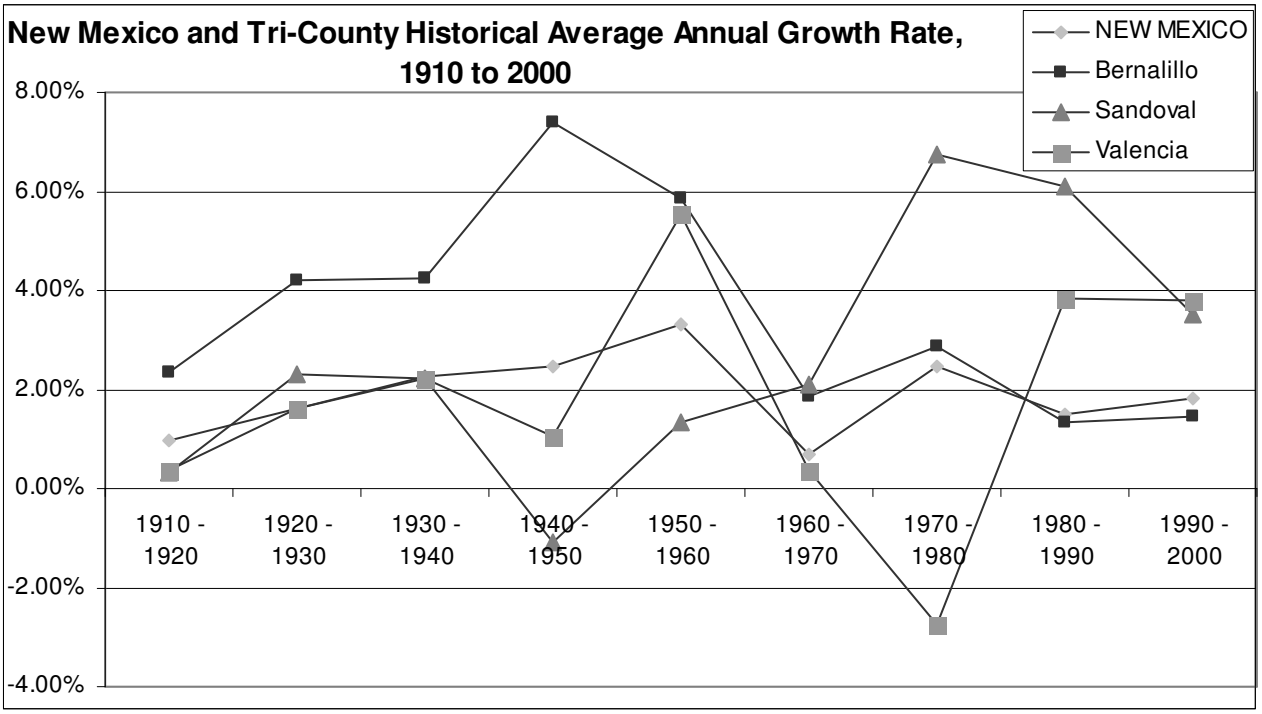
r = 0.009334 * 100 = 0.93%

New Mexico and MRG Population, 1910 to 2000				
	NEW MEXICO	Bernalillo	Sandoval	Valencia
1910	327,301	23,606	8,579	13,320
1920	360,350	29,855	8,863	13,795
1930	423,317	45,430	11,144	16,186
1940	531,818	69,391	13,898	20,245
1950	681,187	145,637	12,438	22,481
1960	951,023	262,199	14,201	39,085
1970	1,017,055	315,774	17,492	40,576
1980	1,303,303	420,262	34,400	30,769
1990	1,515,069	480,577	63,319	45,235
2000	1,819,046	556,678	89,908	66,152

New Mexico and MRG Historical Average Annual Growth Rate, 1910 to 2000				
	NEW MEXICO	**Bernalillo**	**Sandoval**	**Valencia**
1910 - 1920	0.96%	2.35%	0.33%	0.35%
1920 - 1930	1.61%	4.19%	2.29%	1.60%
1930 - 1940	2.28%	4.23%	2.21%	2.23%
1940 - 1950	2.47%	7.40%	-1.11%	1.05%
1950 - 1960	3.33%	5.87%	1.32%	5.52%

1960 - 1970	0.67%	1.86%	2.08%	0.37%
1970 - 1980	2.48%	2.85%	6.75%	-2.76%
1980 - 1990	1.50%	1.34%	6.09%	3.85%
1990 - 2000	1.83%	1.47%	3.50%	3.80%

a In 1981: Cibola County was organized from a part of Valencia County.
b In 1949: Los Alamos County was formed from a part of Sandoval and Santa Fe counties.
Part of Sandoval County annexed to Santa Fe County prior to 1950.
Source: U.S. Dept. of Commerce, Bureau of the Census.
Table prepared by: Bureau of Business and Economic Research, University of New Mexico.



Measurements

Measures of Fertility = Crude Birth Rate (CBR) and Age Specific Fertility Rate (ASFR)

CBR = crude birth rate = number of births during a year divided by the midyear population multiplied by 1000.
ex. CBR = (25,950 / 1,819,046) * 1000 = 14.3 per 1000 people in New Mexico in 2000

Measures of Mortality = Crude Death Rate (CDR) and Age-Specific Death Rater (ASDR)

CDR = crude death rate = number of deaths during a year divided by the midyear population multiplied by 1000.
ex. (5,761 / 745,253) * 1000 = 7.7

Measures of Migration = Gross Migration, Net Migration and Migration Rates

NMR = net migration rate: the difference between the inmigration rate (number of migrants into a community divided by the population of that community multiplied by 1,000) and the outmigration rate (number of people leaving a community divided by the population of that community multiplied by 1,000)

IRS-Based Migration Estimates between 1999 - 2000

	inmigration	outmigration	net migration
NEW MEXICO	102,604	108637	-6,033
Bernalillo	26,681	29,008	-2,327
Sandoval	7,730	6173	1,557
Valencia	3907	3453	454
	38,318	38,634	-316

Migrant Status of MRG Residents 5 Years Prior to Census 2000					
Population 5 years and Older					
Migration Status	Bernalillo	Sandoval	Valencia	Total MRG	NEW MEXICO
Total	**518,381**	**83,382**	**61,142**	**662,905**	**1,689,911**
Stayers	**253,614**	**47,166**	**34,435**	**335,215**	**919,717**
All Migrants	**264,767**	**36,216**	**26,707**	**327,690**	**770,194**
Intrastate migrant	*186,226*	*23,035*	*20,662*	*229,923*	*526,221*
same county	154,634	9,710	10,110	174,454	400,128
same state	31,692	13,325	10,552	55,569	126,093
Interstate Migrants	*65,944*	*12,263*	*5,145*	*83,352*	*206,186*
Other US State	65,562	12,223	5,145	82,930	205,267
Northeast	5,846	1,607	358	7,811	15,329
Midwest	11,261	2,054	693	14,008	29,457
South	20,712	3,392	1,188	25,292	72,497
West	27,743	5,170	2,906	35,819	87,984
US Territory	382	40	0	422	919
Foreign Migrant	*12,697*	*918*	*900*	*14,515*	*37,787*

Percent					
Migrant Status of MRG Residents 5 Years Prior to Census 2000					
Population 5 years and Older					
Migration Status	Bernalillo	Sandoval	Valencia	Total MRG	NEW MEXICO
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Stayers	**48.9%**	**56.6%**	**56.3%**	**50.6%**	**54.4%**
All Migrants	**51.1%**	**43.4%**	**43.7%**	**49.4%**	**45.6%**
Intrastate migrant	*70.3%*	*63.6%*	*77.4%*	*70.2%*	*68.3%*
same county	83.0%	42.2%	48.9%	75.9%	76.0%
same state	17.0%	57.8%	51.1%	24.2%	24.0%
Interstate Migrants	*24.9%*	*33.9%*	*19.3%*	*25.4%*	*26.8%*

Other US State	99.4%	99.7%	100.0%	99.5%	99.6%
Northeast	8.9%	13.1%	7.0%	9.4%	7.5%
Midwest	17.2%	16.8%	13.5%	16.9%	14.4%
South	31.6%	27.8%	23.1%	30.5%	35.3%
West	42.3%	42.3%	56.5%	43.2%	42.9%
US Territory	0.6%	0.3%	0.0%	0.5%	0.4%
Foreign Migrant	*4.8%*	*2.5%*	*3.4%*	*4.4%*	*4.9%*

Table prepared by: Bureau of Business and Economic Research, University of New Mexico.

1985
Stayers = 47.2%
Movers = 52.8%

1995
Stayers = 48.9%
Movers = 51.1%

Projection Outcomes

Based upon assumptions:
* no war, epidemic or other cataclysmic event
* declining fertility
* declining migration rate - constant number of migrants based on average between 1990 & 2000
* improving mortality conditions; increasing life expectancy

Projected Population: New Mexico Counties
July 1, 2000 - July 1, 2030

	Midyear Population	Compound Annual Growth Rate (%)	Annual Number			Annual Rate			Yearly Change	Share of Migration (%)
			Births	Deaths	Migrants	CBR	CDR	NMR		
Bernalillo										
2000	558,437		8,363	3,919		15.0	7.0	5.8		
2005	595,954	1.30	8,501	4,209	3,212	14.5	7.5	5.4	7,503	42.8%
2010	631,839	1.17	8,703	4,738	3,212	13.9	7.9	5.1	7,177	44.8%
2015	666,114	1.06	8,850	5,207	3,212	13.4	8.2	4.8	6,855	46.9%
2020	698,832	0.96	8,976	5,644	3,212	12.9	8.4	4.6	6,544	49.1%
2025	729,750	0.87	9,066	6,095	3,212	12.5	8.7	4.4	6,184	51.9%
2030	759,000	0.79	9,216	6578	3,212	12.3	9.0	4.2	5,850	54.9%
Sandoval										
2000	90,775		1238	586	2887	14.1	6.5	31.8		
2005	108,538	3.57	1,360	695	2887	13.3	7.4	26.6	3,553	81.3%
2010	126,294	3.03	1,565	900	2887	13.4	7.9	22.9	3,551	81.3%
2015	144,377	2.68	1,823	1,093	2887	13.4	8.2	20.0	3,617	79.8%
2020	162,409	2.35	2,003	1,284	2887	12.6	8.5	17.8	3,606	80.1%
2025	179,998	2.06	2,113	1,482	2887	12.1	8.8	16.0	3,518	82.1%
2030	197,182	1.82	2,241	1,691	2887	11.7	9.1	14.6	3,437	84.0%

Valencia										
2000	66,699		988	406	1,362	14.8	6.1	20.4		
2005	76,512	2.75	1,053	452	1,362	14.8	6.5	17.8	1,963	69.4%
2010	86,708	2.50	1,223	548	1,362	15.2	6.8	15.7	2,039	66.8%
2015	97,330	2.31	1,404	642	1,362	15.2	7.1	14.0	2,124	64.1%
2020	108,064	2.09	1,525	740	1,362	14.5	7.3	12.6	2,147	63.4%
2025	118,593	1.86	1,587	843	1,362	13.6	7.6	11.5	2,106	64.7%
2030	128,922	1.67	1,652	949	1,362	13.2	7.8	10.6	2,066	65.9%

Growth Rates: New Mexico & MRG, 2000 to 2030

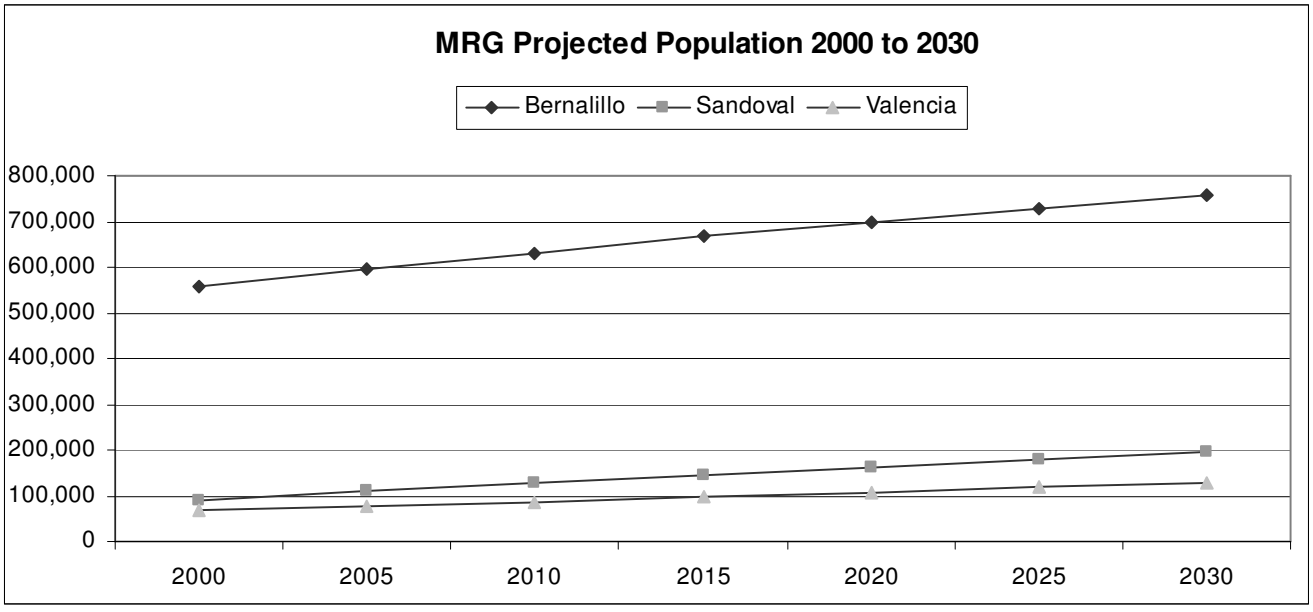
	As of July 1…					
County	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
NEW MEXICO	1.52	1.39	1.27	1.14	1.02	0.93
Bernalillo	1.30	1.17	1.06	0.96	0.87	0.79
Sandoval	3.57	3.03	2.68	2.35	2.06	1.82
Valencia	2.75	2.50	2.31	2.09	1.86	1.67

Released August 2002.
Table prepared by: Bureau of Business and Economic Research, University of New Mexico.

Projected Distribution, 2000 to 2030

	2000	2005	2010	2015	2020	2025	2030
Bernalillo	30.6	30.2	29.9	29.6	29.3	29.1	28.9
Sandoval	5	5.5	6	6.4	6.8	7.2	7.5
Valencia	3.7	3.9	4.1	4.3	4.5	4.7	4.9
	39.3	39.6	40	40.3	40.6	41	41.3

Source: University of New Mexico, Bureau of Business and Economic Research.



CONCLUSIONS (Dely - 10/16/02)

- New Mexico will continue to be more diverse demographically
- Anglos or White Not Hispanic will continue to predominate among the elderly
- The non Anglo population predominates among the young
- Competition for resources could lead to greater polarization of the population
- population is rapidly aging
  - aging will accelerate post 2010 as the baby boom generation reaches age *65*
  - females will predominate in the older age groups
- population growth will steadily decline as fertility goes down and mortality goes up resulting from the aging of the population
- as a result of aging and declining fertility, migration as a source of population growth is expected to increase
- economic growth as well as affordable real estate will determine where population will grow
  - Bernalillo County will continue to attract labor migrants and will maintain its demographic primacy although its share in the total population is declining
  - surrounding counties will attract families in search of affordable housing
  - Valencia and Sandoval counties will increase their share in the state population

The University of New Mexico

notes prepared by Elaine Moore Hebard

POPULATION PROJECTIONS WITHOUT TRYING

Data Users Conference
September 24, 2002

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Some Basic Terminology

- Cohort. A cohort consists of a group of individuals who experienced the same significant demographic event during a particular period of time and who may be identified as a group at successive later dates on the basis of this common demographic experience. [Shryock, H. and Siegel, J. (1973). The methods and materials of demography. Washington, D.C.: US Government Printing Office, p.712). For example, all babies born in the 1990s comprise the birth cohort for that decade.
- Projection. The numerical outcome of a particular set of assumptions regarding future values of a variable (e.g., population).
- Forecast. The projection selected as the one most likely to provide an accurate prediction of the future value of a variable (e.g., population).
- Estimate. A calculation of a current or past value of a variable (e.g., population) typically based on symptomatic indicators of change in that variable.
- Base year. The year of the earliest data used to make a projection.
- Launch year. The year of the most recent data used to make a projection.
- Target year. The year for which a variable is projected.
- Projection horizon. The interval between the launch year and target year of a projection.
- Projection interval. The increments in which the projections are made.

PROJECTION METHODOLOGIES

Trend extrapolation methods

The defining characteristic of trend extrapolation methods is that future values of any variable are determined solely by its historical values.

For very short term projection horizons (five to 10 years) and for places where little or no migration occurs, these methods can produce reasonably accurate forecasts.

The advantage to using these methods is their relatively low costs and small data requirement.

LINEAR EXTRAPOLATION METHOD (LINE) assumes that the population will increase (decrease) by the same number in each future year as the average annual increase (decrease) observed over the base period.

Average annual absolute change can be computed as

$$AAAC = (Pl - Pb)/n$$

where Pl is the population in the launch year,
Pb is the population in the base year.

Example:
The AAAC for Catron County from 1990 to 2000 can be calculated as

AAAC = (3,543 – 2,563)/10 = 98 per year

Population projections based on LINE method can be expressed as

Pt = Pl + z * (AAAC)

where Pt is the population in the target year, and
z is the number of years in the projection horizon.

LINE Example

The LINE projection for Catron County for 2005 and 2010 can be calculated as

Catron 2005 = 3,543 + (5 * 98) = 4,033
Catron 2010 = 3,543 + (10 * 98) = 4,533

GEOMETRIC EXTRAPOLATION METHOD (GEO)

This method assumes that a population will increase (decrease) at the same annual percentage rate during the projection horizon as during the base period. Growth rates estimated using GEO assumes compounding at discrete time intervals, e.g. one year. To calculate the average annual geometric rate use the following formula:

$$r = (Pl/Pb)1/y - 1$$

Given this formula a population projection using the GEO method can be expressed as

$$Pt = Pl * (1+ r)z$$

GEO Example

Catron 1990 = 2,563
Catron 2000 = 3,543

r = ((3,543/2,563)^(1/10)) – 1 = .032909

The GEO projection for Catron County for 2005 and 2010 can be calculated as

Catron 2005 = (3,543 (1 + .032909)^5 = 4,165

Catron 2010 = (3,543 (1 + .032909)^10 = 4,896

EXPONENTIAL EXTRAPOLATION METHOD (EXPO)

Like the GEO method, EXPO assumes that a population will increase (decrease) at the same annual percentage rate during the projection horizon as during the base period. The difference is that population growth is assumed to occur continuously rather than at discrete intervals.

To calculate the average annual exponential rate use the following formula:

$$r = \ln (Pl / Pb)/y$$

where ln is the natural logarithm .

Given this formula a population projection using the GEO method can be expressed as

$$Pt = Pl * e\ rz$$

EXPO Example

Catron 1990 = 2,563
Catron 2000 = 3,543

r = (ln(3,543/2,563)) /10= .03238

The GEO projection for Catron County for 2005 and 2010 can be calculated as

Catron 2005 = 3,543 * exp (5* .03238) = 4,167

Catron 2005 = 3,543 * exp(10* .03238) = 4,898

LINEAR TREND

Simplest and most familiar of the complex trend extrapolation methods.

Assumptions

- population will increase (decrease) by a constant numerical amount, as determined by historical population.
- same assumption as LINE but operationalized differently
- equation is that for a straight line

The formula is as follows: $Y = a + bX$

Where Y is the dependent variable (e.g., total population
X is the independent variable (e.g., time)
a is the constant term
b is the slope of the line.

X and Y are the model's variables. They represent the data used in estimated the model and take on values that vary with each observation.

The terms a and b

- are the model's parameters or coefficients.
- represent the relationships between the model's independent and dependent variables.
- take on values that remain constant for any particular application of the model but vary from one application to another.

EXAMPLE
New Mexico

Year	Time	Population
1950	1	981,187
1960	2	951,023
1970	3	1,017,055
1980	4	1,303,303
1990	5	1,515,069
2000	6	1,819,046

. LINEAR TREND EXAMPLE

The linear regression results are as follows:

a = 666,755.7 R = .990
b = 219,076.6 R2 = .981 adjusted R2 = .976

The model shows that NM population increases by 219,076.6 a year.

We construct population projections by plugging the estimated parameters into the linear trend model as follows:
Pt = a + b(time) + CALIB

CALIB is an error term calculated by subtracting the estimated population from the actual population in the launch year. In the New Mexico, the launch year is 2000.

NM 2000 = 666,755.7 + (219,076.6 * 6) = 1,981,215
CALIB = 1,819,046 – 1,981,215 = 162,169
NM 2010 = (666,755.7 + (219,076.6 * 7)) – 162,169
=2,038,123

<u>OTHER COMPLEX TREND EXTRAPOLATION METHODS</u>

POLYNOMIAL CURVE FITTING

Like the EXPO and GEO methods, a polynomial curve can be useful for basing projections on nonlinear patterns, i.e., when annual population change is not a constant numerical value.

The general formula for a polynomial curve is

$$Y = a + b1X + b2X2 + b3X3 + \ldots bnXn$$

Where Y is the dependent variable, e.g., total population

a is the intercept or constant

b is the slope that indicates the amount of change in the population

X is the independent variable, e.g. time

The coefficients of the polynomial curve include both a linear (b1) and nonlinear measures (b2, b3…bn).

For use in population projections a second-degree polynomial or quadratic equation is used.

$$Y = a + b1X + b2X2$$

OTHER TREND EXTRAPOLATION METHODS

RATIO METHODS

- In these methods, the population (or population change) of a smaller area is expressed as a proportion of the population (or population change) of a larger area in which the smaller area is located.
- Small data requirements
- Easy to apply

TYPES OF RATIO METHODS

a. Constant Share, the smaller area's share in the larger area's population is held constant at some historical level, such as the level observed in the launch year.
b. Shift Share accounts for changes in the population shares over time.
c. Share of Growth or apportionment method focuses on shares of population growth rather than population size. This method assumes that the smaller area's share of population growth will be the same over the projection horizon as during the base period.

STRUCTURAL METHODS

- Land use models
- REMI model (input-output)
- Econometric models

Date: Wed, 12 Mar 2003 03:37:11
From: elaine hebard <emhebard@unm.edu>
To: Mike Trujillo <mtrujillo@mrgcog.org>

Re: Rio Puerco y Rio Jemez - technical information

Hi Mike,

This is a follow up to the phone call I made to you on Tuesday. As you know, I have been asking you about the supply, demand and future demand studies for the subregions. Many are concerned that both subregions lack the very basic information to engage truly in the water planning. To begin with, according to the Regional Water Planning Handbook, each region must answer the following questions:

III. GENERAL GUIDELINES

1 a. What is the region's available water supply?
b. What is the region's future water demand?
c. How will the region undertake to meet demand with supply?

Furthermore, in accord with the Handbook, the plan (written for the entire region or the three subregions) is to include the following:

4. In assessing what categories are necessary and what should be included, planners shall focus on the following:

a. Location, quality, and extent of the current water resource supply.
b. Current water use, including specific categories of use (See II.6.).
c. Projections of future water use, quantified.
d. Impacts of conservation on water use, including i.) the suitability of conservation measures for each region, and ii.) the projected water savings for each measure evaluated.
e. Source and quality of future water supply including i.) cost effectiveness, technical feasibility, and social and political issues of using the identified future water source, and ii.) potential for water supply contamination.
f. Current water rights status.
g. Methods used to solicit public involvement in developing the water plan

Given that, I now turn to the information you suggested that the two subregions utilize.

1. Supply - You said that the subregions had the Water Budget. However, like the Papadopolous Water Supply Study, the figure used in the Budget is the gaged tributary inflow as it enters the Rio Grande. The Water Budget actually lumps many tributaries into one number. I hope that you would agree that that's not a supply figure that is usable within the subregion. What is the supply figure you suggest using for each basin?

2. Demand - You mentioned that the Shomaker report also provided information for the subregions. I am attaching the page from the report, plus some charts to fill in with information regarding withdrawals, depletions and consumptive use for the two basins. It seems to me that the subregion information is fairly incomplete. Since you have the information, would you help by filling in the charts with the demand information?

3. Future Demand - You said to use the Future Water Use Report for the future water demand. First of all, the methodology employed by Jim Gross was that he used the 1995 Withdrawals (Chart 50 in Shomaker) for the region and tried to apply them to land uses. After calibrating the urban usage with Albuquerque, and getting a good correlation, he reduced urban uses by 30% so as to match up with Shomaker's chart. Then he applied the results region-wide. Are you suggesting then that the Future Water Use Projections, particularly with its modification reducing urban metered withdrawals and being based upon withdrawals rather than consumptive use, should be applied in the Rio Puerco y Rio Jemez? As we all know, the withdrawals alone portray a very skewed picture. I have attached the page and charts for that as well. Is that what the two subregions are to use? Can you tell me, for example, how those amounts in Table 4 match up with the demand reported in Shomaker?

Needless to say, I am confused. Last spring, Joe Q. indicated that the technical studies had not been done. Now it appears that you are saying that they are. Which is it? The contract CS&WCD certainly does not include tasks to fulfill the questions of supply, demand and future water demand. Will there be any supply, demand and future water use demand done for the subregions over and above what I have attached, or should I tell them that there will not be? Will there be the information called for in 4 (a)-(g), or should I report that it will not be forthcoming?

Elaine

Attachments:

1.

HISTORICAL AND CURRENT WATER USE IN THE MIDDLE RIO GRANDE REGION

June 2000

PIONEERWEST & JOHN SHOMAKER & ASSOCIATES, INC.
WATER-RESOURCE AND ENVIRONMENTAL CONSULTANTS

6.2 Subregions

The three different subregions of the Middle Rio Grande Region, the Middle Rio Grande Valley, and Rio Puerco and Rio Jemez (Fig. 1A), also have very distinct water-use signatures. The majority of people, businesses, industries, as well as agricultural fields are located within a few miles of the Rio Grande itself; therefore, the majority of water withdrawn and consumed is within the Middle Rio Grande Valley subregion (see Table 3, Fig. 27). The Rio Puerco basin has

only one city, Cuba (1999 population less than 1,000), and little irrigated agriculture. Likewise, the Rio Jemez basin contains only the towns of Jemez Springs and San Ysidro, as well as the Jemez Pueblo, with a combined population of less than 5,000.

Though we do not have data regarding how much open-water evaporation occurs in the Rio Puerco or Rio Jemez basins with respect to the total amount in the region, it is probably safe to assume that the majority of water consumption by this category also occurs in the Middle Rio Grande Valley subregion. Data were not available regarding how much water is consumed by riparian vegetation in the Rio Puerco subregion. However, the BOR made the Rio Jemez basin a subunit in their analysis, and on average only 11.5 per cent of the total riparian consumptive use in our study area occurs in the Rio Jemez subregion (Table 28).

Table 28. Riparian vegetation consumptive use in the Rio Jemez subregion (1935 - 1994)

average riparian consumptive use in Rio Jemez subregion (acre-feet)	average riparian consumptive use in total region (acre-feet)	per cent of riparian consumptive use occurring in Rio Jemez subregion
11,500	100,000	11.50%

Source: Kinkel, 1995a

For the years 1975, 1980, and 1985, withdrawal and consumptive use data for self-supplied categories (domestic, commercial, industrial, mining, and power) were available only by county. However, the NMOSE meter record database for 1990 and 1995 included the addresses of the individual water users (not including domestic), allowing withdrawals to be subdivided into the appropriate subregions (Appendix 3). As reported in the NMOSE meter files, both the Rio Puerco and Rio Jemez subregions comprise less than 1 percent of self-supplied commercial withdrawals, and essentially no self-supplied industrial, self-supplied mining, or self-supplied power withdrawals.

Public water-supply withdrawals within the Rio Puerco and Rio Jemez subregions combined constitute less than 0.3 percent of the total amount of water withdrawn for public water suppliers in the study area. In 1995, about 231 acre-feet were withdrawn in the Rio Puerco subregion, 126 acre-feet in the Rio Jemez subregion (Table 3). The largest recorded water use category in either of these regions is irrigated agriculture; according to 1995 NMOSE data (Wilson and Lucero, 1997), 7,580 acre-feet were withdrawn in the Rio Puerco subregion and 4,610 acre-feet were withdrawn in the Rio Jemez subregion.

This report does not intend to imply that water demand within the Rio Puerco and Rio Jemez subregions is unimportant with respect to the Middle Rio Grande Valley subregion, which contains New Mexico's largest metropolitan area, as well as the productive agricultural zone located within the Rio Grande floodplain. Part of the reason why the Rio Puerco and Rio Jemez subregions are less populated and less extensively farmed may be because surface- and ground water are, and historically have been, relatively scarce when compared to the water supplies of the Middle Rio Grande Valley. For example, the Rio Jemez has "no flow for many days" beneath the Jemez Canyon Dam, and the Rio Puerco has, "no flow for many days," to, "no flow for

extended periods," along most of its length (Waltemeyer, 1989). Therefore, a thorough understanding of those subregions' water use and demand remains extremely important, especially if they are experiencing growth.

Water Withdrawals	Rio Puerco	Rio Jemez
Public water-supply withdrawals	231	126
Agricultural withdrawals	7,580	4,610
riparian vegetation		
open-water evaporation		
self- supplied domestic		
self- supplied commercial		
self- supplied industrial		
self- supplied mining		
self- supplied and power		

Water Depletions	Rio Puerco	Rio Jemez
Public water-supply withdrawals		
Agricultural withdrawals		
riparian vegetation		
open-water evaporation		
self- supplied domestic		
self- supplied commercial		
self- supplied industrial		
self- supplied mining		
self- supplied and power		

Water Consumptive Use	Rio Puerco	Rio Jemez
Public water-supply withdrawals		
Agricultural withdrawals		
riparian vegetation		
open-water evaporation		
self- supplied domestic		
self- supplied commercial		
self- supplied industrial		
self- supplied mining		
self- supplied and power		

2. *Future Water Use Projections for the Middle Rio Grande Water Planning Region*

Note: These projections were partially based on information contained in the report entitled "Historical and Current Water Use in the Middle Rio Grande Region" prepared by John Shomaker and Associates and PioneerWest. The withdrawal and depletion projections were also based on a forecasted future land-use map prepared by the Middle Rio Grande Council of Governments for the Focus 2050 project. This future land-use map reflects the continuation of existing growth trends and a projected regional population in the year 2050 of approximately 1.47 million people.

Shomaker et al. reported that 1995 regional withdrawals were approximately 600,000 acre-feet per year, and that 1995 regional depletions were approximately 340,000 acre-feet per year. Withdrawal and depletion coefficients relating water use to land uses were adjusted so that calculated existing regional water withdrawals and depletions based on the land-use map prepared by the Middle Rio Grande Council of Governments matched the regional withdrawals and depletions reported by Shomaker.

Table 3 - **Areas of existing land uses in the planning region by subregion (in acres)**

Land-Use Category	Rio Jemez	Rio Puerco
Single-family residential	1,400	1,502
Multi-family residential	0	0
Major retail commercial	0	0
Mixed and minor commercial	131	50
Office	0	0
Industrial and wholesale	80	63
Institutions	109	2
Schools and universities	10	47
Airports	0	29
Transportation and major utility corridors	8	0
Irrigated agriculture	586	553
Rangeland and dry agriculture	432,055	1,275,581
Major open space and parks (with water use)	0	0
Major open space and parks (no water use)	207,724	69,554
Natural drainage and riparian systems	7,012	125
Urban vacant and abandoned	98	40
Landfills and sewage treatment plants	8	1,414
Other urban non-residential	19	28
Totals:	649,240	1,348,988

Table 5 – Areas of future land uses in the planning region by subregion (in acres)

Land-Use Category	Rio Jemez	Rio Puerco
Single-family residential	4,263	3,008
Multi-family residential	0	0

Major retail commercial	0	0
Mixed and minor commercial	187	376
Office	30	91
Industrial and wholesale	86	89
Institutions	117	0
Schools and universities	7	46
Airports	0	37
Transportation and major utility corridors	8	0
Irrigated agriculture	491	554
Rangeland and dry agriculture	428,923	1,273,367
Major open space and parks (with water use)	0	0
Major open space and parks (no water use)	207,838	69,625
Natural drainage and riparian systems	6,965	126
Urban vacant and abandoned	92	36
Landfills and sewage treatment plants	6	1,395
Other urban non-residential	78	241
Kirtland Air Force Base	0	0
Totals:	649,091	1,348,991

Table 14 - **Future land-use areas and water withdrawals - Rio Jemez Subregion**

Land-Use Category	Area (acres)	Withdrawal (acre-feet)
Single-family residential	4,263	4,897
Multi-family residential	0	0
Major retail commercial	0	0
Mixed and minor commercial	187	412
Office	30	66
Industrial and wholesale	86	60
Institutions	117	90
Schools and universities	7	5
Airports	0	0
Transportation and major utility corridors	8	6
Irrigated agriculture	491	3,689
Rangeland and dry agriculture	428,923	0
Major open space and parks (with water use)	0	0
Major open space and parks (no water use)	207,838	0
Natural drainage and riparian systems	6,965	24,251
Urban vacant and abandoned	92	0
Landfills and sewage treatment plants	6	5
Other urban non-residential	78	60
Kirtland Air Force Base	0	0

Totals:	649,091	33,541

Table 15 - **Future land-use areas and water withdrawals - Rio Puerco Subregion**

Land-Use Category	Area (acres)	Withdrawal (acre-feet)
Single-family residential	3,008	3,455
Multi-family residential	0	0
Major retail commercial	0	0
Mixed and minor commercial	376	829
Office	91	201
Industrial and wholesale	89	62
Institutions	0	0
Schools and universities	46	35
Airports	37	28
Transportation and major utility corridors	0	0
Irrigated agriculture	554	4,163
Rangeland and dry agriculture	1,273,367	0
Major open space and parks (with water use)	0	0
Major open space and parks (no water use)	69,625	0
Natural drainage and riparian systems	126	439
Urban vacant and abandoned	36	0
Landfills and sewage treatment plants	1,395	1,070
Other urban non-residential	241	185
Totals:	1,348,991	10,467

Table 17 – Existing depletions and depletion coefficients Planning Region

Land-Use Category	**Depletions (acre-feet)**	**Depletion coefficient (gal/acre/day)**
Single-family residential	59,164	559
Multi-family residential	3,582	850
Major retail commercial	1,696	1,361
Mixed and minor commercial	13,249	1,361
Office	1,413	1,361
Industrial and wholesale	4,058	431
Institutions	1,108	474
Schools and universities	2,124	474
Airports	3,545	474
Transportation and major utility corridors	409	474
Irrigated agriculture	93,590	2,227

Rangeland and dry agriculture	0	0
Major open space and parks (with water use)	3,460	474
Major open space and parks (no water use)	0	0
Natural drainage and riparian systems	148,121	3,109
Urban vacant and abandoned	0	0
Landfills and sewage treatment plants	1,475	474
Other urban non-residential	932	474
Kirtland Air Force Base	2,076	60
Totals:	340,002	

Table 18 – Future depletions in the planning region for the base-case projection

Land-Use Category	Land-Use Category Depletions (acre-feet)
Single-family residential	142,636
Multi-family residential	6,000
Major retail commercial	2,276
Mixed and minor commercial	25,087
Office	4,094
Industrial and wholesale	5,933
Institutions	1,355
Schools and universities	1,871
Airports	2,906
Transportation and major utility corridors	350
Irrigated agriculture	71,647
Rangeland and dry agriculture	0
Major open space and parks (with water use)	2,883
Major open space and parks (no water use)	0
Natural drainage and riparian systems	148,372
Urban vacant and abandoned	0
Landfills and sewage treatment plants	1,567
Other urban non-residential	1,911
Kirtland Air Force Base	2,081
Totals:	420,969

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Date: Thu, 13 Mar 2003 10:03:02
From: Mike Trujillo <mtrujillo@mrcog-nm.org>
To: 'elaine hebard' <emhebard@unm.edu>

Cc: Lawrence Rael <lrael@mrcog-nm.org>, Joseph Quintana <jquintana@mrcog-nm.org>, 'Bob Wessely' <wessely@sciso.com>

RE: Re Rio Puerco y Rio Jemez - technical information

Elaine --

In response to your inquiry below, the issue of water supply, demand and future water demand studies has been done on a regional basis and existing studies are to be utilized for said information. I would ask you to carefully look at the contract scope of work with CS&WCD -- the items contained in that scope of work are the only requirements being made of them regarding their participation in the regional water planning process and since time is short and funding limited we hope that you concentrate heavily in insuring that they complete the contract requirements so they can be included in the final RWP.

The purpose of this contract is to insure public participation in the formulation of goals and objectives, and water management alternatives applicable to the subregions and in a form that can be incorporated into the RWP.

Michael R. Trujillo
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Phone: 505-247-1750, Fax: 505-247-1753

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Date: Thu, 13 Mar 2003 11:59:56
From: elaine hebard <emhebard@unm.edu>
To: Mike Trujillo <mtrujillo@mrcog-nm.org>
cc: Lawrence Rael <lrael@mrcog-nm.org>, Joseph Quintana <jquintana@mrcog-nm.org>, 'Bob Wessely' <wessely@sciso.com>

RE: Re Rio Puerco y Rio Jemez - technical information

Dear Mike,

Thank you for your response, and your reminder as to the purpose of the contract with CS&WCD. I am not the only one who has noticed the lack of information for the subregions. It comes up repeatedly. But your note left me really confused. I have been told by others in your office that the technical information had not yet been done for the subregions - leading me to believe that it was still forthcoming. Your note, however, seemingly indicates that there will not be any further technical information provided. Which is correct?

You mention that the regional studies were done for the region. However, as you can see, for example, the water supply study done by SSP&A provides numbers for the Rio Puerco Inflow and the Jemez River Inflow, both to the Rio Grande. That is quite different than knowing the

water supply as it enters the basin, which is provided for the Middle Rio Grande region. SSP&A specifically said that it had not done a water supply study for the two subregions. Are you now suggesting that that is the water supply figure to be used? Likewise, the Sandia Model, which contains an amazing array of data, has been built with the Middle Rio Grande in mind, omitting data from the two subregions. So it's not quite true that the information available is the same, or that the studies have been done, is it?

Since you had said that the data was available, I sought your help so that it could be provided to the two watersheds. I figured that I would ask you since you obviously knew more than I did. As you could see, I spent some time gathering what I could so as to begin the process. I was hopeful that you could fill in the details. But now, if I read your note correctly, there will not be further information forthcoming. Is that correct? Shall I use the material I gathered and sent to you? I just want to be clear.

With respect to the contract scope of work with CS&WCD, I can assure you, Mike, that I have carefully read it over. The two subregions are being asked to provide their goals and objectives, and prioritized alternatives, into the regional water plan. As you know, they have already held one of the two workshops required in the contract. They are well on their way to completing their tasks in a timely manner. I have no reason to believe that they will not complete their contract requirements. Had you attended any of the steering committee meetings, you would know how very diligently folks are working.

Of course, any help that you might provide is always welcome. For example, you mentioned that the subregions are to select "water management alternatives applicable to the subregions." Without knowing the technical information, nor the water saved/demand reduced, the costs, benefits, trade-offs, etc., for each alternative, what criteria do you suggest they utilize in selecting them? Do you anticipate assistance being provided by MRCOG with respect to analyzing the alternatives? Or, what "form that can be incorporated into the RWP" are you looking for, especially since the alternatives for the Middle Rio Grande have been analyzed and a preferred scenario will have been chosen before the subregions are even to submit their prioritized alternatives? How will the two be meshed? Your guidance is appreciated.

Of course, public participation alone doesn't address the underlying problem - lack of data and evaluations - nor does it ensure that the plan incorporates the information provided. I am constantly asked questions such as "how can we choose an alternative when we have no technical information?" "what will happen to the alternatives we choose?" "how will they be integrated into the regional plan?" and "how will we participate in the planning process once we complete these tasks in June?" I have raised all of these questions with you, and today's response is the first one I have received. How do I answer the questions? For instance, I have yet to hear what strategies you anticipate to utilize to involve the subregions in the plan approval process this fall. There are no funds currently allocated in the program to involve the subregions, nor does the contract with CS&WCD include such. I asked last December if there might be a Phase III which would enable this to be done. You never responded. If not issuing a Phase III contract, what are you contemplating?

I have worked hard to keep you in the loop by letting you know when activities are happening and passing along concerns as well as suggestions as to how to keep these processes together. Here's an example. Although I have asked on several occasions over the past year as to whether the MRCOG mailing database has been updated after last year's workshop, until today I never received a simple "yes" or "no." (I hated to ask someone else to create a mailing database since MRCOG already has one. Rather than duplicating efforts or creating databases with different fields, I figured that it would be easy enough to extract the information for Rio Puerco and Rio Jemez from MRCOGs and send them to Peggy Ohler so that she could run her mailing labels from it, update it periodically and send it back for inclusion in the master one.) Today you responded that it was not possible. Thank you.

Mike, you know that I believe that communication is the best way to ensure these activities fit together. I look forward to receiving your responses to the above questions.

Sincerely,

Elaine

cc: Steve Lucero

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Date: Thu, 13 Mar 2003 14:27:22
From: elaine hebard <emhebard@unm.edu>
To: Mike Trujillo <mtrujillo@mrcog-nm.org>
cc: Lawrence Rael <lrael@mrcog-nm.org>, Joseph Quintana <jquintana@mrcog-nm.org>, 'Bob Wessely' <wessely@sciso.com>

RE: Re Rio Puerco y Rio Jemez - technical information

Hi Mike,

It did not appear from your response that the additional recipients received the attachments I had sent to you, so I thought I would send them along! If anyone can assist in filling them in, please don't hesitate to do so!

Thanks,

Elaine

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Date: Thu, 13 Mar 2003 15:11:36
From: Mike Trujillo <mtrujillo@mrcog-nm.org>
To: 'elaine hebard' <emhebard@unm.edu>

Cc: Lawrence Rael <lrael@mrcog-nm.org>, Joseph Quintana <jquintana@mrcog-nm.org>, 'Bob Wessely' <wessely@sciso.com>

RE: Re Rio Puerco y Rio Jemez - technical information

Elaine -- I have reviewed your reply with Joe Quintana who carries the historical perspective on this issue in the office. Our joint and final response on this issue is:

Point 1: Technical information regarding supply and demand was done for the region as a whole and data specific to the subregions was provided to the extent possible given the resources available. The Regional Water Planning Handbook does not require, and was not intended to cover, sub-regional planning. Subregions were created for this region because there was a request from the rural communities to have the opportunity to provide input to the regional plan that reflected their values and was sensitive to their needs.

Point 2: There was never any "promise" to conduct a technical assessment of the water resources in the Rio Puerco and Rio Jemez watersheds. It has always been acknowledged that data for these watersheds is lacking but that funding is not available. A hydrographic survey of the Rio Jemez was initiated by the OSE but it is not known what the status of that work is at this time.

Point 3: It is not impossible to complete a plan for management of water resources in any given area if you assume that future water supplies may be limited, population and development may increase the demand for water, and water resources may be vulnerable to contamination. Therefore, the Plan should be focused on implementing water use efficiencies, drought contingency planning, water pollution control, protection of watershed recharge areas, etc. Technical information and water management alternatives developed for the Middle Rio Grande area can be "transferred" for applicability to the rural settings in the Rio Puerco and Rio Jemez watersheds. What is important in these sub-regional planning activities is to express values and priorities about managing water in the future, rather than getting into an "us versus them" attitude.

Point 4: There are no funds available for a Phase 3 or 4 funding process. Should the ISC make such funds available later we certainly would consider a request to be able to provide additional technical information. Until such time, we have to do with what we have.

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<><><>

Date: Thu, 13 Mar 2003 16:50:25
From: elaine hebard <emhebard@unm.edu>
To: Mike Trujillo <mtrujillo@mrcog-nm.org>

cc: Lawrence Rael <lrael@mrcog-nm.org>, Joseph Quintana <jquintana@mrcog-nm.org>, 'Bob Wessely' <wessely@sciso.com>

RE: Re Rio Puerco y Rio Jemez - technical information

Thanks, Mike, for your answer. I wish it had been forthcoming months ago! While I disagree with some aspects of it, and I'm sorry that no further data will be forthcoming from your office, I take it that it is your final response.

I have no interest in getting the subregions into an "us versus them" attitude, though they know that the urban regions are seeking their waters. Indeed, that is how they often "express [their] values and priorities about managing water in the future." However, without data, how does a region implement plans to stay within a water budget? Surely the Cuba area can't use the water budget for the Middle Rio Grande!

May I ask what specific activities you anticipate with respect to "Information and data regarding the identification, screening, and analysis of potential alternatives developed to date for the Middle Rio Grande Regional Water Plan shall be made available by MRGCOG for review and consideration by the Rio Puerco and Rio Jemez Sub-regions," as called for in the contract? For example, will you be available to do a workshop on these alternatives?

I am still quite unclear as to how the subregions will be included in the planning process once the tasks are completed in June, and how the input will be included into the RWP. Will there be a separate section for the subregions, or will the goals and objectives be meshed into the ones for the Middle Rio Grande? Since there are no funds for a Phase 3, how do you see them being included in the plan approval process? Do you expect that the contract with the facilitator (executed for Community Conversations VI - Scenario Review and for the Regional Forum - Scenario Review, as well as for Community Conversations VII - The Regional Water Plan and Regional Forum - The Regional Water Plan) includes holding sessions in Canon and Cuba? I guess that would make the most sense to ensure that the subregions are included in the overall plan, but that isn't what appears to be written. To me, it appears best to advise the Steering Committees to seek additional funding since there will be no further funds forthcoming from MRCOG.

Mike, I am trying to keep the subregions hooked into the regional plan, and certainly appreciate your assistance in so doing. But since the details with the subregions were not worked out for months, it is quite difficult to keep them on the same planning track. Ensuring that their input is based upon the best available data and that they will continue to be involved clearly are ways to ensure that the "us versus them" attitude, or the sense that they are involved in a "sham" process, does not grow legs.

Elaine

cc: Steve Lucero