APPENDIX 1: INCHES OF AVERAGE MONTHLY PRECIPITATION IN NEW MEXICO

	*INCHES OF AVERAGE MONTHLY RAINFALL FOR NM TOWNS												
**NM Towns	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	**Annual**
Abiquiu Dam	0.38	0.26	0.51	0.55	0.83	0.71	1.59	2.01	1.13	0.88	0.53	0.34	**9.71**
Alamogordo	0.73	0.52	0.46	0.32	0.50	0.83	2.13	2.13	1.68	1.05	0.54	0.81	**11.68**
Albuquerque	0.39	0.40	0.48	0.50	0.61	0.65	1.31	1.52	1.02	0.81	0.48	0.49	**8.66**
Animas	0.70	0.54	0.49	0.19	0.17	0.45	2.20	2.36	1.46	0.99	0.57	1.03	**11.15**
Belen	0.28	0.40	0.40	0.26	0.31	0.63	1.40	1.32	0.90	0.98	0.20	0.39	**7.45**
Bernalillo	0.43	0.49	0.56	0.43	0.58	0.55	1.47	1.50	0.83	0.95	0.44	0.47	**8.68**
Carlsbad	0.43	0.44	0.30	0.53	1.24	1.53	1.73	1.96	2.34	1.24	0.49	0.51	**12.72**
Clayton	0.27	0.40	0.65	1.21	2.39	1.91	2.64	2.31	1.68	1.09	0.50	0.38	**15.44**
Clines Corners	1.05	0.82	0.99	1.00	1.60	1.61	2.72	3.16	2.24	1.49	1.04	1.00	**18.71**
Clovis	0.43	0.43	0.59	1.04	2.10	2.60	2.62	2.96	2.16	1.61	0.56	0.60	**17.71**
Corrales	0.43	0.39	0.67	0.65	0.68	0.82	1.63	1.95	1.18	0.85	0.91	0.64	**10.80**
Crownpoint	0.52	0.51	0.49	0.50	0.36	0.67	2.06	1.89	0.85	0.85	0.46	0.61	**9.75**
Cuba	0.89	0.69	0.88	0.68	0.80	0.80	2.07	2.28	1.38	1.11	0.80	0.72	**13.09**
Deming	0.48	0.54	0.34	0.20	0.16	0.37	2.07	1.90	1.22	0.79	0.52	0.89	**9.50**
Española	0.47	0.43	0.59	0.58	0.89	0.75	1.50	1.94	1.00	0.90	0.57	0.50	**10.12**
Estancia	0.54	0.53	0.64	0.55	1.01	0.97	2.19	2.38	1.51	1.13	0.64	0.80	**12.87**
Farmington	0.58	0.50	0.55	0.51	0.36	0.46	0.80	1.07	0.83	1.11	0.49	0.62	**7.89**
Fort Sumner	0.39	0.40	0.44	0.59	1.16	1.47	2.42	2.81	1.80	1.37	0.55	0.49	**13.90**
Gallup	0.89	0.73	0.89	0.53	0.64	0.47	1.54	1.93	1.13	1.00	0.99	0.74	**11.50**
Grants	0.51	0.43	0.52	0.45	0.57	0.57	1.71	2.10	1.35	1.10	0.56	0.66	**10.52**
Hobbs	0.48	0.45	0.46	0.80	2.09	1.83	2.16	2.42	2.66	1.58	0.57	0.58	**16.06**
Jemez Springs	1.08	0.88	1.02	0.89	1.07	1.07	2.61	3.12	1.58	1.50	1.06	0.94	**16.83**
Las Cruces	0.52	0.33	0.23	0.21	0.33	0.66	1.46	2.27	1.31	0.82	0.46	0.76	**9.17**
Los Alamos	0.91	0.79	1.10	0.94	1.31	1.38	3.14	3.78	1.82	1.42	0.98	0.98	**18.53**
Los Lunas	0.35	0.42	0.46	0.44	0.49	0.57	1.23	1.76	1.21	1.06	0.46	0.53	**8.98**
Pecos	0.66	0.65	0.86	0.73	1.14	1.29	3.00	3.48	1.86	1.09	0.80	0.63	**16.21**
Raton	0.37	0.39	0.71	0.91	2.51	2.25	2.87	3.34	1.88	0.92	0.49	0.41	**17.07**
Roswell	0.42	0.46	0.29	0.60	1.33	1.63	2.01	2.48	2.16	1.06	0.51	0.59	**13.52**
Ruidoso	1.17	1.20	1.21	0.63	0.94	1.94	4.05	4.03	2.65	1.54	0.85	1.63	**21.85**
Sandia Park	3.10	1.24	1.44	0.93	1.14	1.12	3.00	3.00	1.83	1.40	1.31	1.20	**20.44**
Santa Fe	0.65	0.74	0.79	0.94	1.33	1.05	2.35	2.17	1.52	1.11	0.62	0.71	**13.99**
Shiprock	0.51	0.43	0.46	0.40	0.52	0.32	0.63	0.98	0.67	0.86	0.57	0.59	**6.93**
Silver City	1.25	0.85	0.84	0.55	0.21	0.58	2.78	2.48	1.91	1.21	0.49	1.07	**14.17**
Socorro	0.39	0.39	0.33	0.37	0.59	0.62	2.59	1.77	1.46	0.97	0.37	0.56	**10.40**
Taos	0.71	0.63	0.83	0.77	1.17	0.89	1.62	1.98	1.25	1.03	0.84	0.68	**12.40**
Tijeras	0.63	0.97	1.06	0.90	0.78	0.88	2.45	2.42	1.57	1.46	0.80	1.18	**15.10**
T or C	0.47	0.37	0.33	0.21	0.42	0.81	1.72	2.11	1.37	0.96	0.54	0.96	**10.26**
Tucumcari	0.26	0.47	0.39	0.87	1.49	1.78	3.30	2.40	1.46	0.94	0.50	0.27	**14.11**
Vaughn	0.44	0.44	0.35	0.51	0.92	1.60	1.99	2.56	1.41	0.87	0.41	0.38	**11.87**

* Data obtained from the Western Region Climate Center and the National Oceanic and Atmospheric Agency

** The average rainfall for more specific locations may vary from the averages shown here. In Albuquerque, for example, average rainfall ranges from 8.51 inches a year at the airport to 14.00 inches a year near the Sandia foothills.

APPENDIX 2: WATER DEMAND WORKSHEET

A	B	C	D	E
Zone	**Locale**	**Irrigation requirement in gallons per sq. ft. per year**	**Square footage of irrigated area**	**Total gallons required** **(C x D)**
Total Column E				

For Year One (installation year) multiply the total by 120%
Year Two x 110%
Year Three x 105%
Every other year = 100%

APPENDIX 3: LANDSCAPE IRRIGATION REQUIREMENTS IN NEW MEXICO (in gallons per square foot per year)

County	Locale	Zone 1	Zone 2	Zone 3
Bernalillo	Albuquerque	5.97	14.79	37.65
Bernalillo	Coralles and Rio Rancho	5.81	14.38	36.59
Bernalillo	Los Ranchos	6.07	15.05	38.31
Bernalillo	Rio Rancho Estates	5.37	13.27	33.73
Catron	Reserve	5.50	13.59	34.57
Chaves	Roswell	6.91	17.20	43.81
Cibola	Grants	5.16	12.73	32.36
Cibola	Milan	5.13	12.66	32.17
Colfax	Cimarron	4.62	11.38	28.91
Colfax	Raton	4.40	10.82	27.48
Colfax	Springer	5.06	12.49	31.76
Curry	Clovis	6.00	14.87	37.86
De Baca	Fort Sumner	6.33	15.71	40.00
Dona Ana	Hatch	7.05	17.53	44.64
Dona Ana	Las Cruces and Mesilla Park	7.23	18.00	45.84
Eddy	Artesia	7.03	17.50	44.59
Eddy	Carlsbad	7.29	18.16	46.28
Eddy	Loving	7.37	18.37	46.80
Grant	Bayard and Central	5.77	14.28	36.34
Grant	Silver City	5.60	13.85	35.23
Guadalupe	Santa Rosa	6.16	15.28	38.90
Harding	Mosquero	5.18	12.80	32.54
Hidalgo	Lordsburg	7.01	17.43	44.41
Lea	Hobbs	6.77	16.83	42.86
Lincoln	Carrizozo	5.98	14.81	37.70
Lincoln	Ruidoso	4.89	12.03	30.57
Los Alamos	Los Alamos	4.46	10.96	27.83

(continued next page)

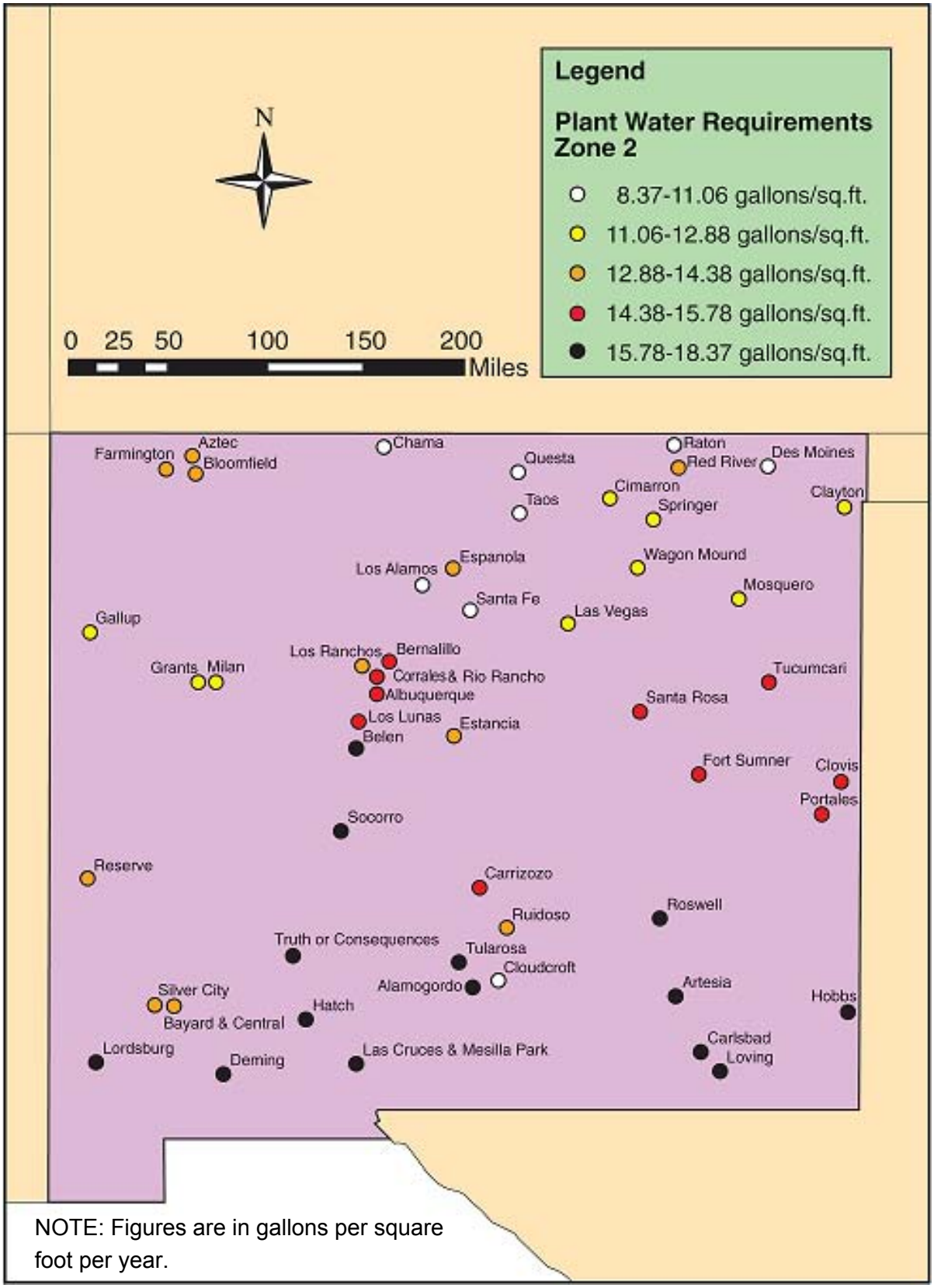
Note: The Hargreaves Samani equation was used to calculate ET_0. Irrigation system efficiency is not reflected in these numbers.

APPENDIX 3: LANDSCAPE IRRIGATION REQUIREMENTS IN NEW MEXICO, PAGE 2 (in gallons per square foot per year)

County	Locale	Zone 1	Zone 2	Zone 3
Luna	Deming	7.08	17.62	44.87
McKinley	Gallup	4.94	12.17	30.94
Mora	Wagon Mound	4.88	12.04	30.61
Otero	Alamogordo	6.59	16.37	41.70
Otero	Cloudcroft	3.45	8.37	21.20
Otero	Tularosa	6.67	16.58	42.22
Quay	Tucumcari	6.12	15.18	38.66
Rio Arriba	Chama	3.64	8.89	22.54
Rio Arriba	Espanola	5.46	13.50	34.35
Roosevelt	Portales	6.20	15.38	39.16
San Juan	Aztec	5.42	13.41	34.12
San Juan	Bloomfield	5.54	13.71	34.89
San Juan	Farmington	5.58	13.79	35.09
San Miguel	Las Vegas	4.86	11.98	30.44
Sandoval	Bernalillo	5.99	14.86	37.81
Santa Fe	Santa Fe	4.50	11.06	28.08
Sierra	Truth or Consequences	6.89	17.12	43.59
Socorro	Socorro	6.64	16.48	41.97
Taos	Questa	3.96	9.69	24.59
Taos	Red River	4.75	11.70	29.74
Taos	Taos	4.41	10.83	27.51
Torrance	Estancia	5.34	13.18	33.52
Union	Clayton	5.21	12.88	32.75
Union	Des Moines	4.36	10.72	27.22
Valencia	Belen	6.36	15.78	40.18
Valencia	Los Lunas	6.28	15.57	39.65

Note: The Hargreaves Samani equation was used to calculate ET_0. Irrigation system efficiency is not reflected in these numbers.

APPENDIX 4: NEW MEXICO PLANT WATER REQUIREMENTS (ZONE 2)



NOTE: Figures are in gallons per square foot per year.

APPENDIX 5: MONTHLY WATER BUDGET SETTING REQUIREMENTS IN NEW MEXICO

Albuquerque

Month	Minutes per month	Minutes per week	Water Budget Setting
January	20	5	5%
February	34	8	9%
March	76	19	20%
April	146	37	38%
May	243	61	64%
June	337	84	89%
July	380	95	100%
August	341	85	90%
September	234	59	62%
October	133	33	35%
November	49	12	13%
December	24	6	6%

Carlsbad

Month	Minutes per month	Minutes per week	Water Budget Setting
January	28	7	7%
February	41	10	11%
March	89	22	23%
April	164	41	42%
May	262	66	68%
June	360	90	93%
July	388	97	100%
August	353	88	91%
September	248	62	64%
October	150	38	39%
November	62	15	16%
December	35	9	9%

Clovis

Month	Minutes per month	Minutes per week	Water Budget Setting
January	19	5	5%
February	29	7	8%
March	67	17	18%
April	134	33	36%
May	228	57	62%
June	330	82	89%
July	371	93	100%
August	334	83	90%
September	226	56	61%
October	128	32	35%
November	48	12	13%
December	24	6	6%

Gallup

Month	Minutes per month	Minutes per week	Water Budget Setting
January	0	0	0%
February	17	4	5%
March	46	11	14%
April	99	25	30%
May	178	45	55%
June	262	66	80%
July	326	81	100%
August	284	71	87%
September	189	47	58%
October	101	25	31%
November	32	8	10%
December	0	0	0%

Grants

Month	Minutes per month	Minutes per week	Water Budget Setting
January	14	3	5%
February	22	5	7%
March	52	13	17%
April	99	25	33%
May	171	43	57%
June	257	64	86%
July	300	75	100%
August	262	65	87%
September	181	45	60%
October	102	25	34%
November	38	9	13%
December	19	5	6%

Las Cruces

Month	Minutes per month	Minutes per week	Water Budget Setting
January	30	7	7%
February	44	11	11%
March	94	24	23%
April	165	41	41%
May	262	65	64%
June	366	91	90%
July	406	101	100%
August	360	90	89%
September	258	65	64%
October	157	39	39%
November	66	16	16%
December	36	9	9%

Mountainair

Month	Minutes per month	Minutes per week	Water Budget Setting
January	14	3	5%
February	22	5	7%
March	52	13	18%
April	103	26	35%
May	176	44	61%
June	257	64	89%
July	290	73	100%
August	255	64	88%
September	180	45	62%
October	101	25	35%
November	38	9	13%
December	19	5	6%

Santa Fe

Month	Minutes per month	Minutes per week	Water Budget Setting
January	0	0	0%
February	16	4	6%
March	36	9	13%
April	83	21	31%
May	149	37	56%
June	226	56	84%
July	267	67	100%
August	239	60	89%
September	160	40	60%
October	86	22	32%
November	28	7	10%
December	0	0	0%

Source: Albuquerque Bernalillo County Water Utility Authority

APPENDIX 6: INSTALLATION SCHEDULING CHECKLIST

Here is a sample scheduling checklist for a roof-reliant landscape:

- ❑ Plan the project
- ❑ Design the water harvesting system
- ❑ Select contractor(s), if applicable
- ❑ Obtain permit(s), if applicable
- ❑ Arrange for cistern delivery
- ❑ Excavate for cistern and associated piping, electricity, etc.
- ❑ Install cistern(s)
- ❑ Install conveyance, overflow, and other pipes/conduit
- ❑ Backfill soil and tamp appropriately
- ❑ Control potential erosion below overflow pipe
- ❑ Install hardscape and conduits for irrigation and lighting
- ❑ Construct play and recreation equipment (if any)
- ❑ Amend the soil if necessary
- ❑ Plant trees and/or other critical plant material as your water budget allows
- ❑ Irrigate as needed
- ❑ Mulch plant material
- ❑ Install outdoor furniture, garden art, signage, lighting, etc.
- ❑ Wait for some precipitation to fill your cistern
- ❑ Plant shrubs, install irrigation and mulch according to your water budget
- ❑ Wait until your plant material to become established
- ❑ Plant conservative quantities of annuals, vegetables, berry bushes, fruit trees, and other water needy plants only when your cistern is full.

Installation Tips

- If a backhoe is used for digging a hole for an underground cistern, water pipes, etc., consider using it to help break up any hard ground to which you plan to add compost and other amendments for any future plant material. If you need a backhoe for the installation of decorative boulders, you may wish to move this item up in your schedule. **(Call 1-800-321-2537 or 811 before you dig!)**

- As soon as plants are in the ground, water them! Plants need supplemental water right away, even if there is no water in your cistern. (Use a hose hooked up to municipal water if necessary!) Quickly connect your water distribution system so it can be available for irrigating your plants.

- Add mulch around your new plants and trees as soon as possible.

- In an ideal roof-reliant landscape installation schedule, planting schedules can be designed to make it easier to stay within your water budget. For example, trees can be planted during the first year, shrubs can be planted in the second year and perennials can be planted in the third year. This method makes sense when trees are needed for an important purpose such as a windbreak, shade or privacy screening.

APPENDIX 7: PIPE SIZES AND DRAINAGE CAPACITIES

Drainage Capacities in Gallons Per Minute (GPM)							
Pipe Diameter Inches	Flow Capacities Drains & Vertical Leaders	Flow Capacity in Horizontal Pipes Slope inches/foot					
		1/8 inch/foot =1%		1/4 inch/foot =2.1%		1/2 inch/foot =4.2%	
		Max roof	1.0%	Max roof	2.1%	Max roof	4.2%
2	30	sq. ft.	max. gal.	sq. ft.	max. gal.	sq. ft.	max. gal.
3	91	1000	34	1600	48	2200	68
4	191	2500	78	3500	110	5000	156
5	359	4500	139	6200	195	8900	278
6	561	7150	222	10000	314	14200	445

Source: Earthwrights Designs, Santa Fe, New Mexico

APPENDIX 8: ADDITIONAL INFORMATION ABOUT XERISCAPING, DRYLAND GARDENING, RAINWATER HARVESTING AND WATER CONSERVATION

Books and Publications

Albuquerque Bernalillo County Water Utility Authority, *Low Volume Irrigation - Design and Installation Guide*

Albuquerque Bernalillo County Water Utility Authority, *Rainwater Harvesting: Supply from the Sky*

Suzy Banks with Richard Heinichen, *Rainwater Collection for the Mechanically Challenged* (Tank Town Publishing, 2004)

Billy Kniffen, *Rainwater Harvesting in Menard County* (Menard County Extension)

Brad Lancaster, *Rainwater Harvesting for Drylands Volume 1* (Rainsource Press, 2006)

Brad Lancaster, *Rainwater Harvesting for Drylands Volume 2* (Rainsource Press, 2008)

Lower Colorado River Authority, *Saving from a Rainy Day* (Austin, Texas)

Art Ludwig, *Water Storage: Tanks, Cisterns, Aquifers and Ponds* (Oasis Design, 2005)

Russell A. Persyn, Dana O. Porter and Valeen A. Silvy, *Rainwater Harvesting* (Texas Cooperative Extension)

Judith Phillips, *New Mexico Gardener's Guide* (Cool Springs Press, 1998)

Wendy Todd Price and Gail Vittori, *Texas Guide to Rainwater Harvesting*, Third Edition (Texas Water Development Board, 2005)

David Salman and Cindy Bellinger, *Waterwise Garden Care* (High Country Gardens Publications, 2005)

Jerry Turrentine, *Wildlife Watering Facilities* (United States Department of Agriculture - Natural Resource Conservation Service, 1992)

Patricia H. Waterfall, *Harvesting Rainwater for Landscape Use* (Arizona Department of Water Resources, 1998)

Websites

www.ose.state.nm.us/ New Mexico Office of the State Engineer
Click on Water Use and Conservation
(Water conservation materials can also be requested by calling 1-800-WATER-NM.)

www.arcsa.org American Rainwater Catchment Systems Association

www.xeriscapenm.com Xeriscape Council of New Mexico

www.ircsa.org International Rainwater Systems Catchment Association

www.cabq.gov/waterconservation The City of Albuquerque's water conservation site.

www.abcwua.org/ Albuquerque Bernalillo County Water Utility Authority
(Water conservation materials can also be requested by calling (505) 768-3655.)

www.rainwaterharvesting.org Rainwater harvesting in India with an international perspective.

www.twdb.state.tx.us Texas Water Development Board

Buried Cable Locating Assistance (throughout New Mexico) 1-800-321-2537

Roof-Reliant Landscaping™




Rainwater Harvesting with Cistern Systems in New Mexico

Because New Mexico is an arid state with significant water challenges, there is a renewed interest statewide in the concept of rainwater harvesting and cistern systems. During the hottest summer months in New Mexico, approximately half of the total metropolitan water use in residential neighborhoods goes toward landscape irrigation. Rooftop rainwater harvesting, along with other outdoor water reuse practices, can reduce the demands on municipal water systems and our aquifers.

New Mexico Office of the State Engineer
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