SUMMARY

Septic Maintenance Workshops

Task

Demonstrate low-cost septic maintenance and best practices for aging septic systems in Luna counties; the use of posters and distribution of brochures (English and Spanish) describing how to decommission septic systems

Activities

NMSU's Erin Ward planned and coordinated six (6) septic maintenance and septic decommissioning workshops in Luna County. Workshops were conducted the week of March 24 at the Deming Industrial Park for residents of La Hacienda Estates mobile home park. Workshops were held one each in English and Spanish in order to help presenters and participants by providing technical information and answer questions in the homeowners' language of preference. A third workshop was held March 28 at the Columbus' Youth Center on Taft Street across from City Hall. Additional workshops were held April 8 at Ruben S. Torres Elementary in north Deming, April 12 at the Luna County Ranchette Owners Association building off Rockhound Road, and April 15 at Sun Country Realtors for real estate professionals in Deming.

During each workshop, pre- and post-tests were administered to determine improvement in knowledge of septic systems, their maintenance, and how to reduce the risk of groundwater contamination from septic failure. A section of the presentation covered New Mexico's new septic system regulations. Additional slides were added to the presentation – found useful to Luna County homeowners -- on state requirements for qualifying as an authorized septic system installers.

Results from the pre- and post-tests revealed an improvement of more than 70% in participant knowledge, a notable achievement. Written comments from workshop participants included:

- ✓ Learned several new issues & how to maintain my system
- ✓ Wonderful class! Wish she had given the one I took for CE credit.
- ✓ Learned so much. I am going to prepare a package for both sellers & buyers of septic systems so they'll know how to treat their systems. Thanks Ruth
- ✓ Learned from class. Thank you!
- ✓ Thank you!
- ✓ Learned about (septic) additives
- ✓ I liked the information on permits. Thank you for the workshop!
- ✓ Pumping chart was helpful. Thank you for driving here and giving us the information.

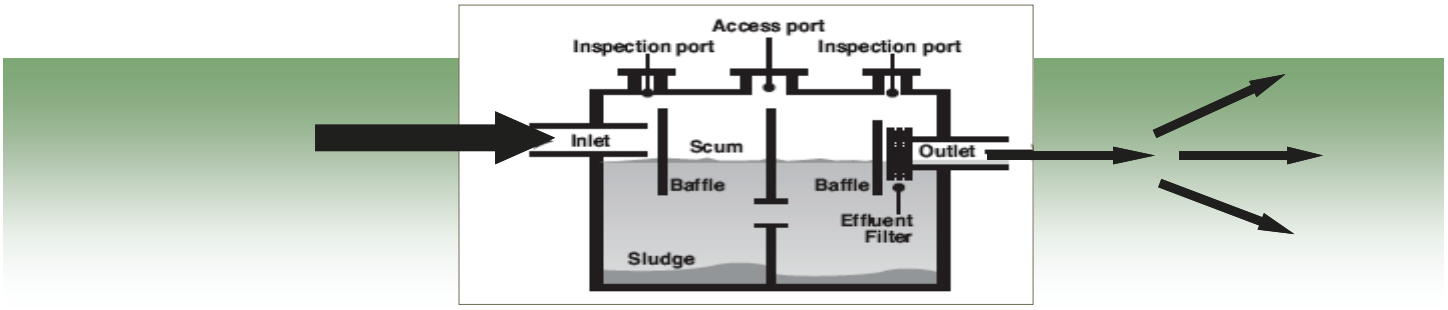
Cynthia Owens, NMED's District III Environmental Scientist (Deming office), attended the workshop at the Ranchette Owners Association clubhouse on April 12 and provided guidance on septic inspection, installation and decommissioning. She proved especially helpful in answering questions about where to find homeowner septic permits and how to obtain a new permit.

Under this task, Erin Ward and Ranchette Owner Association secretary Carol Felsing prepared a news release that was distributed to local radio and newspapers.

Measurable Results

- Sixty-nine (69) participants attended six workshops, representing 4.3% of all septic system owners in Luna County. By a different count, the participants represented 10.3% of known permitted systems.
- During the presentations, 44 posters and 220 brochures were distributed. Of the brochures distributed, some 40 were in Spanish.
- Evaluations of participants (pre- and post-tests) identified a 70.2% overall improvement in participant understanding of system operations and knowledge of state regulations.
- Evaluation results varied widely among participants at individual workshops:
  - Deming Industrial Park 61.5% overall improvement
  - Deming Industrial Park II 100.0
  - Columbus Youth Center 22.0
  - Ruben S. Torres Elementary 66.7
  - Ranchette Owners Association 85.2
  - Sun Country Realtors 80.6

Participants were guaranteed privacy if they would complete the evaluations. No significant statistical correction could be calculated from the evaluations.



Are You on Septic?

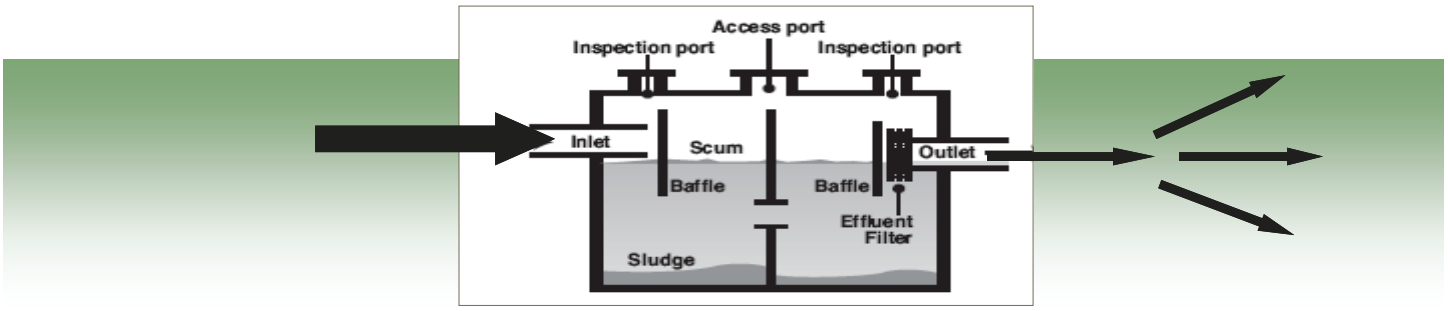
Luna County
Septic System Maintenance Workshop

- Recommended laundry detergents
- Optimal pumping schedules for your family size
- Tips for lengthening the life of your leach field
- New state regulations for selling a home

5:30 - 6:30 p.m.
Tuesday, April 8
Ruben S. Torres Elementary School - Library
1910 8th Street NW
Snacks provided free

For more information ▸ ▸ ▸
Call Erin Ward at (575) 646-7154 (voice)

New Mexico Water Resources Research Institute



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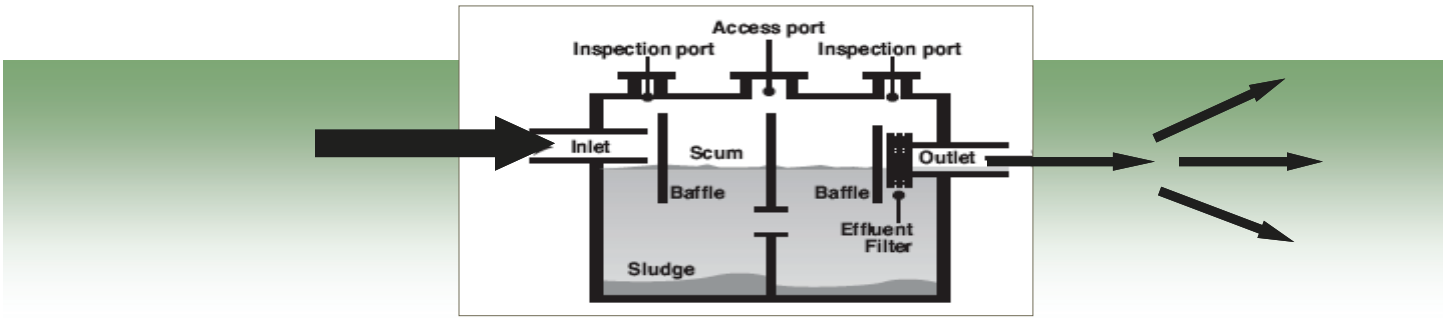


Tiene un sistema séptico?

Luna County
Taller de mantenimiento para sistemas sépticos

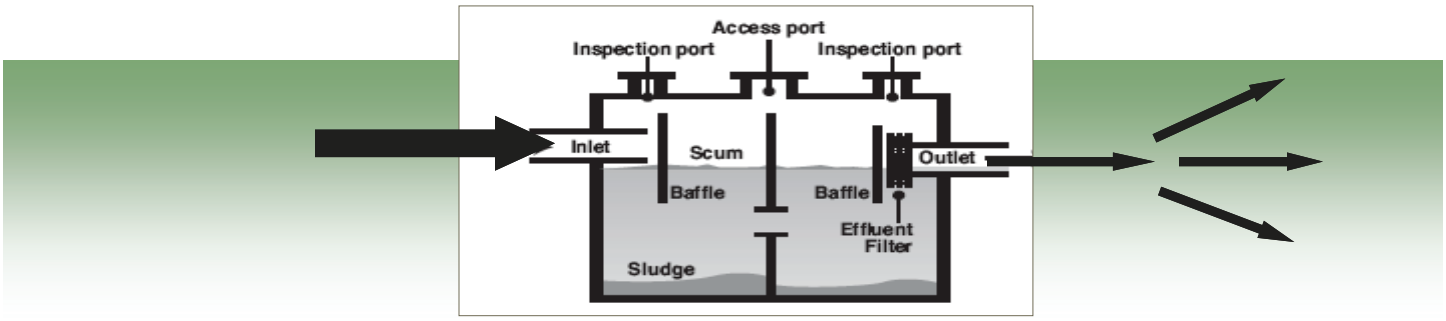
- Los detergentes recomendados para los sistemas in situ
- Horarios de bombeo óptimas para su necesidades y el tamaño de su familia
- Alargar la vida de su campo de drenaje
- Nuevas reglas de Nuevo México para la venta de una casa con un sistema séptico

5:30 - 6:30 p.m.
Martes 8 de abril

Para más información ▸ ▸ ▸
Llame a Erin Ward, 646-7154 (voz)

Ruben S. Torres Elementary - Biblioteca
1910 8th Street NW
Aperitivos gratuitos

New Mexico Water Resources Research Institute



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New Mexico Water Resources Research Institute

PRESS RELEASE

CONTACTS:
Mary Rose, Operation Support Division
NM Environment Department
(505) 827-2932

Erin M. Ward, Project Director
NM Water Resources Research Institute
(575) 644-2583

NMED sponsors workshop on how to maintain a residential septic system,

Topics include the State's new rules for selling a home with a septic system

(Deming) – For a homeowner, a failed septic system can be more than a costly maintenance problem.

In New Mexico, a failed system can cost as much as $10,000 or more to correct. What's worse, a failed system can pose a risk to a family's health and holds the potential to pollute groundwater.

"This is not something you want to have happen in your home or to explain to your neighbors," said Erin Ward, a project manager with the NM Water Resources Research Institute at NMSU. She noted there are things a homeowner can do to forestall a failure.

The New Mexico Environment Department (NMED) has teamed with the Water Resources Research Institute at NMSU and the Luna County Ranchette Owners Association to offer a workshop on how to operate and maintain a residential septic system. The workshop covers tips for homeowners on how to extend the life of an aging leach field, and how to know if an in-ground system may be due for maintenance or replacement.

In addition, the workshop will cover the State's required minimum lot size for building a home that will not be attached to a sewer system and the new rules for permitting home septic systems.

The workshop is scheduled 10:00-11:30 a.m., Saturday, April 12, at the Luna County Rachette Owners Association facility, 5830 LCROA Road. The facility can be found by driving south of Deming on Highway 11, east on Rockhound Road SE (Highway 141), and then north on LCROA Road, across from O'Kelly Sand & Gravel.

The workshop is free and open to the public.

-30-

Homeowner training for onsite wastewater systems

Cynthia Owens, Environmental Scientist, NMED
Michael Montoya, Liquid Waste Specialist, NMED

Steve Walker, GIS Coordinator, NM Water Resources Research Institute

Erin Ward, Border Projects, NM Water Resources Research Institute

Luna County
Ranchette Owners
Presentation
12 April 2014

Acknowledgements

- U.S. EPA and Border Environment Cooperation Commission (BECC / COCEF) provided funding and support
- Staff at NMSU's departments of Geography and Civil Engineering and NM Water Resources Research Institute (WRRI) did technical work
- Cynthia Owens at the NMED office in Deming provided important input and support

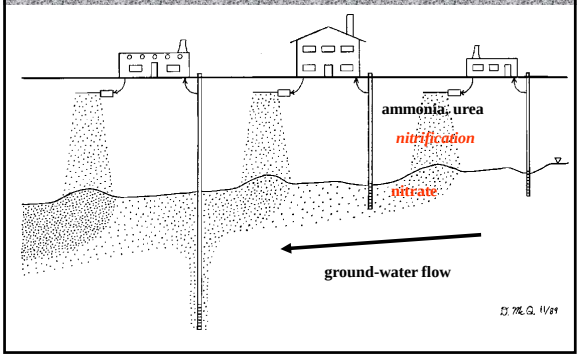
Why do we care about septic tank systems in the community?

It may be 10 years or more before the community (neighborhood) has sewer.

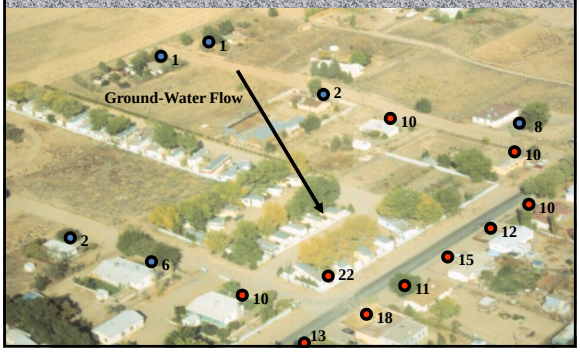
Septic tanks if not properly managed and maintained can contaminated your drinking water source.

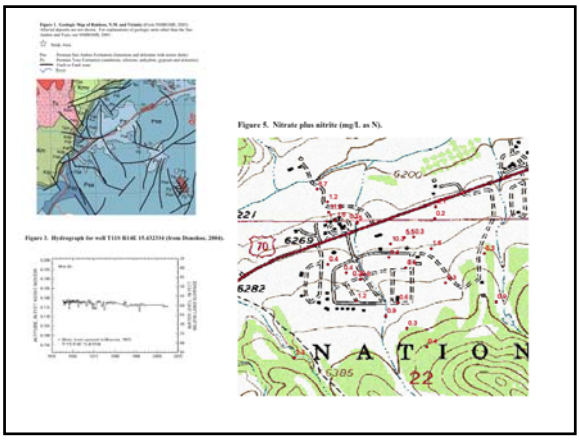
Maintenance is critical to system life.

Drinking Your Neighbor's Sewage

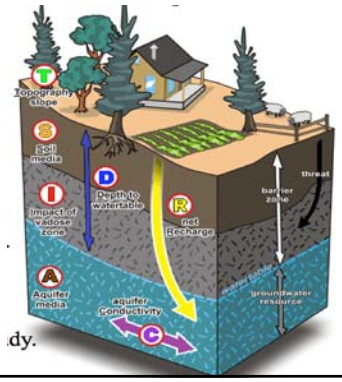


ABQ West Mesa NO_3-N (mg/L)





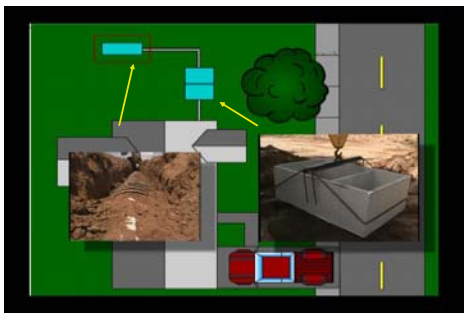
Groundwater Elements



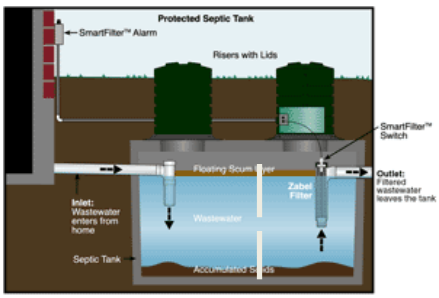
Weighted Components

[D]epth to water table	**×5**
net [R]echarge	**×4**
[A]quifer media	**×3**
[S]oil media	**×2**
[T]opography	**×1**
[I]mpact of the vadose zone	**×5**
hydraulic [C]onductivity	**×3**

Overview of the Septic System



Septic Tanks : Risers & Effluent Screens(Filters)



Effluent Screen (Filter)

Risers

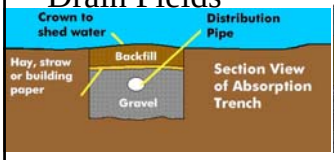
Tank Risers

- Tank Risers are extensions over the septic tank manholes to allow access from ground surface
- Provide easy pumping for your tank
- Serve as visual reminder to pump your tank
- Pumping your tank will extend the life of your system

Tank Risers

Tank Riser manhole covers must be securely locked at all time!!!!

Drain Fields



Rock and Pipe Drain Field System

Eljin In Drain

Chamber System

Inspection Ports

- Inspection ports are 4-inch PVC pipe installed at the end of the disposal field to allow inspection of the disposal field
- Occasional inspection of disposal field may help see developing problems, allowing more time for response

Inspection Ports

- Occasional inspection of disposal field may help see developing problems allow more time for response

Liquid Waste Regulations Changes

Effective September 2013

Section 7-New Definitions

- **Bedroom**- means any room within a building that is **designated as a sleeping room on drawings submitted to the responsible building permitting authority**, manufactured housing authority, or in the case of unpermitted systems, to the department
- **Evaluator** – "third party evaluator" meets requirements of 904.B- **(formerly "Inspector")**
- **Inspector** – defined as an NMED employee
- **Installer** – person licensed as an onsite contractor under CID **(MM-1, MM-98, MS-1, MS-3)**
- **Installer specialist** - certified under 904.E **(New Category)**

Section 201 - Procedures

Number of Bedrooms	Gallons/Day Design Flow Prior to 9/1/13	Gallons/Day Design Flow 9/1/13	Minimum Acreage
1	150	150	0.75
2	300	300	0.75
3	375	375	0.75
4	450	*440*	*0.88*
5	525	*500*	*1.00*
Each Additional Bedroom	75	*50*	

Section 201 - Procedures

- RV cannot be used as a permanent living quarter
- This section does not apply to homeowners who occasionally empty waste from 1 personal RV into their residential LW system

Section 301 – Standards, Lot Size

Conventional systems allowed on small lots if:

- Groundwater doesn't exist;
- TDS of 10,000 mg/l in uppermost water;
- Uppermost water is confined;
- Water 400-600 ft, suitable layer above; or
- Uppermost water below 600 feet
  - Conditions must be demonstrated by applicant, unless mapped by NMED.

Section 302- Setbacks

- Drinking water wells drilled near pre-existing liquid waste systems shall not be required to meet 100-foot setback
- NMED will notify owners of well and septic system and inform them of potential hazards
- NMED will send copy of letter to Office of State Engineer

Section 401 – Permitting

Registration of Unpermitted Systems

- For systems installed **prior to 2/1/2**; system evaluated by **Installer Specialist or NMED**
- For Systems installed **2/1/2 or After**; system evaluated by **NMED**

Section 401 – Permitting

Registration of Unpermitted Systems

•The tank must be watertight, functional, and within one tank size of current requirements

•System appears to meet setbacks & clearances

•Disposal system appears to be functioning properly

•Lot size requirements at the time of initial installation or modification must be met

•Can't pose a threat to public health or safety

Section 401 – Permitting

401(P) Cancelling a Permit

•Only permittee may request that NMED cancels a permit

•Must be in writing

401(Q) Installer Withdrawal from Permit

•Allows a licensed installer to withdraw from a permit, provided notice is given to the owner and NMED.

•The permit is suspended until amended with a licensed contractor, or as a homeowner install

401(R) When a Permittee wants to change Installers

•A permittee may amend the permit to change the installer

•Permittee must provide written notification to the installer

Section 402 – Permitting Conventional Systems

- The following information is required with the permit application:
  - **Detailed site plan**
  - **Details of construction, materials and components**
  - **Floor plan**

A detail log of soil types and groundwater level may be required with the application. **Soil Borings or Test Holes dug in close proximity to disposal system.**

Section 902 – Evaluation at Property Transfer

- Permitted systems to be evaluated by an evaluator certified according to 904.B
- Permitted system - report provided to buyer
- Unpermitted system – See 401.J and K
- In addition, an ATS must be sampled according to permit conditions; **Only MSP can evaluate ATS**
- If a system was inspected or evaluated within 180 days of the transfer, evaluation is not required
- If ownership of a failed system is transferred to the buyer without being remedied, the buyer is responsible for remedying the failed system

Section 902 – Evaluation at Property Transfer

- New Form is required
- Floor plan required

Section 903
Maintenance Service Providers

- NAWT certification no longer required
- MSP must hold a CID license as required for activities performed and one of the following:
  - Manufacturer certification for unit served or
  - Small wastewater advanced, or higher, cert or
  - Acceptable wastewater certification from another state or
  - Other credentials approved by NMED

Section 904 – Qualification
Third Party Evaluator

- **Third party evaluators who are Installer Specialists may evaluate unpermitted systems install prior to 2/1/02**
- Third party evaluators are qualified by one of:
  - Valid and appropriate CID license
  - PE license
  - NSF wastewater inspection certification
  - NEHA installer certification
  - REHS or RS certification
  - Other similar credential approved by NMED

Section 904 Installer Specialist

- Installer specialists may apply to NMED for certification if they possess the following
  - An appropriate CID license, and
  - Either -
    - Three years of experience installing onsite systems in New Mexico/Bernalillo County or
    - Installation or repair of 100 systems in New Mexico/Bernalillo County or
    - Installation or repair of 50 systems plus a national industry or trade onsite installer certification

Section 904 Installer Specialist

- Installer specialist, requirements con't
  - **16 hrs of approved CEU's during previous 3 yrs**
  - **Pass an NMAC class within the past year**
  - Have been issued no compliance orders within past 3 years related to the liquid waste rules
  - Have no criminal convictions within past 5 years related to the liquid waste rules

Section 904 – Installer Specialist

- Certification is valid for up to 3 years, expiring on January 31
- Recertification will be issued upon documentation of CEU's
- Installer specialist training opportunities will be listed on the NMED website
- NMED will provide NMAC classes quarterly in each district
- NMED will maintain a list of Installer Specialists on its website

Liquid Waste Regulations

Questions? Contact us at:

New Mexico Environment Department (NMED)
400 E. Florida -- Deming
(575) 546-1464
or
1170 N. Solano Drive -- Las Cruces
(575) 524-6300

How to make your system LAST LONGER.

Powdered Laundry Detergent

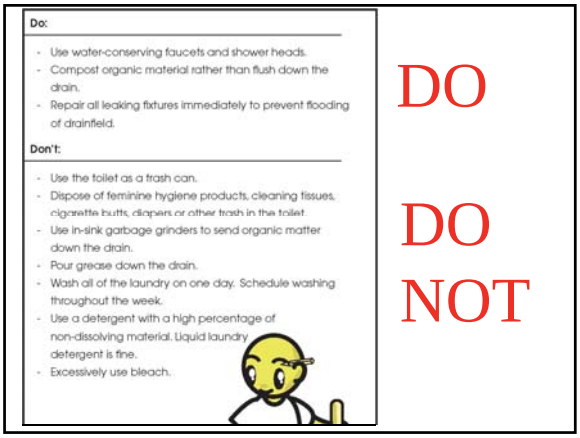
NO NO

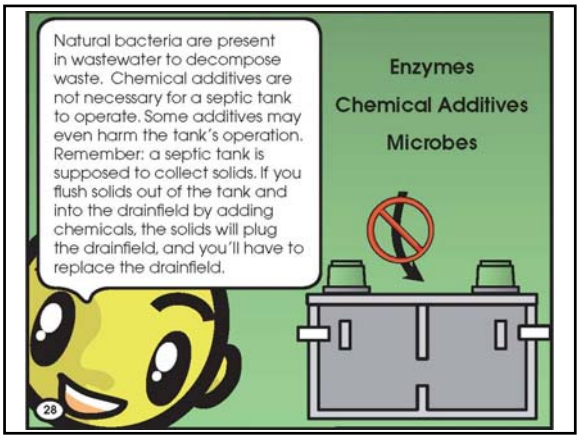
Liquid Laundry Detergents

Yes

NO.	NAME OF SOAPS	Average % Filler	Manufacturer's Claim
1	WISK	25	NC
2	SUNLIGHT (DishWasher)	13	P-5.6%
3	AJAX	<1	NP, BD, SS
4	PUREX	<1	BD
5	SAM'S CHOICE	43	NP, SS
6	SURF	26	NP
7	ELECTRASOL(Dish Washer)	1	P-6.1%
8	OXI CLEAN (Bleach)	<1	NP
9	POWER CLEAN		NC
10	FAB RAINFOREST	19	P <5%, BD, SS
11	ALL	30	NP
12	20-MULTITEAM BORAX	16	NC
13	GAIN	24	NP,SS
14	SPOT FREE (Dish Washer)		P- 7% , SS
15	CASCADE (Dish Washer)		P- 7.4%
16	TIDE	31	NC
17	FABRI CARE (Bleach)	<1	BD, SS
18	COLOREX2		NP, BD, SS
19	CHEER	34	BD
20	ELECTRASOL (Dish Washer)		NC
21	CALGON (Water Softner)		NC
22	PALMOLIVE (Dish Washer)		P-8.7%, SS
23	COLOREX2		SS
24	BIZ (Non Chlorine Bleach)	11	NP, NCL, SS
25	ROMA (Mexican)		NC
26	FOCA (Mexican)		NC

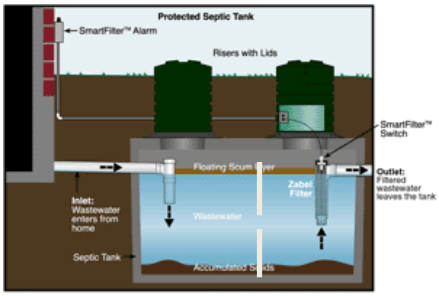
Legends : NC- No Claim, NP- No Phosphorus, P- Phosphorus
SS- Septic Tank Safe, BD- Boidegradable, NCL- Non Chlorine Bleach





Septic Tanks Need to be Pumped

Removes solids that the tank is intended to capture!

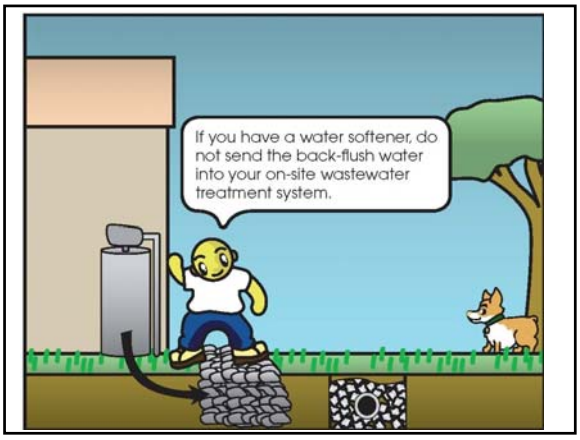


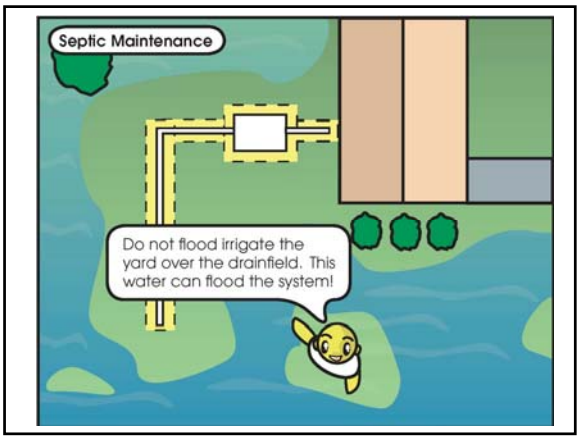
How often should it be pumped?

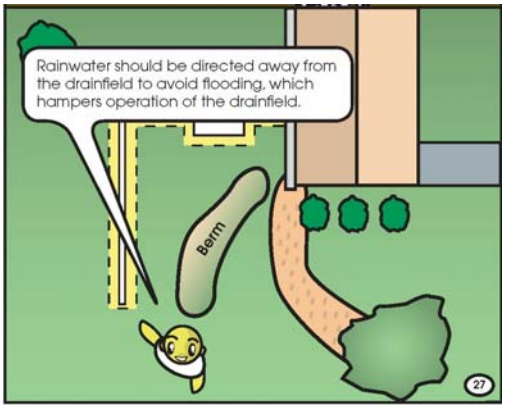
Table 2. Recommended number of years between pumpings of septic tanks according to size of tank and household.

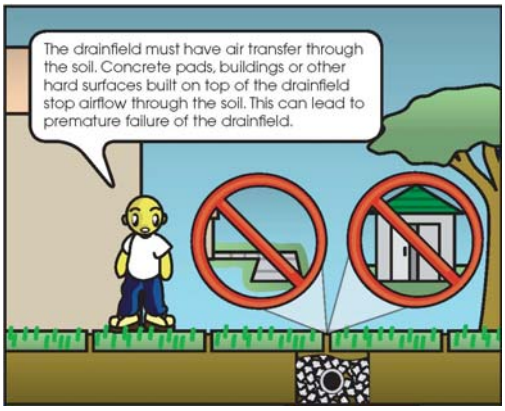
Tank Size (gals)	Household Size (Number of People) 1	2	3	4	5	6	7	8	9	10
500	5.8	2.6	1.5	1.0	0.7	0.4	0.3	0.2	0.1	—
750	9.1	4.2	2.6	1.8	1.3	1.0	0.7	0.6	0.4	0.3
1000	12.4	5.9	3.7	2.6	2.0	1.5	1.2	1.0	0.8	0.7
1250		7.5	4.8	3.4	2.6	2.0	1.7	1.4	1.2	1.0
1500		9.1	5.9	4.2	3.3	2.6	2.1	1.8	1.5	1.3
1750			6.9	5.0	3.9	3.1	2.6	2.2	1.9	1.6
2000			8.0	5.9	4.5	3.7	3.1	2.6	2.2	2.0
2250				6.7	5.2	4.2	3.5	3.0	2.6	2.3
2500					5.9	4.8	4.0	4.0	3.0	2.6

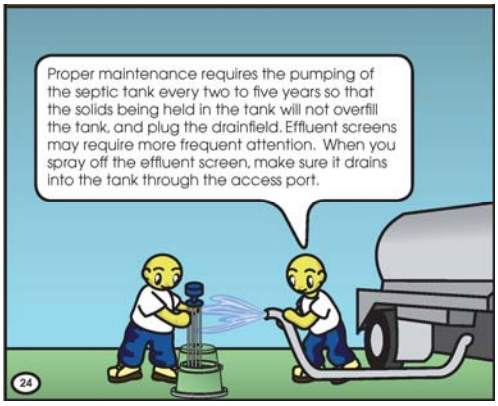
Note: More frequent pumping needed if a garbage disposal is used.






Rainwater should be directed away from the drainfield to avoid flooding, which hampers operation of the drainfield.
Berm
27


The drainfield must have air transfer through the soil. Concrete pads, buildings or other hard surfaces built on top of the drainfield stop airflow through the soil. This can lead to premature failure of the drainfield.


Proper maintenance requires the pumping of the septic tank every two to five years so that the solids being held in the tank will not overfill the tank, and plug the drainfield. Effluent screens may require more frequent attention. When you spray off the effluent screen, make sure it drains into the tank through the access port.
24

Southern New Mexico Septage Disposal

The septage is currently being taken to the Central Dona Ana County WWTP. However, the County is looking at other options.

Swamp or Evaporative Cooler Discharge

It is **NOT acceptable** to allow bleed or blow-down from an evaporative cooler to be discharged through the septic system.

A common practice for HVAC maintenance and installation professionals is to discharge the bleed off water from roof top mounted cooling units into the plumbing system vents.

The purpose of this bleed off is to prevent scaling of the pads in the evaporative cooling system.

The flow from the blow down should be adjusted so that after evaporation which takes place in cooling the water on the pads is still below critical saturation for depositing materials.

In a recent site visit a home was generating the following flows:

Home water use = 150 gpd
Evap cooling bleed off = 360 gpd (excessive, but out of sight out of mind)

The system, only 6 years old, was in saturated failure.

What should be done with the blow down flow?

Keep it high enough so it is not unacceptably saline (steady drip)

Extent tubing over the edge of roof to:

- Supply a bird bath
- Water Flowers
- Flow into a water feature
- Dispose of in a separate French drain

Alternating Drainfields to extend life of the system

Cut new drainfield into existing line and then place diversion valve.

Entrenamiento para propietarios de sistemas de aguas residuales en situ

Adrian Hanso - Ingeniería Ambiental, NMSU

Cynthia Owens - Ecologísta, NMED
Michael Montoya – Especialista Residuos Líquidos, NMED

Steve Walker – NM Water Resources Research Institute, NMSU

Christopher Brown – Departamento de Geografía, NMSU

Agradecimientos

- U.S. EPA y Comisión de Co-operacion Ecológico Fronteriza (COCEF) proporcionó financiación y apoyo
- El personal de NMSU Departamentos de Geografía e Ingeniería Civil y NM WRRI hizo el trabajo técnico
- Cynthia Owens en NMED (Deming) siempre importante aporte y apoyo

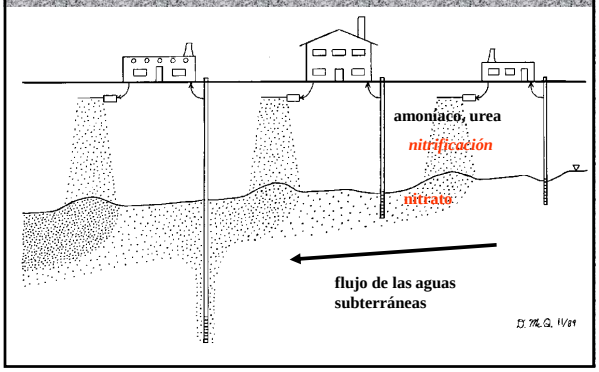
¿Por qué nos preocupamos por los sistemas de tanques sépticos en la comunidad?

Puede ser 10 años o más antes de que toda la comunidad (barrio) tiene alcantarillado.

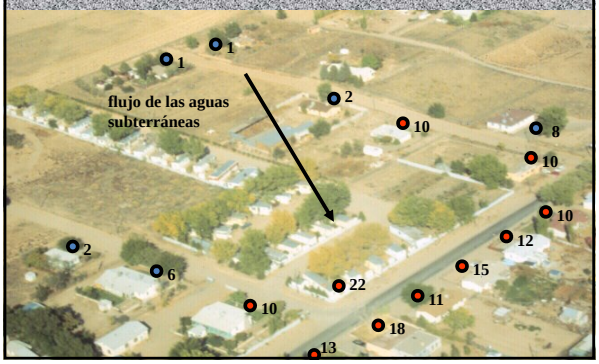
Las fosas sépticas , si no se gestiona y mantiene correctamente pueden contamina su fuente de agua potable.

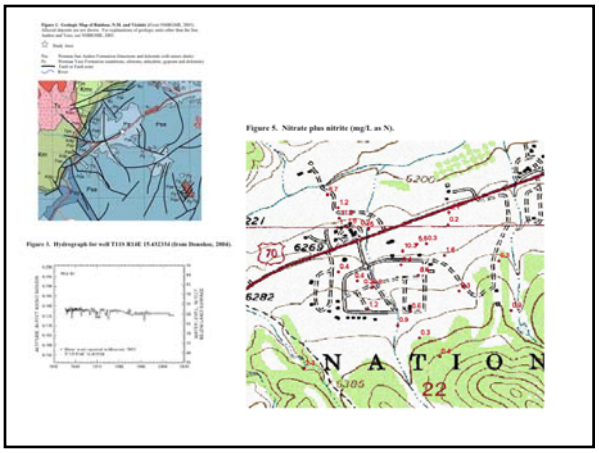
El mantenimiento es fundamental para la vida del sistema.

Potable Alcantarillado de tu vecino

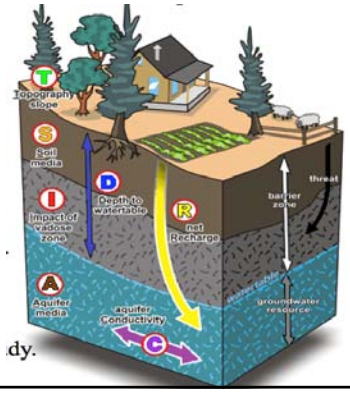


ABQ West Mesa NO3 -N (mg / L)





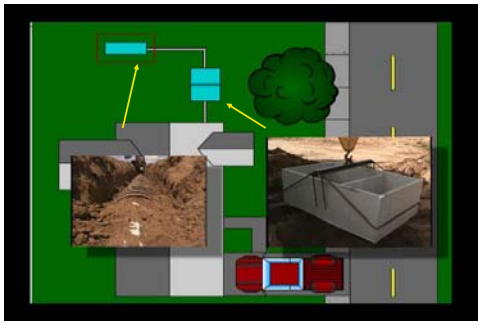
Aguas subterráneas y modelo elementos



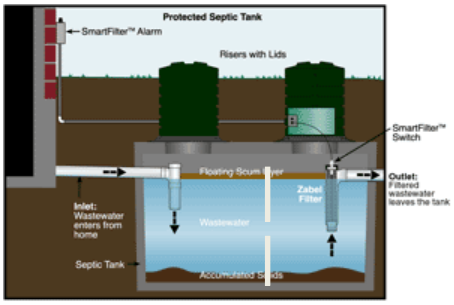
Componentes de flujo de descarga

- Profundidad al nival freático
- Recargar
- Medios Acuífero
- Medios de Suelos
- Topografía
- Sona no saturada
- La Conductividad hidráulica

Panorámica del sistema séptico



Tanques sépticos : Tarimas y efluentes Pantallas (filtros)



Pantalla de Efluentes (Filter)

risers

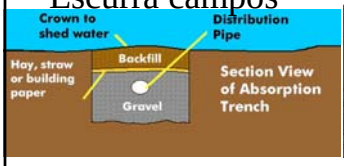
Alzadores de Risers

- Alzadores de tanques son las extensiones más de los pozos de registro de fosas sépticas para permitir el acceso desde la superficie del suelo
- Proporcionar fácil de bombeo para su tanque
- Sirva como recordatorio visual para bombear su tanque
- El bombeo de su tanque se extenderá la vida de su sistema

Alzadores de Tanques

<u>¡Las tapas de alzadores de tanque y tapas de registro deben estar asequran en todo momento! !</u>

Escurra campos



Eljin En Drain

Piedra y tubo de desagüe del sistema Campo

Sistema de Cámara

Puertos de Inspección

- Puertos de inspección son de tubo de PVC de 4 pulgadas instalada en el extremo del campo de alcance para permitir la inspección del campo eliminación
- La inspección ocasional del campo de eliminación puede ayudar a ver el desarrollo de los problemas más tiempo

Reglamento de Residuos Líquidos Cambios

A partir del 09 2013

Sección 7 -Nuevos Definiciones

- **Bedroom- significa cualquier habitación dentro de un edificio que ha sido designada como una habitación para dormir en los dibujos presentados en el edificio lo que permite la autoridad de construción responsable, la autoridad de viviendas prefabricadas , o en el caso de los sistemas no permitidos , al departamento**
- **Evaluador - "evaluador tercero" cumple con los requisitos de 904.B (antes "Inspector")**
- **Inspector - definido como un empleado NMED**
- **Instalador - persona con licencia de un contratista en el sitio bajo CID (MM- 1 , MM -98 , MS- 1 , MS- 3)**
- **Especialista instalador - certificado bajo 904.E (Nueva categoría)**

Sección 201 - Procedimientos

Número de cuarto de dormir	Diseño de flujo Antes de 09/01/13	Diseño de flujo 09/01/13	Tamaño mínimo (US acres)
1	150	150	0.75
2	300	300	0.75
3	375	375	0.75
4	450	*440*	*0.88*
5	525	*500*	*1.00*
Cada dormitorio adicional	75	*50*	

Sección 201 - Procedimientos

- Esta sección no se aplica a los propietarios que los residuos ocasionalmente vacío de 1 RV personal en su sistema LW residencial; RV no puede ser utilizado como un cuarto de vivir permanente.

Sección 301 - Normas, Tamaño del terreno

Los sistemas convencionales permitidos en pequeños lotes, si:

1 . El agua subterránea no existe;

2 . TDS de 10.000 mg / l en el agua superior;

3 . Agua superior está confinada;

4 . Agua 400-600 pies, capa adecuada por encima; o

5 . Agua superior por debajo de 600 pies

Las condiciones deben ser demostradas por el solicitante, a menos que mapeada por NMED

Sección 302 - Contratiempos

- Pozos de agua potable perforados cerca de los sistemas de residuos líquidos pre - existentes no estarán obligados a cumplir con retroceso de 100 pies
- NMED notificara a los propietarios de pozo y sistema séptico e informarles de los peligros potenciales
- NMED enviará copia de la carta a la Oficina de Estado

Sección 401 - Permitir

Registro de Sistemas no permitidas

- **Para sistemas instalados con anterioridad a 2/1/2 ; sistema evaluado por especialista instalador o NMED**
- **Para sistemas instalados 2/1/2 o después; sistema evaluado por NMED**

Sección 401 - Permitir

Registro de Sistemas no permitidas

- El tanque debe ser: a prueba de agua, funcional , y el plazo de un tamaño del tanque de los requisitos actuales
- LWS parece cumplir los contratiempos y espacios libres
- Sistema de eliminación parece estar funcionando correctamente
- Se deben cumplir los requisitos de tamaño de lote en el momento de la instalación o modificación inicial
- No puede suponer una amenaza para la salud o la seguridad pública

Sección 401 - Permitir

401 (P) Cancelación de un Permiso

- Sólo permisionario podrá solicitar que NMED cancela un permiso
- Debe ser por escrito

401 (Q) Instalador Retiro del Permiso

- permite a un instalador autorizado para retirarse de un permiso, siempre que se notifique al propietario y NMED .
- El permiso se suspende hasta que se modifique con un contratista con licencia, o como instalación dueño de propietario

401 (R) Cuando Persona Autorizado quiere cambiar Instaladores

- Una persona autorizada podrá modificar el permiso para cambiar el instalador
- Persona autorizada tiene que notificar por escrito al instalador

Sección 402 – Permisos de los sistemas convencionales

- La siguiente información es requerida con la solicitud de permiso :

1. Plano del sitio detallado
2. Los detalles de construcción, materiales y componentes
3. plano de la planta

Un registro de detalle de los tipos de suelo y el nivel de las aguas subterráneas puede ser necesario con la aplicación de perforaciones al suelo o pozos de prueba excavados en las proximidades de sistema de eliminación

Sección 902 - Evaluación de Transmisiones Patrimoniales

- Sistemas permitidos para ser evaluados por un evaluador certificado según 904.B
- Sistema Permitido - informe proporcionado al comprador
- Sistema no permitida - Ver 401.J y K
- Además , un ATS deben tomarse muestras de acuerdo con las condiciones del permiso; Sólo MSP puede evaluar ATS
- Si un sistema fue inspeccionado o evaluado dentro de los 180 días de la transferencia , no se requiere una evaluación
- Si la propiedad de un sistema que ha fallado se transfiere al comprador sin ser subsanado , el comprador es responsable de reparar el sistema fallido

Sección 902 - Evaluación de Transmisiones Patrimoniales

- Se requiere un nuevo formulario
- Plano de la planta requerida

Sección 903
Proveedores de Servicios de Mantenimiento

- Certificación NAWT ya no es necesario
- MSP debe poseer una licencia CID como se requiere para las actividades realizadas y una de las siguientes :

1. Certificación del fabricante para la unidad sirvido o
2. Pequeño avanzado de aguas residuales , o superior, CERT o
3. Certificación de aguas residuales Aceptable de otro estado o
4. Otras credenciales aprobadas por NMED

Sección 904 - Calificación de Evaluador Terceros

- **Evaluadores de terceros que son especialistas del instalador pueden evaluar los sistemas no permitidos instalar antes del 2/1/02**
- **Evaluadores de terceros son calificados por uno de:**
  1. CID licencia válida y apropiada
  2. licencia de PE
  3. Certificación de inspección de aguas residuales NSF
  4. Certificación del instalador NEHA
  5. REHS o RS certificación
  6. Otros credenciales similares aprobado por NMED

Sección 904 Especialista Instalador

- Especialistas del instalación pueden aplicarse a NMED para la certificación si poseen la siguiente
  1. Una licencia CID apropiado y
  2. cualquiera de los dos

     a. Tres años de experiencia en la instalación de sistemas en el sitio en Nuevo México / Municipio Bernalillo o

     b. La instalación o reparación de 100 sistemas en el Condado de New Mexico / Bernalillo o

     c. La instalación o reparación de 50 sistemas más una industria nacional o certificación del instalador en el sitio de comercio

Section 904 Especialista Instalador

- Especialista Instalador, requisitos continua . . .
- 16 horas de CEU aprobados durante 3 años anteriores
- Pasar una clase NMAC en el último año
- Se han emitido ninguna orden de cumplimiento dentro de los 3 últimos años en relación con las normas de residuos líquidos
- No tener antecedentes penales en últimos 5 años en relación con las normas de residuos líquidos

Sección 904 - Especialista Instalador

- La certificación es válida para un máximo de 3 años, que expira el 31 de enero
- Recertificación será publicado sobre la documentación de CEU
- Oportunidades de entrenamiento para especialista Instalador listados en el sitio web de NMED
- NMED proporcionará clases NMAC trimestralmente en cada distrito
- NMED mantendra una lista de especialistas instaladores en su página web

Reglamento de Residuos Líquidos

¿Preguntas? Contactese con nosotros en

New Mexico Environment Department (NMED)
405 East Florida Street
(575) 546-1464
o
1170 N. Solano Drive – Las Cruces
(575) 524-6300

Cómo hacer que su sistema
Duré Más

Polvo detergente de lavandería

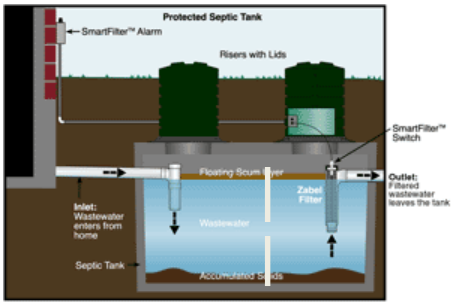
NO NO

Líquidos detergentes para ropa

Sí Sí

• Utilice grifos para conservar el agua y duchas. • Convierta en tierra (composta) material orgánico en vez de tirar por el desagüe. • Repare todas las fugas de inmediato los accesorios para evitar la inundación del campo de drenaje	**Sí**
• Utilice aseo sthe como un cubo de basura • Deseche los productos higienistas femine , limpiar tejidos, colillas de cigarrillos , pañales u otra basura en el inodoro. • Utilice trituradores de basura - en el fregadero para enviar la materia orgánica por el desagüe. • Vierta la grasa por el desagüe. • Lave toda la ropa en un día. Horario de lavado durante toda la semana . • Use un detergente con un alto porcentaje de materiales no- disolución . Detergente líquido está muy bien. • Utilizar excesivamente blanqueador.	**No**

Tanques sépticos necesitan ser bombeados? Elimina los sólidos que el tanque está destinado a capturar!



¿Con qué frecuencia debería ser bombeada?

Southern New Mexico Septage Disposal

The septage is currently being taken to the Central Dona Ana County WWTP. However, the County is looking at other options.

Pantano o refrigerador evaporativo de descarga

No es aceptable permitir purga o purga de un enfriador evaporativo para ser descargado a través del sistema séptico.

Una práctica común para el mantenimiento de HVAC y profesionales de la instalación es para descargar el agua purgue desde el techo de montaje superior de unidades de refrigeración en las rejillas de ventilación del sistema de plomería.

El propósito de este purgue es para evitar que la escala de las pastillas en el sistema de refrigeración por evaporación .

El flujo desde el golpe hacia abajo debe ajustarse de modo que después de la evaporación que tiene lugar en el enfriamiento del agua en las pastillas es todavía debajo de la saturación crítico para depositar materiales .

En una visita reciente a la casa estaba generando los siguientes flujos :

El uso del agua principal = 150 gpd
Refrigeración del evaporador purgue = 360 gpd (excesivo, pero fuera de la vista fuera de la mente)

El sistema, de sólo 6 años de edad, se encontraba en insuficiencia saturado .

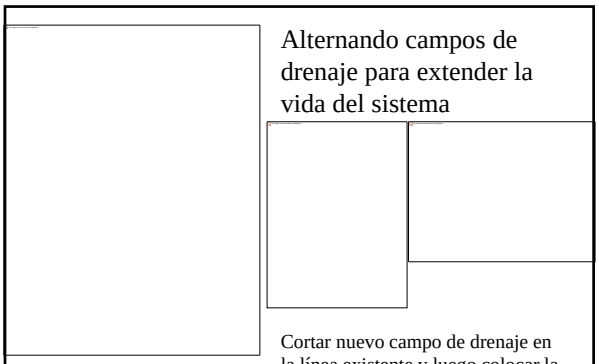
¿Qué debe hacerse con el flujo abajo (blow down)?

Mantener lo suficientemente alto para que no es salina inaceptablemente (goteo constante)

Tubería de Extensión sobre el borde del techo para :

- Proporcione un baño del pájaro
- Flores de Agua
- Fluir en una fuente de agua
- Desechar de un drenaje francés separada

Alternando campos de drenaje para extender la vida del sistema



Cortar nuevo campo de drenaje en la línea existente y luego colocar la válvula de desvío.

¡Gracias!

PREGUNTAS?

La Hacienda Meeting - Spanish Speakers

LAST	FIRST	Email	Address	Est. Age of System	Ethnicity	
Marcos	Jose		La Hacienda Mobile Home	?	Hispanic	Span
Martin	Rodney	royboy@gmail.com	La Hacienda Mobile Home	5 to 10	White	
n/a	Margarita		La Hacienda Mobile Home	10 +	Hispanic	Span
Paez	Hilario		La Hacienda Mobile Home	10+	Hispanic	Span
Delgado	Maria Luisa		La Hacienda Mobile Home	10+	Hispanic	Span
Herrera	Norma		La Hacienda Mobile Home	5 to 10	Hispanic	Span
O'Connell	Fred	donny999@yahoo.com	La Hacienda Mobile Home	5 to10	White	
Dean	Laura		La Hacienda Mobile Home	5 to 10	White	
Ogaz	Clara	cscooter12@gmail.com	La Hacienda Mobile Home	20+	Hispanic	
Ontiveros	Rudy		La Hacienda Mobile Home	10 +	Hispanic	Span
Ontiveros	Dora		La Hacienda Mobile Home	10 +	Hispanic	Span

11 participants from La Hacienda					M: 5	W: 3
					F: 6	H: 8
1) landscaping	5	8		10 testers		
2) detergent	5	9		10 testers		
3) riser covers	8	9				
4) septic rules	6	7				
5) enzymes	2	9				
	26.0	**42.0**	**61.5**	**overall improvement**		

No written comments were received

La Hacienda - English speaking

LAST	FIRST	Email	Address	Est. Age of System	Ethnicity
Strong	Kenneth	kstrong@q.com	5115 Shandoah Trail	20+	White
Givens	Steve	beancracker@hotmail.com	630 Shadow Valley	20+	Other
Flores	John	raptorman1972@gmail.com	923 Wiley Ave., Las Cruces	20+	Hispanic
Diehl	John	jocknlori@a.com	1520 Silver Creek	20+	White
Flores	Tom	geneacaldwell@yahoo.com	923 Wiley Ave., Las Cruces	20+	Hispanic
Maughan	Julie Scott	sjmono65@yahoo.com	5537 Redfox RD	6 to 10	White
Hinojosa	Larry	ljhinojosa77@gmail.com	655 King Edward	20+	Hispanic

7 participants total

M: 6
F: 1

W: 3
H: 3
O: 1

	# Correct Answers			
Question	Pre	Post	% Change	
1) landscaping	3	4	33.3	
2) detergent	2	5	150.0	
3) riser covers	4	6	50.0	
4) septic rules	3	6	100.0	
5) enzymes	1	5	400.0	
TOTAL	13	26	100.0	
% correct	43.3	86.7	**100.0**	% total improvement
	6 testers	6 testers		

Written Comments

1. Had no idea how important this topic was until I attended your workshop!
2. Can you do this again?
3. Learned a lot from this class
4. Please come back and do this again

Columbus Youth Center

LAST	FIRST	Email	Address	Est. Age of System	Ethnicity	
Bergman	Cheryle	ladyberg@yahoo.com	8596 Arroy Rd.	?	White	
O'Connell	Paul	poconnell@vtc.com	8370 Arroyo Rd	10 +	White	
Leyva	Margarita		Hughes Street	20+	Hispanic	Span
Ceniseros	Marcos		Universal Way	20+	Hispanic	Span
Ceniseros	Juana		Universal Way	?	Hispanic	Span
Lino	Enrique	okcrunner@gmail.com	na	?	Hispanic	
Paterra	Randall	kingkong0009@vtc.com	8329 Sunshine Way	5 to10	White	
Paterra	Joyce	joycepat@vtc.com	8329 Sunshine Way	5 to 10	White	
Boyd	Jailene	jaybirdboyd@yahoo.com	8319 Sunshine Way	20+	White	
Perez	AJ		7520 Altura Ave.	?	Hispanic	
Perez	Dora		Amethyst St.	?	Hispanic	
Twilley	Carol Lynn	catwilley@hotmail.com	na	?	White	
Esqueda	Sergio	esqueda.sergio5609@gmail.com	7521 Buena Vista Ave.	5 to 10	Hispanic	Span
Henslee	Marv		7675 Buena Vista Ave.	20+	White	
Smith	Nadia	nattysmith555@yahoo.com	na	20+	White	
Houston	Janell		na	10 ?	White	
Perez	Doris		7520 Altura Ave.		Hispanic	
17 participants total				M: 7	W: 9	
				F: 10	H: 8	

	# Correct Answers		
Question	**Pre**	**Post**	**% Change**
1) landscaping	8	11	37.5
2) detergent	7	13	85.7
3) riser covers	12	13	8.3
4) septic rules	9	10	11.1
5) enzymes	4	14	250.0
TOTAL	**40**	**61**	**52.5**

% correct	66.7	81.3	**22.0**	**% total improvement**
	15 testers	15 testers		

Written Comments

1	Learned about detergents & additives
2	Thank you for the workshop!
3	I'm going to take your handouts and pass them around my neighborhood.

8-Apr-14 Ruben Torres Elementary

LAST	FIRST	Email	Address	Est. Age of System	Ethnicity	
Granillo	Cheryl	cheri_barries@hotmail.com	4435 Hermanas Rd	20+	White	
Maag	Connie	connie.maag@demingps.org	4235 Cherokee Trail, NW	20	White	
Zeferiro	Miguel		building a home	1 - installed, not connected	Hispanic	Span
3 participants total				M: 1	W: 2	
				F: 2	H: 1	

Question	Pre	# Correct Answers Post	% Change	
1) landscaping	1	3	200.0	
2) detergent	3	3	0.0	
3) riser covers	2	3	50.0	
4) septic rules	3	3	0.0	
5) enzymes	0	3		
TOTAL	**9**	**15**	**66.7**	
% correct	60.0	100.0	**66.7**	**% total improvement**
	3 testers	3 testers		

Written Comments

1	Learned about (septic) additives
2	I liked the information on permits. Thank you for the workshop!
3	Pumping chart was helpful. Thank you for driving here and giving us the information.

4/12/2014 Ranchette Owners clubhouse

LAST	FIRST	Email	Address	Est. Age of System	Ethnicity
Kasinski	Shirely		Tangle Rd SE	11 to 15	White
Felsing	Carol			20	White
Chatterton	Jim		5835 Cmaino Diaz, SE, Deming	6 to 10	White
Cole	Lori		2830 Canto Rd, SE	6 to 10	White
Brown	Doug		4355 Enchanted View, SE	6	White
Cecil	Betty		3765 Lucga Rd.	6	White
Tipton	Kevin		7 Apache Moon Rd	0 to 5	Other
Wycoff	Bill		90 Apache Hills	15	White
Lopez	Leo		PO Box 1762	20+	Hispanic
Jones	Pat		PO Box254, Petoskey, MI	6 to 10	White
Eaton	Dennis		16635 Azalea, SE	8 to 9	White
Eaton	Pamela		16635 Azalea, SE	8 to 9	Other
Wion	Peggy		Deming, NM	15	White
Seltzer	Pat		10370 Bonito Rd, SE	6 to 10	White
Seltzer	Mary		10370 Bonito Rd, SE	6 to 10	White

(9 participants arrived late and did not sign in)

24 participants total

M: 8 W: 12
F: 7 H: 1
O: 2

	# Correct Answers				
Question	Pre	Post	% Change		
1) landscaping	5	8			
2) detergent	7	10			
3) riser covers	9	12			
4) septic rules	7	11			
5) enzymes	3	12			
TOTAL	31	53			
% correct	47.7	88.3		**85.2**	**% total overall improvement**

	13 testers	12 testers

Written Comments

1	THANK YOU!
2	informative.

4/15/2014 Sun Country

LAST	FIRST	Email	Address	Est. Age of System
Salinas	Jose	Jjsalinaslpc@peoplepc.com	2830 Canto Rd., SE	0-5
Darlington	Averil	amdarling@q.com	2420 Playthru Dr	?
Stallard	Ruth	ruth.stallard@gmail.com	211 S. Silver	?
Hodgkins	Barbara	BJJodgkins10@yahoo.com	1410 Columbus Rd., Ste. B., Deming	
Caldwell	Genea	geneacaldwell@yahoo.com	1410 Columbus Rd., Ste. B., Deming	
Mahnke	Malinda	malindamahnke@gmail.com	5045 Gold	5 to 10
Baeza	Irene	irenebaeza8@gmail.com	1410 Columbus Rd., Ste. B., Deming	building home with septic

7 participants total M: 1

	# Correct Answers			
Question	Pre	Post	% Change	
1) landscaping	4	4		
2) detergent	1	5		
3) riser covers	4	6		
4) septic rules	3	6		
5) enzymes	0	5		
TOTAL	12	26		
% correct	48.0	86.7	**80.6**	**% total improvement**
	5 testers	6 testers		

Written Comments

1. Learned several new issues & how to maintain your system
2. Wonderful class! Wish she had given the one I took for CE credit.
3. Learned so much. I am going to prepare a package for both sellers & buyers of septic systems so they'll know how to treat their systems. Thanks Ruth
4. Learned from class. Thank you!
5. Thank you!

Summary Evaluations

Question	# Correct Answers Pre	Post		
1) landscaping	1	3		3 testers
2) detergent	3	3		3 testers
3) riser covers	2	3		
4) septic rules	3	3		
5) enzymes	0	3		
	9	**15**	**66.7**	
1) landscaping	5	8		13 testers
2) detergent	7	10		12 testers
3) riser covers	9	12		
4) septic rules	7	11		
5) enzymes	3	12		
	47.7	**88.3**	**85.2**	
1) landscaping	4	4		5 testers
2) detergent	1	5		6 testers
3) riser covers	4	6		
4) septic rules	3	6		
5) enzymes	0	5		
	48.0	**86.7**	**80.6**	
1) landscaping	8	11		15 testers

SUMMARY				
1)	26	38	46.2	
2)	25	45	80.0	
3)	39	49	25.6	
4)	31	43	38.7	
5)	10	48	380.0	
Total	**131**	**223**	**70.2**	**overall improvement**

52	52

Total 69 participants

M: 32	W: 28
F: 37	H: 26
	O: 5

				15
2) detergent	7	13		testers
3) riser covers	12	13		
4) septic rules	9	10		
5) enzymes	4	14		
	40.0	**61.0**	**52.5**	
				6
1) landscaping	3	4		testers
				6
2) detergent	2	5		testers
3) riser covers	4	6		
4) septic rules	3	6		
5) enzymes	1	5		
	13.0	**26.0**	**100.0**	
				10
1) landscaping	5	8		testers
				10
2) detergent	5	9		testers
3) riser covers	8	9		
4) septic rules	6	7		
5) enzymes	2	9		
	26.0	**42.0**	**61.5**	

CONTRACTORS & SELF-INSTALLERS

- Most septic tank installers can provide an adequate system for a private home.
- Contractors can be found in the telephone book under "Septic Tanks & Systems," or check with your plumber for a recommendation.
- The cost of installing a septic tank and drainfield will vary depending upon specific site needs and conditions.
- NMED offers a certification program for homeowners (self-installers), consisting of specific coursework and passing an exam.
- All contractors must be certified by NMED and possess a valid New Mexico contractor's license.
- The following information is required with the permit application: Detailed site plan; Details of construction, materials, and components; and Floor plan. Also, a detail soil log may be required with the application.
- For a checklist to apply for a liquid waste (septic tank) permit or registration, visit this Web site: *www.nmenv.state.nm.us/fod/liquidWaste/permit.app.html*

DETECTING SYSTEM FAILURES & BEST PRACTICES

Without proper maintenance, if you have not been careful about what you have flushed into the tank, or if the absorption field has not been installed properly, the system may fail.

These are several warning signs of absorption field failure:

- Obnoxious odors.
- Surfacing sewage, soggy or wet spots.
- A change of vegetation in the drainfield area
- Gurgling sound in the plumbing system and or slow-draining fixtures.
- Plumbing or septic tank backups.

Do

- Learn the location of your septic tank and drainfield. Keeping a sketch of your system with your maintenance records will come in handy during future repairs.
- Have your septic system inspected annually.
- Have your septic tank pumped out by a licensed contractor, approximately every three to five years, or as often as is appropriate for your system.
- Keep your septic tank cover accessible for inspections and pumping. Install risers if necessary.
- Conserve water to avoid overloading the system. Be sure to repair any leaky faucets or toilets.
- Divert other sources of water, like roof drains, house footing drains, and sump pumps, away from the septic system. Excessive water keeps the soil in the drainfield from naturally cleansing the wastewater.

Do Not

- Allow anyone to drive or park over any part of the system.
- Plant anything over or near the drainfield except grass. Roots from nearby trees or shrubs may clog and damage the drain lines.
- Dig in your drainfield or build anything over it, and don't cover the drainfield with a hard surface such as concrete or asphalt. The area over the drainfield should have only a grass cover since the grass will not only prevent erosion but will help remove excess water.
- Make or allow repairs to your septic system without obtaining the required Environment Department permit. Use licensed onsite contractors when needed.
- Use septic tank additives. Under normal operating conditions, these products usually do not help and some may even be harmful to your system.
- Use your toilet as a trash can or poison your septic system and the groundwater by pouring harmful chemicals and cleansers down the drain. Harsh chemicals can kill the beneficial bacteria that treat your wastewater.

- *This brochure was funded by the Environmental Protection Agency (EPA) through the Border Environment Cooperation Commission Technical Assistance Agreement (TAA 10-056), a part of the Agency's Border 2012 Program, and through support and encouragement from the New Mexico Environment Department (NMED).*

- *New Mexico Office of the State Engineer Web site: www.ose.state.nm.us*
- *Environmental Protection Agency Web site: www.epa.gov*

SEPTIC SYSTEMS & GROUNDWATER PROTECTION

EPA United States Environmental Protection Agency

New Mexico Environment Department

NM STATE UNIVERSITY

Live, Learn and Thrive.™

HOW SEPTIC SYSTEMS WORK

The most commonly used wastewater system for private homes is the conventional septic tank and drainfield. The septic tank (Figure 1) is a specially built container, usually barrel or box-shaped, placed under the ground. Its function is to hold the sewage long enough to allow solids to settle.

The solids gradually accumulate in the bottom of the tank, forming a "sludge," while some lighter solids float in the surface, forming a greasy scum.

The wastewater (effluent) coming out of the septic tank may contain potentially disease-causing pollutants and microorganisms.

The effluent is passed on to the absorption field through a connecting pipe or distribution box; the absorption field is also known as soil drainfield, disposal field, or leachfield.

The drainfield consists of a series of gravel-filled trenches containing perforated pipes. The liquid waste is carried through the pipes and discharged into the soil below the ground.

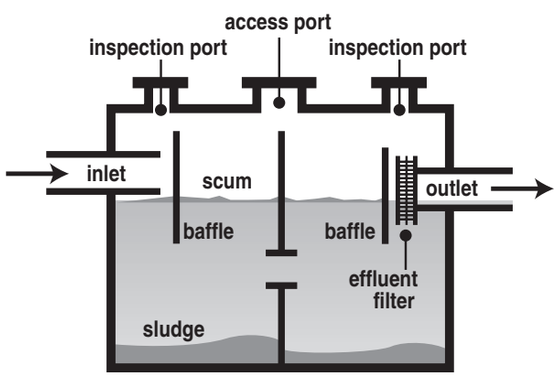


FIGURE 1.
Cross-section of a two-compartment septic tank

While the liquid seeps through the soil, natural chemical and biological processes treat the waste so that it no longer represents a hazard to human health. Ultimately, the treated liquid combines with groundwater.

COMPONENTS

A conventional septic system (Figure 2) has three main components:

- septic tank
- absorption field (drainfield), and
- surrounding soil

INSTALLATION

According to environmental protection regulations effective in the state of New Mexico, to install a liquid waste system the homeowner must obtain a permit from the New Mexico Environment Department (NMED).

NMED is the state agency responsible for assuring proper system location to protect environmental quality and public health. The permit can be obtained from any Environment Department office. NMED charges a $100 permit fee for a residential system construction.

To protect public health and groundwater quality, NMED has regulations governing the siting of individual liquid waste systems. For instance, specific distances must separate waste disposal fields from private water wells, watercourses, and water supply pipes.

Disposal fields must have a minimum depth of soil between them and groundwater or bedrock. Other restrictions may apply depending upon soil types and lot characteristics.

There is no limit to the number of systems on a single lot, as long as the total lot size meets the requirements for conventional systems and the setbacks between any two systems meet current regulations.

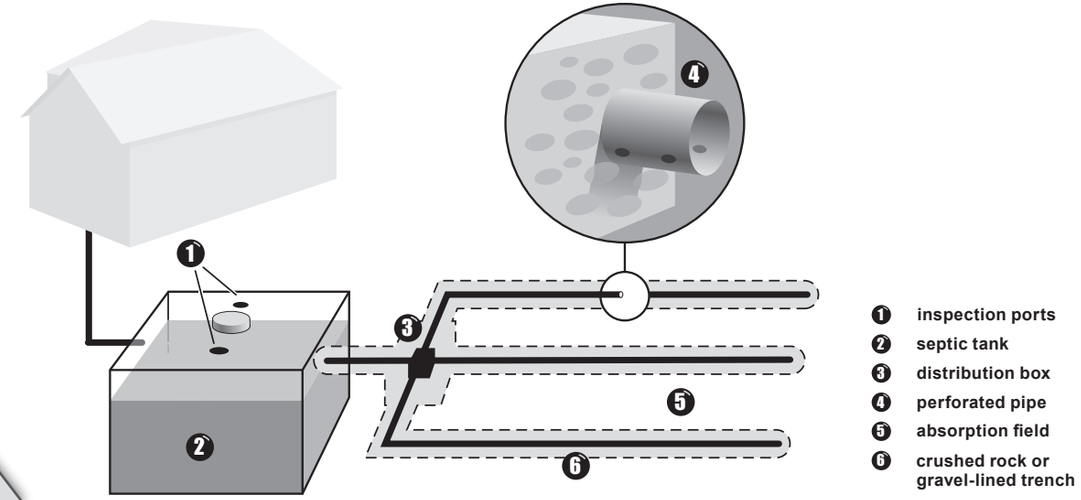


FIGURE 2.
Layout of a typical septic system

DID YOU KNOW?

- If you are going to use an individual liquid waste system, carefully evaluate your property for system suitability and siting choices.
- Soil texture (e.g. sand, silt clay loam, and clays) is used to determine the appropriate size for the drainfield. NMED provides guidance for conducting said tests.
- A percolation test on several locations may be needed to find the area best suited for the disposal field.
- Before deciding where to place the liquid waste system, check the location of nearby wells and the depth-to-groundwater.
- Groundwater quality can be threatened by the improper siting of wells and septic tanks. Due to poor percolation rates wastewater may not be adequately treated by the time it reaches the groundwater.
- All third party inspectors are qualified by one of the following: Valid and appropriate CID license; PE license; NSF wastewater inspection certification; NEHA installer certification; REHS or RS certification; Other similar credential approved by NMED.

CONTRATISTAS & INSTALADORES INDEPENDIENTES

- La mayoría de los instaladores de tanques sépticos pueden suministrar un sistema adecuado para viviendas privadas.
- Los contratistas aparecen en la guía telefónica bajo el encabezado “Septic Tanks & Systems,” o consulte a su plomero.
- El costo de instalación de un tanque séptico y el área de drenaje varían segun las necesidades y condiciones particulares de cada lugar.
- NMED ofrece un programa de certificación para propietarios de residencias el cual consiste en varios cursos y un examen final.
- Todos los contratistas deben estar certificados por NMED y tener una licencia vigente.
- La siguiente información debe adjuntarse al el permiso de aplicación: Plan detallado del sitio; Detalles de construcción, materiales, y componentes; y el Plano. También es posible que se requiera un registro detallado del suelo.
- Para ver la lista de aplicación para el permiso de aguas de desecho (tanque séptico) o para registro, visite el sitio Web: *www.nmenv.state.nm.us/fod/liquidWaste/permit.app.html*

CÓMO DETECTAR FALLAS EN EL SISTEMA & RECOMENDACIONES

Sin un mantenimiento adecuado de su tanque séptico, si no ha sido cuidadoso con lo que descarga en el tanque, o si el área de absorción no ha sido instalada correctamente, el sistema podría fallar.

Entre las señales que indican fallas se encuentran:

- Olores desagradables.
- Aguas cloacales en la superficie, lugares húmedos o empapados.
- Cambios en la vegetación en el área de drenaje
- Gorgoteos en la plomería o retretes que descargan lentamente.
- Atascamientos en la plomería o retrocesos de aguas cloacales.

Se Recomienda

- Conocer la ubicación de su tanque séptico y área de drenaje. Conserve un bosquejo del sistema con los registros de mantenimiento para futuras reparaciones o inspecciones.
- Inspeccionar su sistema séptico anualmente.
- Hacer que un contratista certificado bombee su tanque séptico de cada tres a cinco años, o tan a menudo como lo requiera su sistema.
- Mantener accesible la cubierta del tanque séptico para facilitar las inspecciones y el bombeo. Instale una plataforma si fuera necesario.
- Economizar el agua para prevenir sobrecargas en el sistema. Asegúrese de reparar grifos y lavabos que gotean.
- Desviar otras fuentes de agua del tanque séptico, por ejemplo el drenaje del techo, los desagües, y el agua de los fosos. El exceso de agua evita que el suelo del área de drenaje limpie naturalmente el agua de desecho.

No Se Recomienda

- Manejar o estacionar sobre el sistema.
- Sembrar sobre o cerca del área de drenaje, excepto césped. Las raíces de árboles o matorrales cercanos pueden obstruir y dañar las líneas de drenaje.
- Excavar en el área de drenaje o construir sobre la misma. No cubra el área de drenaje con superficies duras como asfalto o concreto. El área de drenaje solamente debe estar cubierta de césped: el césped no solo evita la erosión sino que ayuda a eliminar el exceso de agua.
- Hacer o permitir reparaciones del tanque séptico sin contar con un permiso emitido por NMED. Llame a un contratista certificado cuando sea necesario.
- Usar aditivos para el tanque séptico. En condiciones normales de funcionamiento estos productos generalmente no ayudan, y algunos pueden ser perjudiciales para su sistema.
- Usar su retrete como basurero o envenenar su tanque séptico y el agua subterránea vertiendo purificadores y químicos dañinos en su sistema. Los químicos cáusticos pueden matar las bacterias que tratan las aguas de desecho.

- *Este folleto fue financiado por la Agencia de Protección Ambiental (EPA) mediante la concesión de asistencia cooperativa X4-97675201, parte del Programa Border 2012 de la Agencia, y gracias al respaldo e incentivo del Departamento de Ambiente de Nuevo México (NMED).*

- *Sitio Web de la Oficina del Ingeniero del Estado de Nuevo México: www.ose.state.nm.us*
- *Sitio Web de la Agencia de Protección Ambiental: www.epa.gov*

SISTEMAS SÉPTICOS & PROTECCIÓN DEL AGUA SUBTERRÁNEA

EPA United States Environmental Protection Agency

New Mexico Environment Department

NM STATE UNIVERSITY

Live, Learn and Thrive.™

¿CÓMO FUNCIONA UN SISTEMA SÉPTICO?

El sistema de tratamiento más común para aguas de desecho en residencias privadas es el tanque séptico y el área de drenaje. Un tanque séptico (Figura 1) es un contenedor especial subterráneo, generalmente con forma de barril o de caja. Su función es la de retener las aguas cloacales durante tiempo suficiente como para que los sólidos se asienten.

Los sólidos más pesados se acumulan gradualmente en el fondo del tanque formando un fango, mientras que los sólidos más livianos flotan en la superficie formando una capa grasosa. El agua de desecho (efluente) que sale del tanque séptico puede contener contaminantes y microorganismos que causan enfermedades.

El efluente pasa del área de absorción al suelo a través de un tubo empalmado o de una caja de distribución; el área de absorción también es conocida como suelo de drenaje, área de desecho, o de filtración. El área de absorción consiste en una serie de zanjas que contienen tubería perforada; estas zanjas están cubiertas de grava. El desecho líquido viaja por la tubería y se descarga subterráneamente.

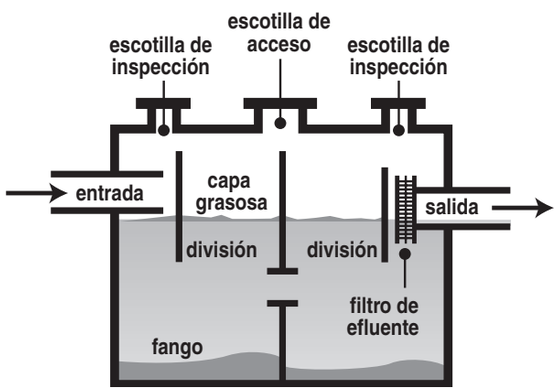


FIGURA 1.
Vista transversal de un tanque séptico de dos compartimientos

Cuando el líquido se cuela por el suelo, procesos químicos naturales tratan los desechos de modo que ya no representen un peligro para la salud humana. Finalmente, el líquido tratado se combina con el agua subterránea.

COMPONENTES

Un sistema séptico convencional (Figura 2) tiene tres componentes principales:

- tanque séptico
- área de drenaje (absorción), y
- suelo de los alrededores

INSTALACIÓN

De acuerdo con las regulaciones de protección ambiental vigentes en el estado de Nuevo México, antes de instalar un sistema de tratamiento para aguas de desecho, el dueño de la propiedad debe obtener un permiso del Departamento de Ambiente de Nuevo México (New Mexico Environment Department) o NMED.

NMED es la agencia estatal responsable de asegurar la correcta ubicación de los sistemas sépticos para proteger la calidad del ambiente y la salud pública. El permiso puede obtenerse en cualquier oficina del NMED y el costo es de $100 para construcciones residenciales.

Para proteger la salud pública y la calidad del agua subterránea, el NMED regula la ubicación de cada sistema de desecho de líquidos. Por ejemplo, la ley prescribe distancias específicas entre las áreas de desecho y pozos privados, arroyos, y tuberías de agua.

En las áreas de desecho debe haber una cantidad mínima de suelo entre éstas y el agua subterránea o el sustrato de rocas. Existen otras restricciones según los tipos de suelo y características de cada terreno.

No hay un límite establecido para el número de sistamas en un mismo lote en tanto el tamaño total del lote reúna los requerimientos para sistemas convencionales y los obstáculos entre cualquiera de dos sistemas reúna las regulaciones vigentes.

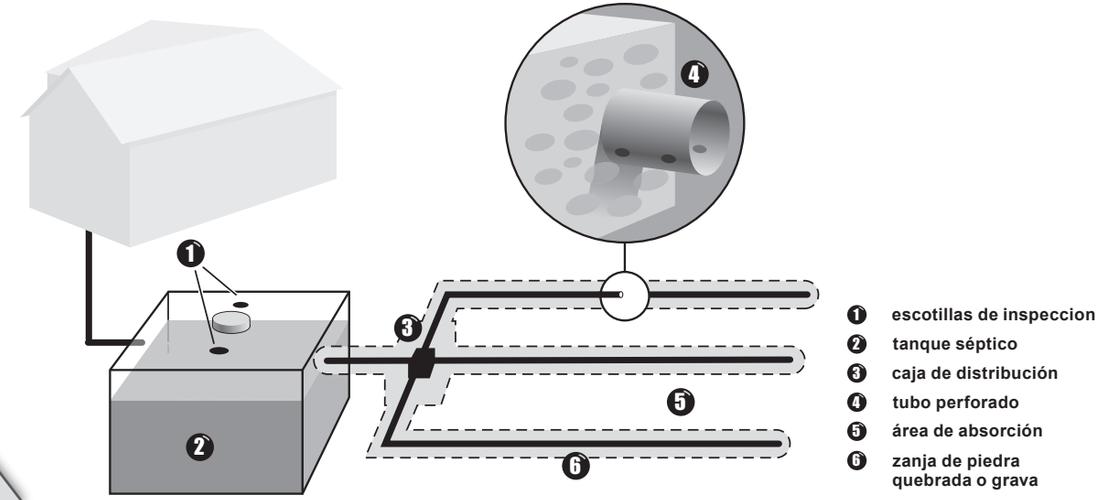


FIGURA 2.
Diseño de un sistema séptico convencional

¿SABÍA QUE?

- Si planea instalar un sistema individual para aguas de desecho, evalúe cuidadosamente su propiedad en términos de conveniencia y ubicación del sistema.
- La textura del suelo (arenoso, arcilloso y limo arcilloso) del lugar se usa para determinar el tamaño apropiado del área de desecho. El NMED puede asistirle con dichas pruebas
- Quizá tenga que realizar pruebas de percolación en varios lugares de su propiedad para encontrar el sitio idóneo para el área de desecho.
- Antes de decidir dónde ubicar su sistema de desechos líquidos, verifique la localización de pozos cercanos y la profundidad del agua subterránea.
- La calidad del agua subterránea podría verse amenazada por la incorrecta ubicación de pozos y tanques sépticos. Un índice lento de percolación puede hacer que las aguas de desecho no estén tratadas adecuadamente cuando lleguen al agua subterránea.
- Todos los inspectores independientes poseen una de las siguientes credenciales: Licencia CID válida y apropiada; licencia PE; Certificación para inspección de aguas de desecho NSF; Certificación de instalador NEHA; Certificación REHS o RS; Otro documento similar aprovado por NMED.

SUMMARY

Columbus Household Water Conservation Workshop

Saturday, Sept. 28

Task

Improve understanding by Columbus residents of household water consumption, reducing household water bills

Activities

A workshop for Columbus, NM, households on water conservation was conducted Saturday, Sept. 28, at the Columbus Youth Center on Taft Street across from City Hall. A separate event was held on the same day for school-age children, who were entertained at the Columbus Fire Station while their parents attended the workshop. Some 30 homeowners participated in the workshop, which was concluded with two in-home demonstrations of how to check for plumbing leaks. Plumbing leaks were identified and then repaired by workshop speakers. Homeowners who volunteered their homes for the demonstration were rewarded with free low-flow showerheads.

At the Fire Station, about 50 children were introduced to interactive water games, including an educational activity known as "water bingo." Bingo players were asked to answer questions on ways to conserve water in their homes. A correct answer was marked on a bingo card. Winning players showed their bingo cards to the other students and repeated out loud the correct answers to confirm their winning card.

Project PI Mary Rose supported the event by issuing a press release.

At the close of the workshop, participants were asked to fill out written evaluations.

Measurable Results

Workshop evaluations identified an overall approval rating of 84.8%. Participants "strongly agreed" with the following:

Question	Strongly Agree
Workshop was a good use of your time?	92.86 %
Workshop was useful?	89.29 %
Workshop was well organized?	92.86 %
Meeting facility was convenient?	89.29 %
Speakers were informative and helpful?	78.57 %
Did we cover specific topics that should have been covered?	78.57 %
Were handouts and presentations useful?	71.43 %
Overall, did we meet your expectations?	85.71 %

Written comments at the bottom of the evaluation forms included:

- ✓ I would like to know more information about how to lower my bills.
- ✓ Liked everything!
- ✓ Good information. Wish I had known this sooner.
- ✓ Good job! Thank you!!!
- ✓ Thanks for driving all the way down here.
- ✓ I would like more information about the aquifer. How much water do we have? How long will it last?
- ✓ Dr. Hawley knows a lot about our area!
- ✓ I liked just about everything the speakers said.
- ✓ Too many slides
- ✓ I learned a lot about things I can do in my home to reduce my water bill.
- ✓ Lots of information on how to reuse water.
- ✓ Thank you very much for coming to Columbus.
- ✓ This was helpful for me and my wife to learn how to reduce our bills
- ✓ I found out about our water rates. They are really high!

In addition to the evaluations, the Columbus water utility reported a 3.5% reduction in monthly water consumption from August 2013 to March 2014. Based on Columbus' average household consumption of 17,287.74 gallons for the month prior to the workshop, project partners were able to calculate an estimated savings in treated municipal water of 309,623.4 gallons (0.95 acre feet) for the same eight-month period.

SUSANA MARTINEZ, GOVERNOR
Ryan Flynn, *Cabinet Secretary-Designate*
Butch Tongate, *Deputy Secretary*

NEWS RELEASE
September 26, 2013

Contact: Jim Winchester
Communications Director
New Mexico Environment Department
(505) 231-8800 / jim.winchester@state.nm.us

NMED Sponsors Water Conservation Workshop in Columbus

Noted Hydro-Geologist to Speak on the Mimbres Aquifer

(Santa Fe) – The New Mexico Environment Department is proud to announce a water conservation workshop on the Mimbres Aquifer. The geology of the Mimbres groundwater basin, a cross-border aquifer that provides water for communities in New Mexico and Chihuahua, is the subject of a presentation scheduled September 28 in Columbus, NM.

New Mexico hydrologist Dr. John Hawley of Albuquerque, a noted expert on U.S.-Mexico cross-border groundwater supplies, is scheduled to talk at 10:00 a.m. in the Recreation Hall at Pancho Villa State Park on the history and geologic characteristics of the Mimbres Basin. The basin is the primary water source for Columbus, NM and Palomas, Chihuahua.

Dr. Hawley's talk is part of a day long workshop for residents of Columbus and Palomas on how to reduce household water use and lower a family's monthly water bill. Other speakers include Alfredo Granados-Olivas, a professor at Universidad Autónoma de Ciudad Juárez; Erin Ward, Project Manager for the New Mexico Water Resources Research Institute; and Denise Smith, director of the Office of Sustainability for Silver City, NM. Albert "A.J." Sandoval of Deming will offer free in-home testing for water leaks for Columbus homeowners.

The talk and workshop are part of an effort by the New Mexico Environment Department to address issues in New Mexico's border region. The workshop is funded under a grant from the U.S. Environmental Protection Agency's Border Program.

For more information, please contact Jim Winchester, NMED Communications Director, or Mary Rose, Operational Support Division Director at (505) 827-2855.

###

WATER CONSERVATION

Workshop

"How to Save $$ on Your Water Bill"

Saturday, Sept. 28

10 AM to 2:30PM

⇒AT THE⇐

Youth Center

223 Taft St.

Columbus, NM

FREE LUNCH INCLUDED

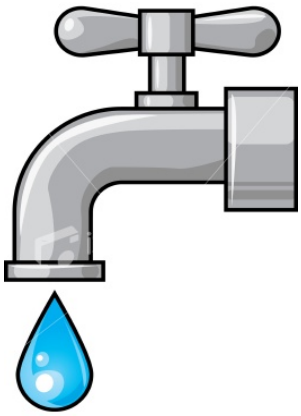
Taller de Conservación de Agua en la Hogar

‘Cómo ahorrar dinero en su factura de agua’

Sábado, 28 de septiembre
10:00-14:00

en el

Centro de la Juventud
223 Taft Street
Columbus, NM



Almuerzo gratuito

Saturday

Water Games !!

September 28

10:00 a.m. – 3:30 p.m.

Columbus Fire Station – 504 Wisconsin Street

Enjoy the fun, games and water sports

Free hotdogs and sodas

For kids ages 5 - 12 years

Please dress your children in clothes that can get wet in order for them to participate in our water games!

Sponsored by the village of Columbus and New Mexico Water Resources Research Institute, the New Mexico Environment Department and the U.S. Environmental Protection Agency

Sábado

¡ Juegos De Agua !

28 Septiembre

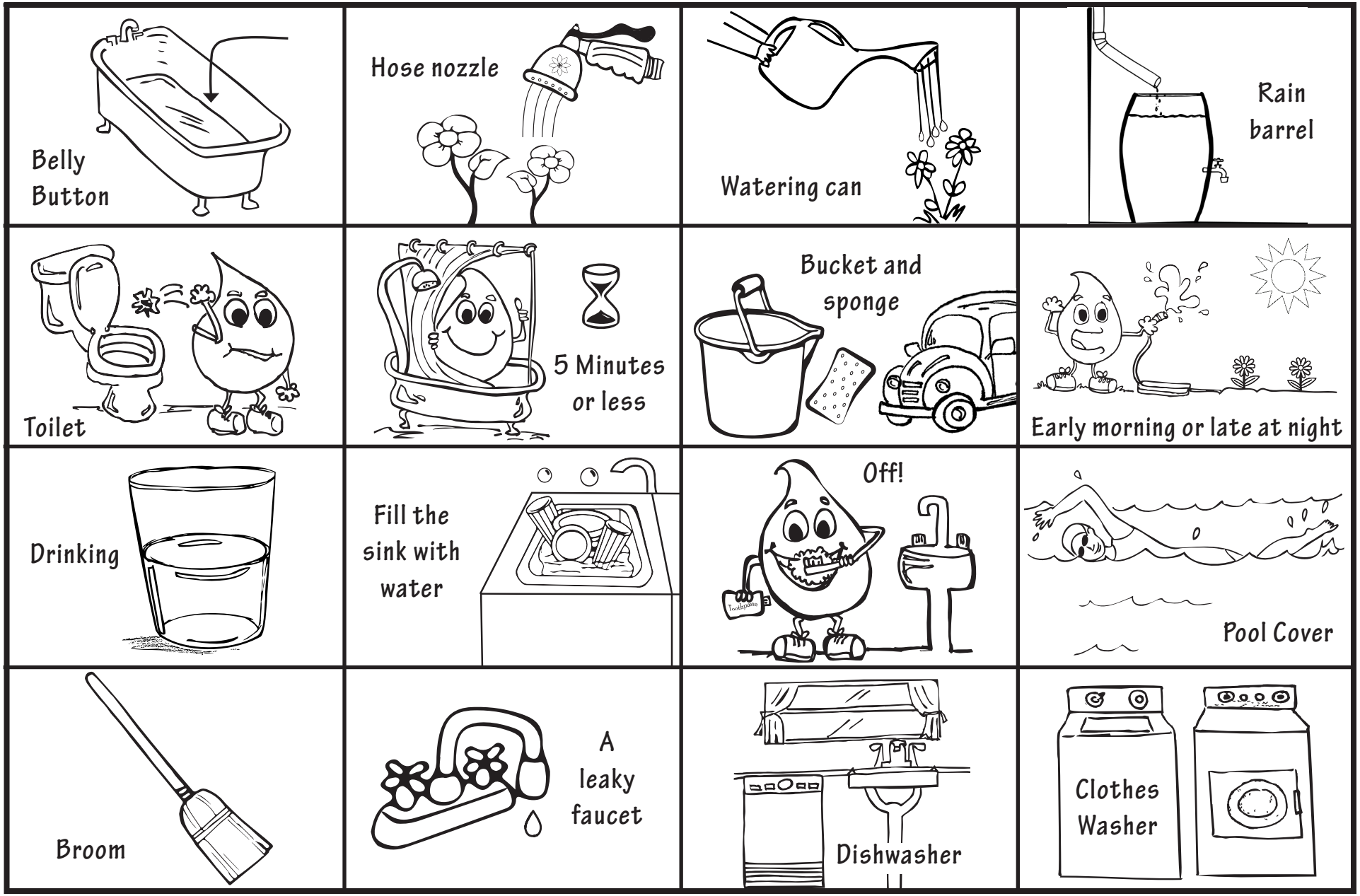
10:00 a.m. – 3:30 p.m.

Columbus Departamento de Bomberos–504 Wisconsin St
Abra diversion, juegos y deportes con agua
Abra hot dogs gratis y sodas
Para niños edades 5 a 12

¡Por favor vista a sus hijos en la ropa que se pueda mojar con el fin de que puedan participar en los juegos de agua!

Patrocinado por Columbus y la Universidad Estatal de Nuevo México, la Instituto de investigación de los recursos hídricos y Agencia de Protección Ambiental de EE.UU

Water Conservation Bingo



Bingo Game Instructions:

1. Print the ***Water Conservation Bingo Question Cards*** double sided.
2. Give each student a bingo game card and some type of marker such as pennies, paper squares, or beans, etc.
3. Without showing students the picture, read the question on the back of the card.
4. Have the students look at their bingo card and call out the answer. When they get it correct show them the picture. Ask the students follow up questions such as how does this save water?
5. To win, students must call out BINGO when they get either 4 in a row going across, up and down, or diagonally.
6. To verify that they've won, the winning student should read their answers out loud.

Some 30 children from Columbus and Palomas participated in “Water Games,” an event for children held Saturday, Sept. 28, at the Columbus< NM, Fire Station on Wisconsin Street. The event for children was held in conjunction with the Columbus Water Conservation Workshop, a Border 2020-sponsored educational program targeted to Columbus homeowners.

Below: Volunteer Perla Morales stands next to professional firefighters at the Columbus Fire Station. Perla oversaw the Water Games event, while parents attended the Water Conservation Workshop across town.

AGENDA

Home Water Conservation Workshop

10:00 a.m. – 2:00 p.m.

Saturday, Sept. 28

Youth Center, 223 Taft Street

Columbus, NM

10:00 a.m. **WELCOME**

10:15 a.m. **HYDROGEOLOGY OF THE SOUTHERN MIMBRES BASIN**

John W. Hawley, Ph.D.

Emeritus Senior Environmental Geologist, NM Tech

& Visiting Senior Hydro-geologist, NN Water Resources Research Institute

Alfredo Granados-Olivas, Ph.D.

Professor of Geosciences
Universidad Autónoma de Ciudad Juárez

11:30 a.m. **MONEY IN YOUR POCKET**

Erin M. Ward

Project Director
NM Water Resources Research Institute

12:15 p.m. **LUNCH – Free**

1:00 p.m. **WATER SAVING IDEAS**

Denise Smith

Office of Sustainability
Silver City, NM

2:00 p.m. **Seeking volunteers for free home testing for leaks**

Albert J. "AJ" Sandoval

Home Water Technician
Deming, NM

Sponsored by the New Mexico Environment Department and the NM Water Resources Research Institute at NMSU under a grant from the U.S. Environmental Protection Agency's Border Program

ORDEN DEL DÍA

Taller de Conservación del Agua en el Hogas

10 a.m.-02:00 p.m.

Sábado, 28 de septiembre

Centro de la Juventud, 223 Taft Street

Columbus, NM

10:00 a.m. **BIENVENIDOS**

10:15 a.m. **HIDROGEOLOGÍA DEL SUR MIMBRES CUENCA**

John W. Hawley, Ph.D.
Emérito geólogo ambiental mayor, NM Tech
Y Visita hidrogeólogo mayor, Instituto de Investigación de Recursos del Agua, Nuevo México

Alfredo Granados-Olivas, Ph.D.
Professor of Geosciences
Universidad Autónoma de Ciudad Juárez

11:30 a.m. **DINERO EN SU BOLSILLO**

Erin M. Ward
Director del proyecto
Instituto de Investigación de Recursos Hídricos, NM

12:15 p.m. **ALMUERZO - Libre**

13:00 p.m. **IDEAS PARA AHORRAR AGUA**

Denise Smith
Oficina de la Sostenibilidad
Silver City, NM

14:00 p.m. **Buscando voluntarios para las pruebas de hogar de fugas**

Albert J. "AJ" Sandoval
Técnico de agua en el hogar
Deming, NM

Patrocinado por el Departamento de Medio Ambiente de Nuevo México y el Instituto de Investigación de Recursos Hídricos en NMSU bajo una subvención del Programa Frontera de la Agencia de Protección Ambiental de EE.UU.

Columbus Workshop on Home Water Conservation

LAST	FIRST	PHONE	ADDRESS	ZIP	GENDER	AGE RANGE
Mcarthur	Maria	(575) 531-2421	PO Box 319, 319 N. Ohio	88029	F	82
Sanchez	Magdalena	(575) 531-2584	1118 Roosevelt St.	88029	F	74
Lester	Lance	(575) 531-2421	PO Box 319, 319 N. Ohio	88029	F	73
Long	Jack	(575) 694-3171	PO Box 529	88029	M	78
Lujan	Gilbert	494-0244	PO Box 614	88029	M	61
Sanchez	Trinidad	(575) 545-1196	30540 Altura Ave.	88029	M	65
Licona	Cajetaro					
Herrera	Pedro	(575) 202-1746				
Morales	Jose	(575) 531-2162	PO Box 505	88029		
Licona	Oscar					
Taylor	Gordon		PO Box 1614	88029	M	
Harron	Ralph		PO Box 742	88029	M	60+
Magallon	Astrid	(915) 999-1890	519 1/2 Prospect St., El P	79902		19-59
Coleman	Ruth	(575) 531-2789	901 Slocum St.	88029		60+
Smith	Denise		Silver City			
Smith	Ralph		421 Kansas	88029		60+
Chevrier	Lisa	(575) 694-1403		88029		19-59
Skinner	Philip	(915) 526-2307	PO Box 810	88029		60+
Rincon	Carlos	(915) 533-7273	4050 Rio Bravo, Suite 100	79902		60+
Reshel	Mark	(575) 494-3742	PO Box 1523	88029		60+
Martinez	Cesar	545-2909	Oelular	88029		75
Elios	Duetero	(575) 531-0212				
Moralez	Jose					
Torres	Antonio	(575) 694-1205	PO Box 664	88029		
Torres	Juana	(575) 694-1205	PO Box 664	88029		
Smith M.	Maria	(575) 531-2584	1118 Roosevelt St.	88029		19-59
Plant D.	Bill	(432) 294-0329	611 W. Broadway	88029		60+
Ortiz	Alberto			88029		59
Amaya Arreola	Sr. Prinitivo	(575) 531-7150	PO Box 1155	88029		60+
Medina	Sr. Simon	(575) 531-7275	PO Box 235	88029		60+

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OVERVIEW OF THE HYDROGEOLOGY OF THE SOUTHERN MIMBRES BASIN, WITH EMPHASIS ON THE TRANSBOUNDARY AQUIFER SYSTEM OF THE COLUMBUS-PALOMAS AREA AND WATER QUALITY CONCERNS

John W. Hawley, Ph.D., HAWLEY GEOMATTERS
Emeritus Senior Environmental Geologist
N.M. Bureau of Geology & Mineral Resources
A Division of N.M. Tech
Visiting Senior Hydrogeologist, N.M. Water Resources Research Institute, N.M.S.U.
hgeomatters@qwestoffice.net

INTRODUCTION 1

Thank you for the opportunity to briefly share my insights on hydrogeology and related groundwater quality issues in the southern Mimbres Basin area of SW New Mexico and NW Chihuahua.
This overview is illustrated by slides that emphasize aspects of local geology that are closely related to the aquifers and important water-quality concerns in the binational Columbus and Palomas area.

INTRODUCTION 2

The primary objective in this talk is to communicate as effectively as possible about complex, <u>but quite-relevant</u>, hydrogeological matters to a general audience who face pressing water-supply and water-quality issues on a day-to-day basis. How I succeed remains to be seen. So please help me out by interrupting the presentation at any time with questions whenever I seem to be getting too carried away with information overload.

INTRODUCTION 3

Remember, moreover, that most earth sciences involve a lifelong learning curve, much of which field based, and often book and laboratory free. My personal journey started in 1962 as a SCS-USDA geologist based in Las Cruces; and my learning experiences are still in progress! For example, an early mentor on groundwater conditions in the Columbus area (1966) was a water-well driller, the late Raeford Guffey!

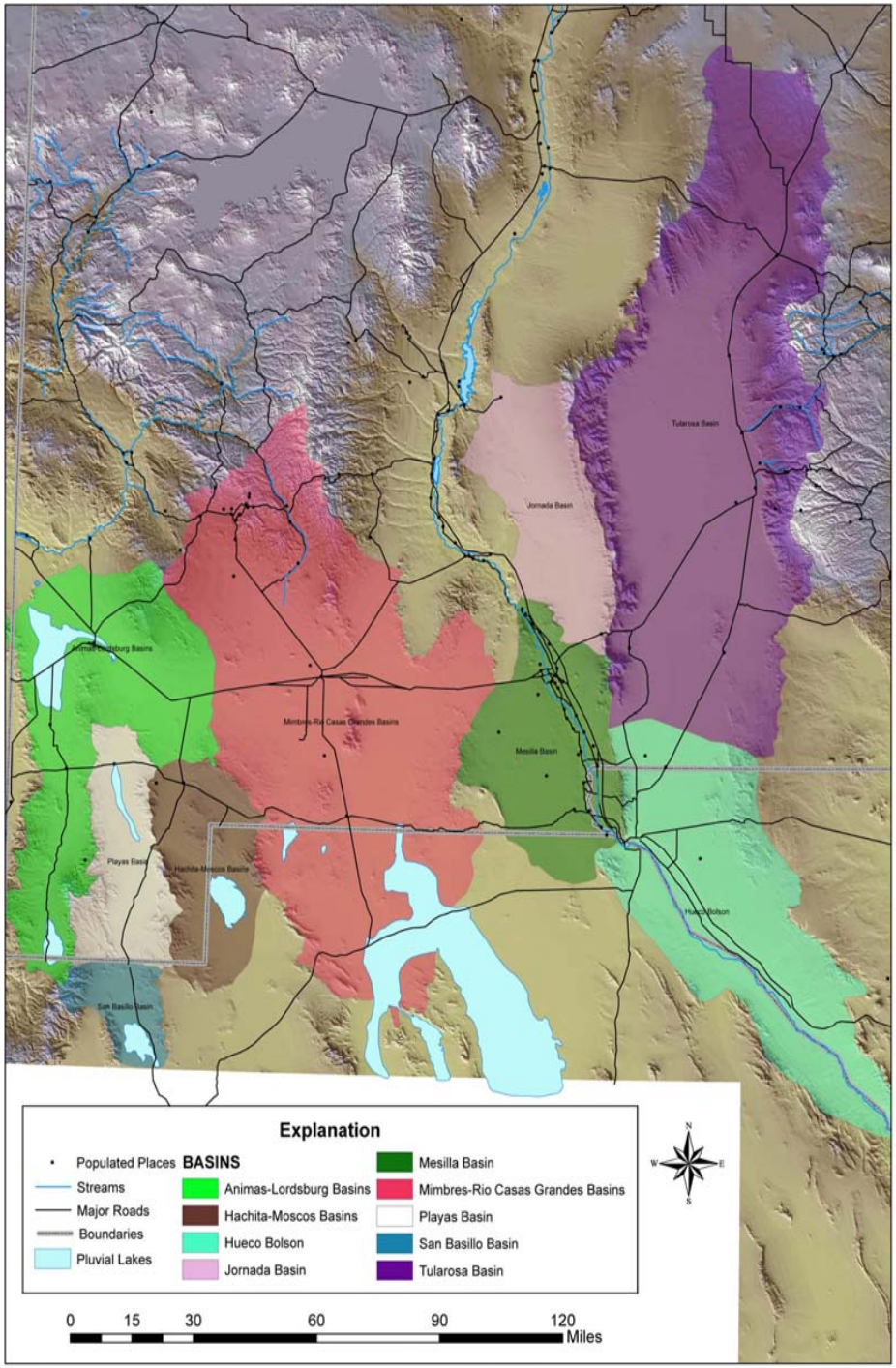
The talk is illustrated by the following slide sets:

1. General Geologic Setting. 2. Hydrogeology.

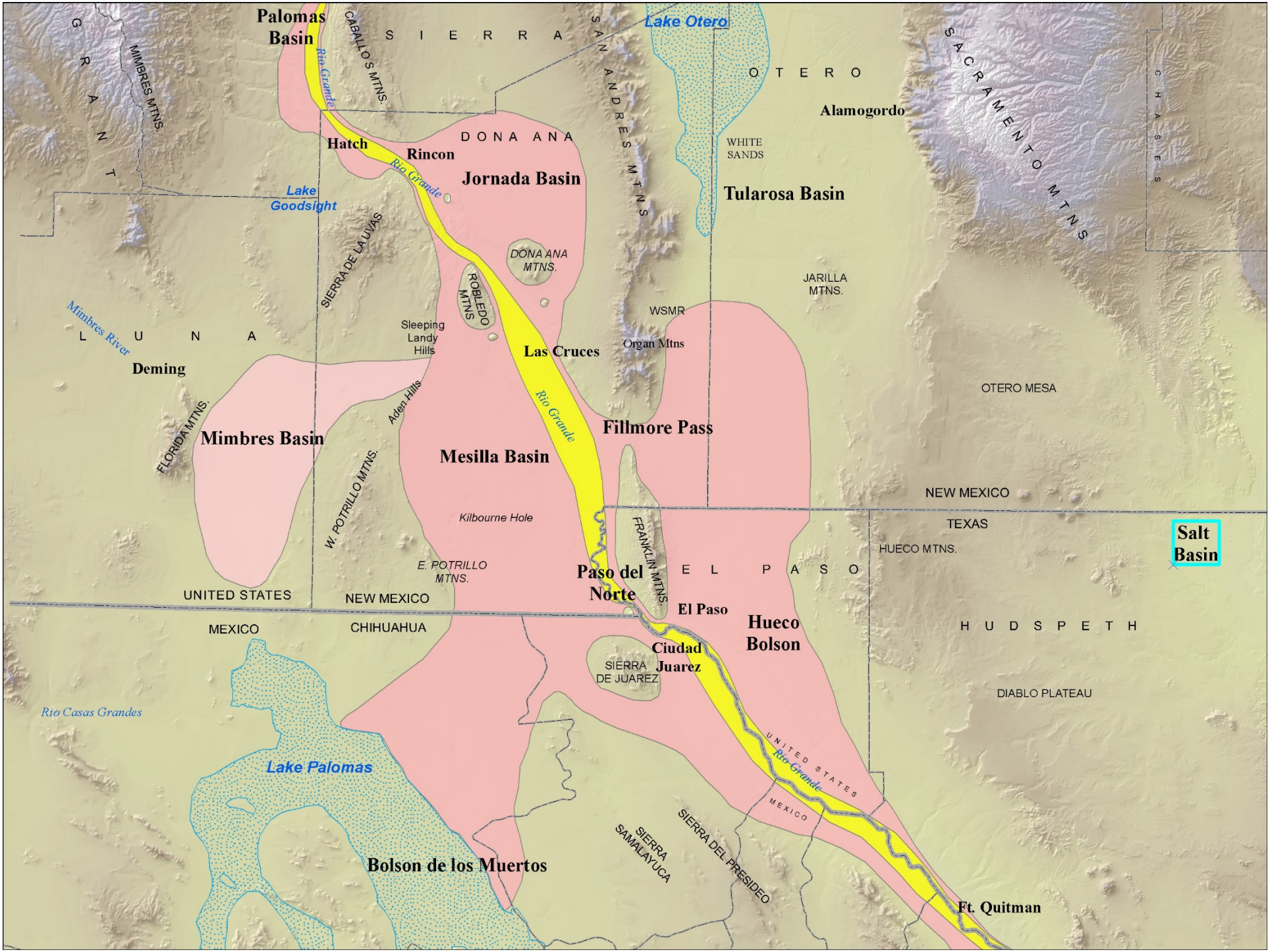
3. Groundwater-Quality Discussion

Slide Set 1

The first group of five slides introduces the regional and local geomorphic and geologic setting of the southwestern New Mexico intermontane basin region. It includes a 1916 hydrogeological map of the western part of Luna County by D.H. Darton, one of the foremost United States Geological Survey geologists of the early 20th Century.



Index Map to Basin-Fill Aquifer Systems of the Southwestern New Mexico Region


Palomas Basin
CABALLOS MTNS.
S I E R R A
SAN ANDRES MTNS
Lake Otero
O T E R O
SACRAMENTO MTNS
CHASES
G R A N T
MIMBRES MTNS.
Rio Grande
Alamogordo
Hatch
Rincon
D O N A A N A
Jornada Basin
WHITE SANDS
Tularosa Basin
Lake Goodsight
SIERRA DE LA UVAS
DONA ANA MTNS.
ROBLEDO MTNS
JARILLA MTNS.
Mimbres River
L U N A
Sleeping Landy Hills
WSMR
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Las Cruces
Deming
OTERO MESA
Aden Hills
FLORIDA MTNS.
Mimbres Basin
Fillmore Pass
Mesilla Basin
W. POTRILLO MTNS.
NEW MEXICO
Kilbourne Hole
TEXAS
Salt Basin
HUECO MTNS.
FRANKLIN MTNS.
E. POTRILLO MTNS.
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CHIHUAHUA
H U D S P E T H
Ciudad Juarez
SIERRA DE JUAREZ
DIABLO PLATEAU
Rio Casas Grandes
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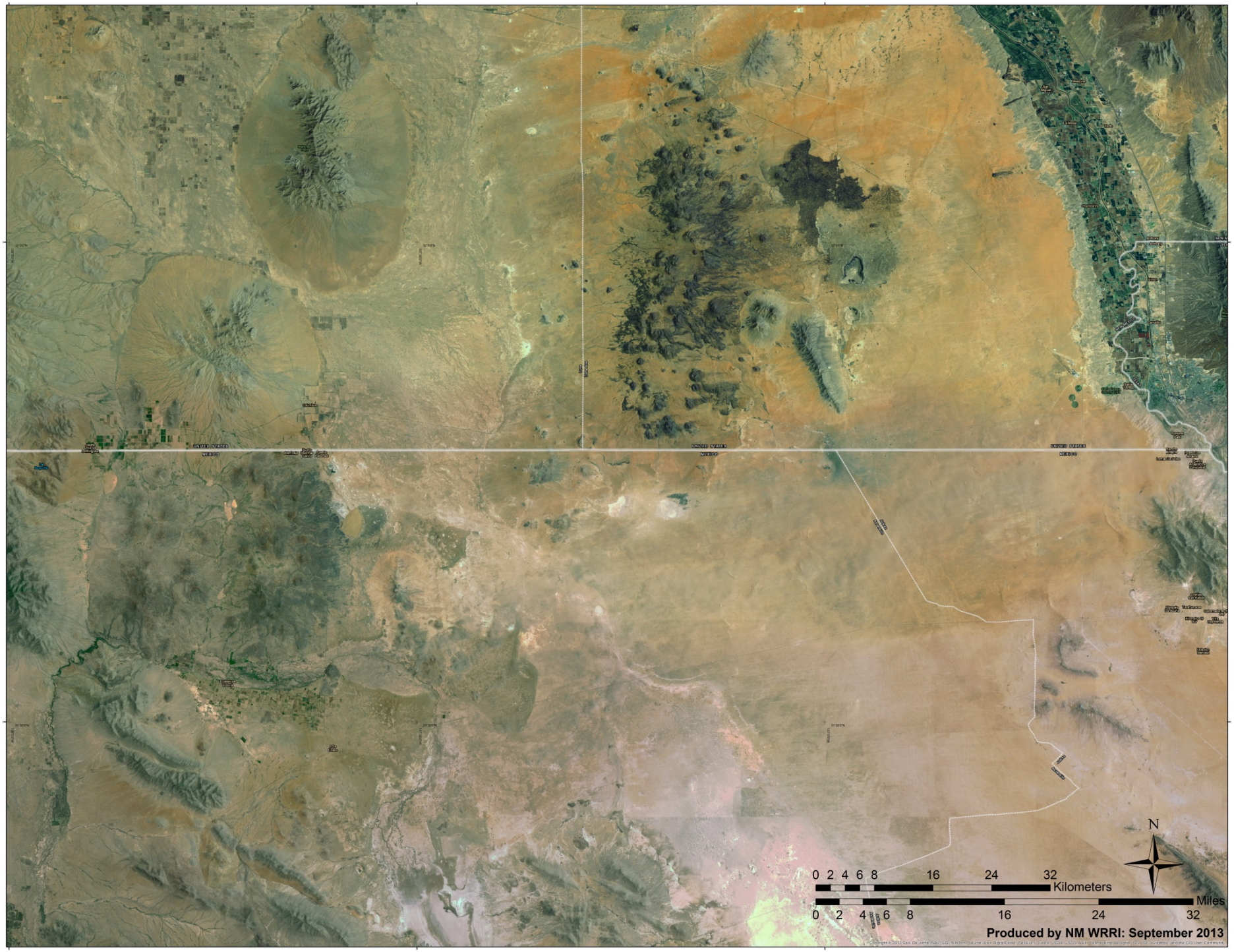
SIERRA DEL PRESIDIO
Bolson de los Muertos
Ft. Quitman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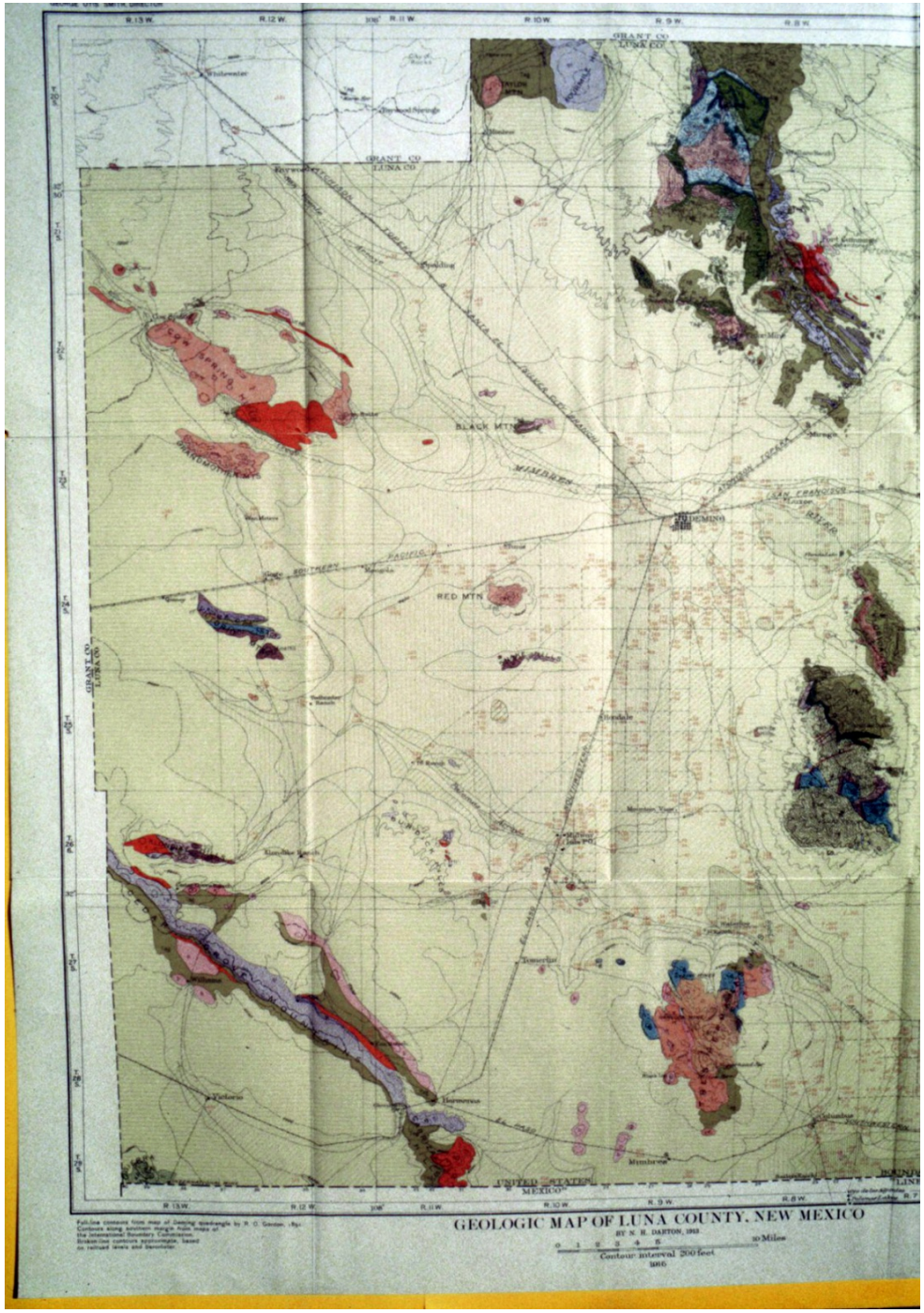
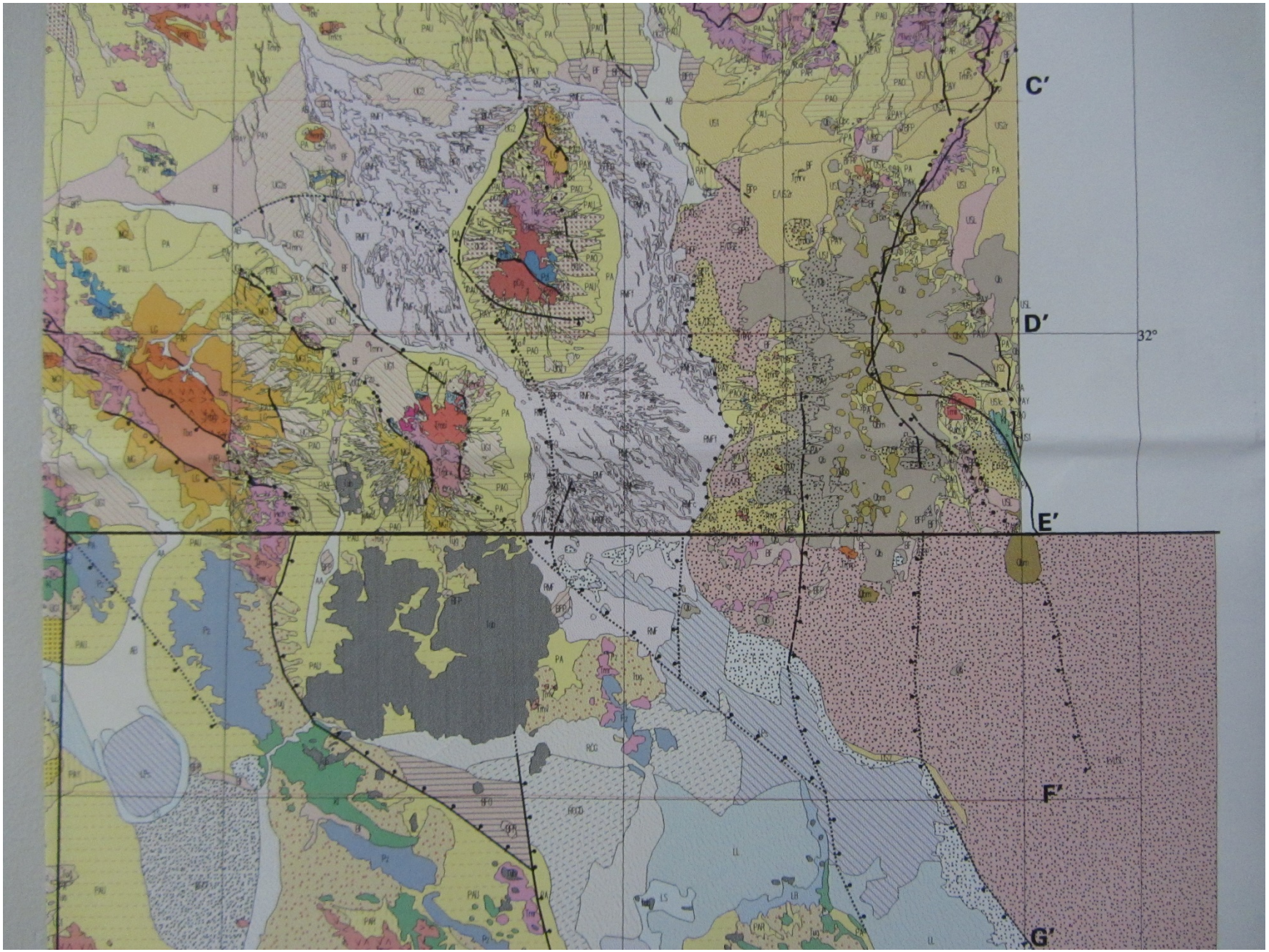
Palomas
La
Boquilla



Western Part of N.H. Darton's (1916) Geologic Map of Luna County; with water-well locations and contours showing depth to groundwater. (*from* USGS Bulletin 618).

Slide Set 2

The second group of slides illustrate the hydrogeologic setting of the SW New Mexico—NW Chihuahua region from both surface and subsurface (map and cross-section) perspectives. Aquifer systems of the southern Mimbres Basin (including the Columbus-Palomas area) are portrayed in more detail in the last two slides (*from* Hawley and others, 2000, NMWRRI report on Trans-International Boundary Aquifers).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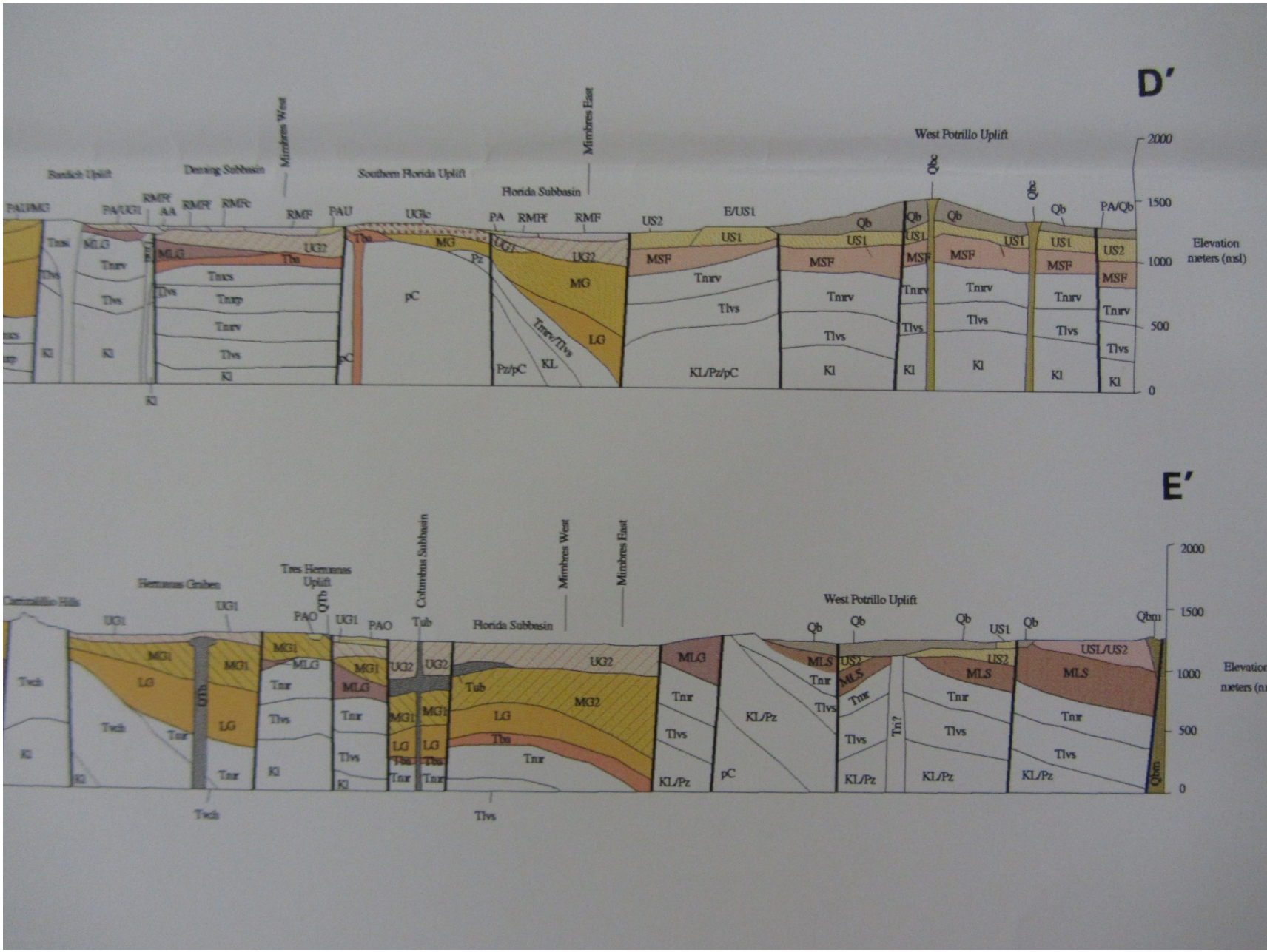
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Deming Subbasin
Mimbres West
Southern Florida Uplift
Florida Subbasin
Mimbres East
West Potrillo Uplift
Elevation meters (nsl)
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1500
1000
500
0
E′
Cerrillos Hills
Hermanas Graben
Tres Hermanas Uplift
Columbus Subbasin
Mimbres West
Mimbres East
Florida Subbasin
West Potrillo Uplift
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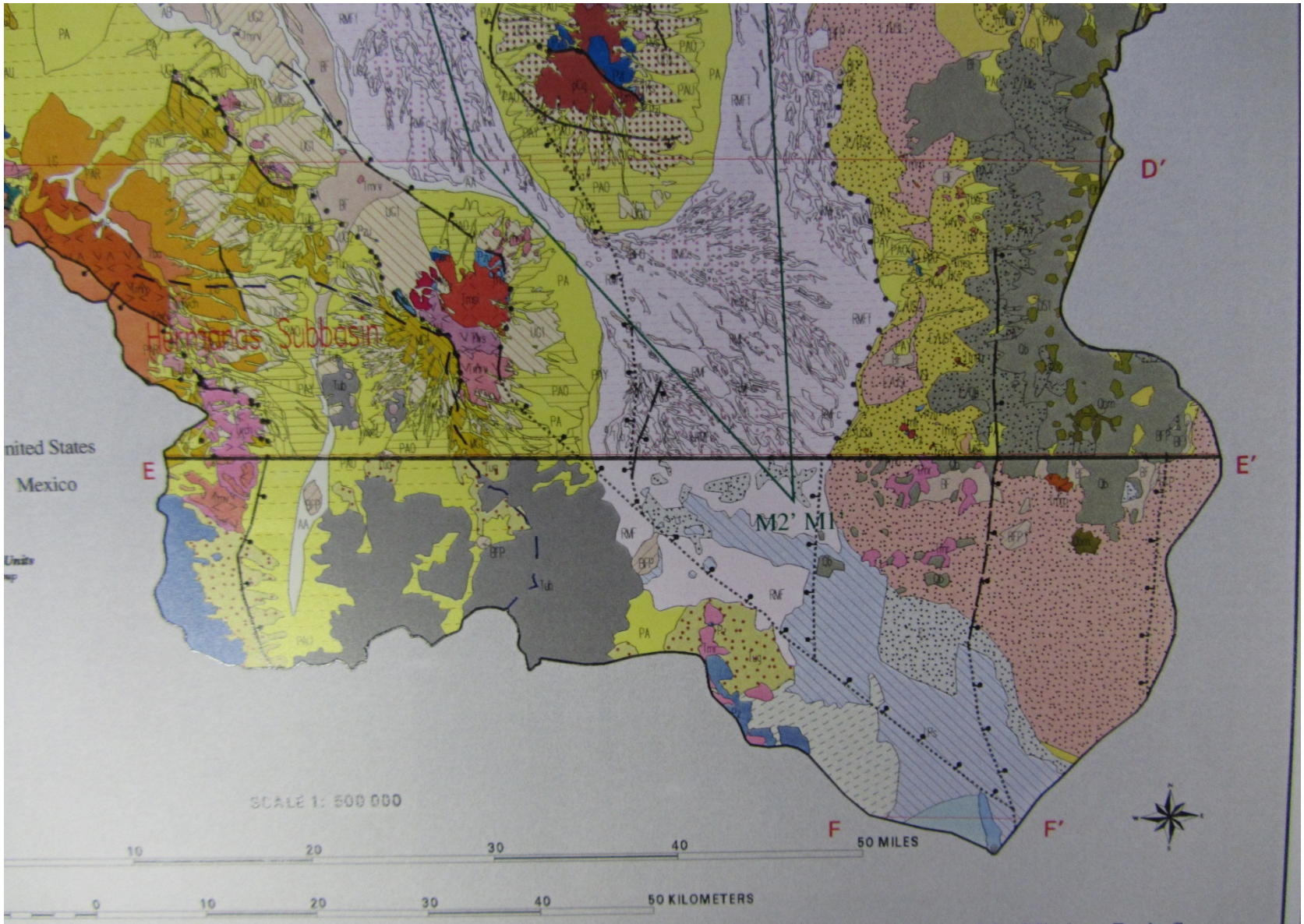
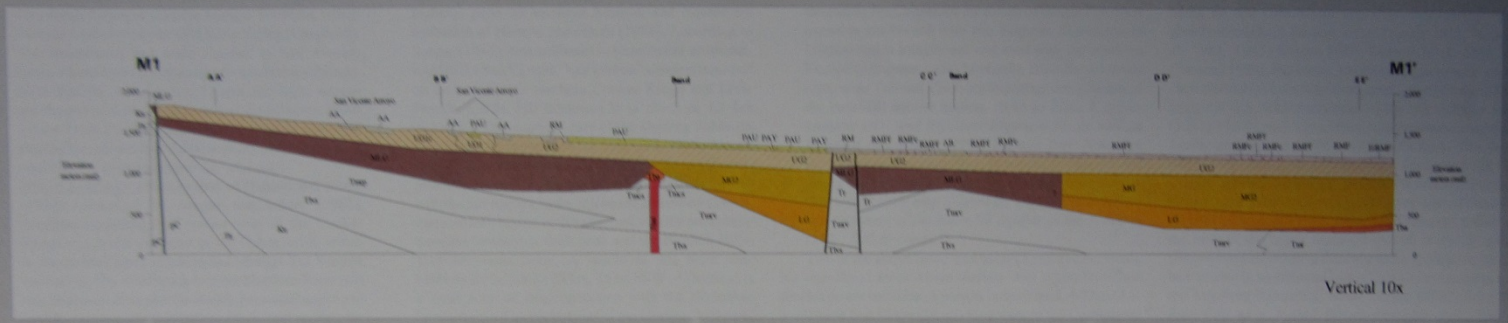


Figure 4- 2a. Hydrogeologic map of the Mimbres Basin System.



Profile Explanation

AA - Alluvial deposits in axial arroyo channel systems; facies *b* (like *3a*)

AB - Unchannelled alluvial deposits of axial basin floodways; facies *b and c* (like *3*)

PAU - Older and younger piedmont-slope deposits and correlative Upper Gila (UGU) and Upper Santa Fe piedmont facies (*5 to 8*), undivided

PAY - Younger piedmont-slope deposits of late Quaternary age; mostly facies *5*

RM - Channel, floodplain and low terrace deposits of the Lower Mimbres River; mostly facies *a* and *b*

RMF, URMF - Fluvial-fan deposits of the ancestral and modern Mimbres River, undivided; up to 20 m thick and primarily in vadose zone; facies *a*

RMFc - Fluvial-fan deposits of the Mimbres River, coarse-grained facies; mostly facies *a2*

RMFf - Fluvial-fan deposits of the Mimbres River, fine-grained facies; **mostly facies *a3* and *c***; includes extensive gypsiferous and alkali impregnated sediments in the Florida subbasin

UGU, UGIs - Proximal to distal, Upper Gila Hydrostratigraphic Units, piedmont slope facies, undivided; mostly facies *3*

UG2 - Upper Gila HSUs, undifferentiated fine to medium grained basin-floor deposits, including those of ancestral Mimbres and Rio Santa Barbara systems; mostly facies *3*

MG1 - Upper Tertiary Middle Gila HSUs, undivided (includes MG2 and MG3), primarily facies *7 and 8* (mostly in zone of saturation in central basin areas)

LG - Upper Tertiary Lower Gila Hydrostratigraphic Units (HSUs), undivided (surfaces and basin-floor facies *4, 7, 8, 9, and 10*; basin-fill unit is mostly buried in central basin area)

MGLG - Middle and Lower Gila undivided HSUs, may be characterized

Tmp - Middle Upper Tertiary Basalts (includes rhyolite tuffs)

Tw - Upper Tertiary volcanics interbedded with and underlying *3-4*

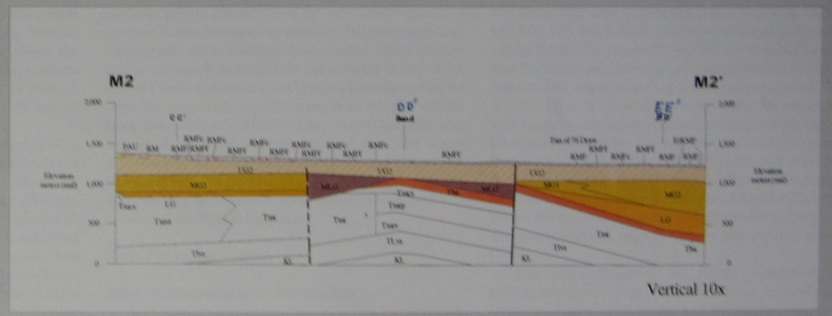


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Figure 4-2b. Hydrostratigraphic profile for the Mimbres Basin.

Slide Set 3

This hydrochemical *Stiff Diagram*-slide illustrates the general southward deterioration of groundwater quality (increase in salinity) from the Mimbres River headwaters (Continental Divide) area of high-quality groundwater recharge to the Transboundary discharge zone east of Columbus-Palomas. *From* Hibbs, Lee, and Hawley (1999), and Hawley and others (2000

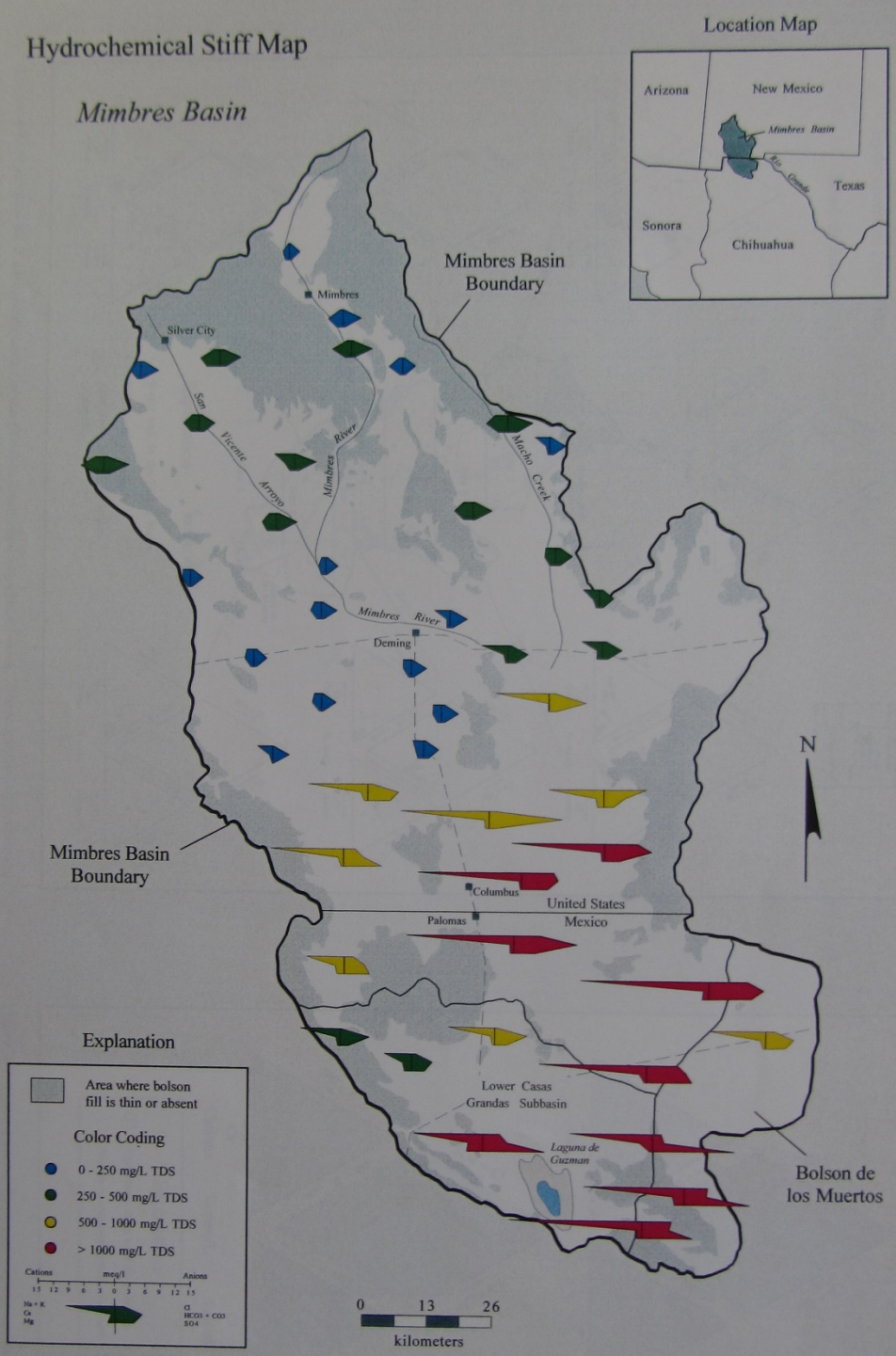


Figure 4-5. Hydrochemical stiff map for the Mimbres Basin, and associated basins, showing stiff diagrams color coded by TDS ranges (source of data: U.S. Geological Survey; Comision Nacional Del Agua; Instituto Nacional de Estadistica, Geografia e Informatica).

Primary References

Hibbs, B.J., Lee, M.M., and Hawley, J.W., 1999, Evolution of hydrochemical facies in the Mimbres Basin aquifer system: A transboundary resource, *in* Hydrological issues of the 21st Century: Ecology, Environment, and Human Health: American Institute of Hydrology, Hydrological Science and Technology, v. 15, no. 1-4, p.52-65.

Hawley, J.W., Hibbs, B.J., Kennedy, J. F., Creel, B.J., Remmenga, M.D., Johnson, M., Lee, M.M., and Dinterman, P., 2000, Trans-International Boundary aquifers in southwestern New Mexico: N.M. Water Resources Research Institute,Technical Completion Report-Interagency Contract No. X-996350-01-3, 126 p., 1 plate, with data and GIS coverages on CD ROM. http://wrri.nmsu.edu/publish/otherrept/swnm/downl.html

QUESTIONS?

RESUMEN DE LA HIDROGEOLOGÍA DE LA CUENCA MIMBRES DEL SURE, con énfasis en el sistema acuífero transfronterizo del área de Columbus-Palomas: asuntos de la calidad del agua.

John W. Hawley, Hawley GEOMATTERS
Emérito Geólogo Ambiental Mayor
N.M. Oficina de Geología y Recursos Minerales
Una división de N.M. Tech
Visitar hidrogeólogo principal del Instituto de Investigación de Recursos Hídricos NM, NMSU
hgeomatters@qwestoffice.net

INTRODUCCIÓN 1

Gracias por la oportunidad de compartir brevemente mis ideas sobre la hidrogeología y los problemas de calidad de aguas subterráneas relacionadas en la zona sur de la Cuenca de Mimbres SW New Mexico y Chihuahua NW usted.

Esta visión se demuestra con diapositivas que tienen que ver con los acuíferos y asuntos de la calidad del agua en el area fronterizo del Columbus y Palomas.

INTRODUCCIÓN 2

El objetivo principal de esta presentación es comunicar con eficacia los asuntos hidrogeológicos muy muy relevantes a un público general que se enfrentan con los problemas acuciantes de calidad del agua de abastecimiento de agua y en el día a día. ¿Cómo lo logro aún está por verse.

Así, ayúdenme con interrumpirme cuando deje de hablar de cosas pertenientes.

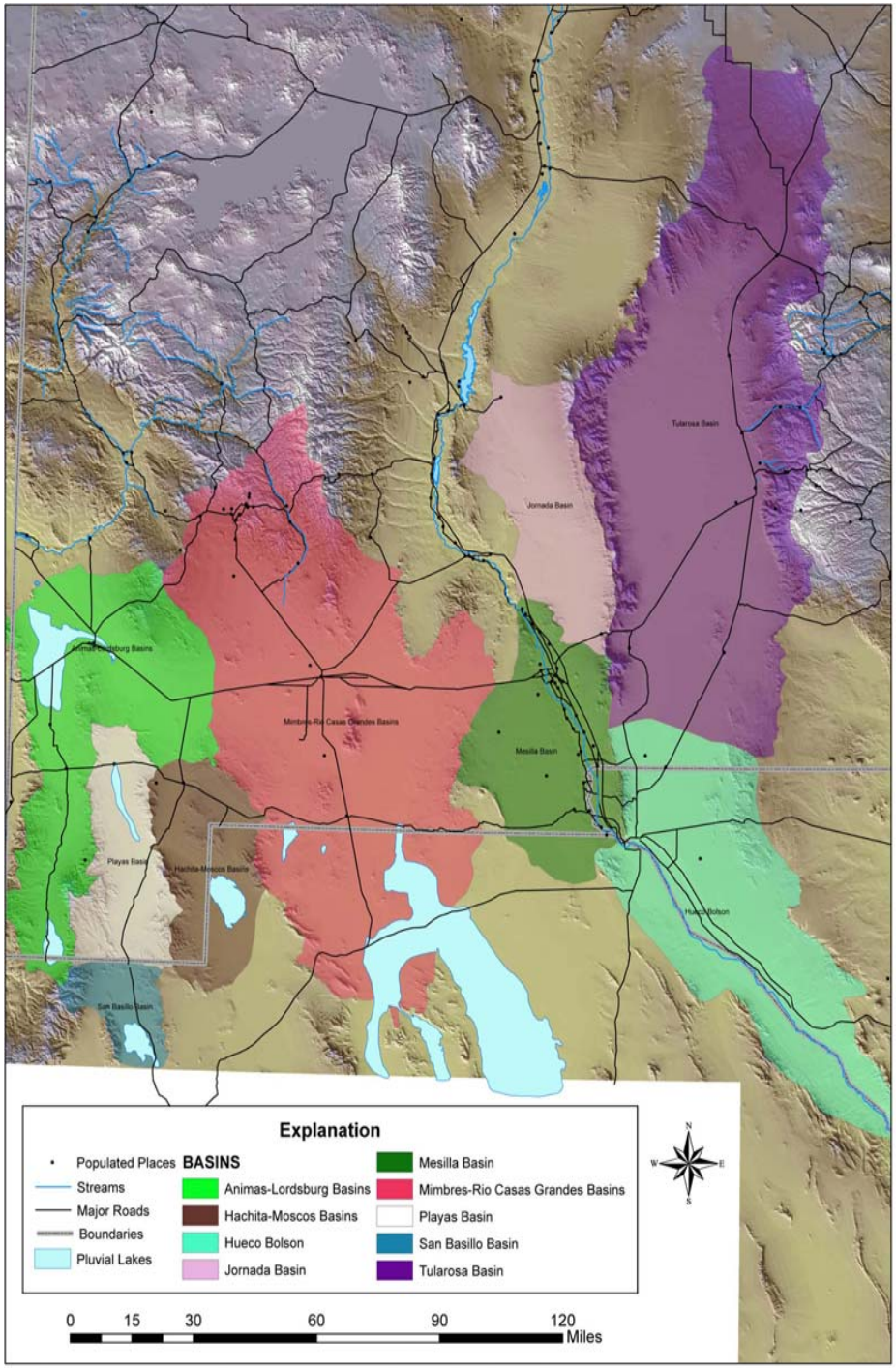
INTRODUCCIÓN 3

Recuerden, que las ciencias terrestres involucran mucha información deducida de escenarios afuera del laboratorio. ¡Mi experiencia personal empezó en 1962 como geólogo SCS-USDA en Las Cruces, y sigo aprendiendo! Por ejemplo, un mentor de principios sobre las condiciones del agua subterránea en el área de Columbus (1966) fue un perforador de pozos de agua, el fallecido Raeford Guffey!
La presentación se ilustra por los siguientes conjuntos de diapositivas:

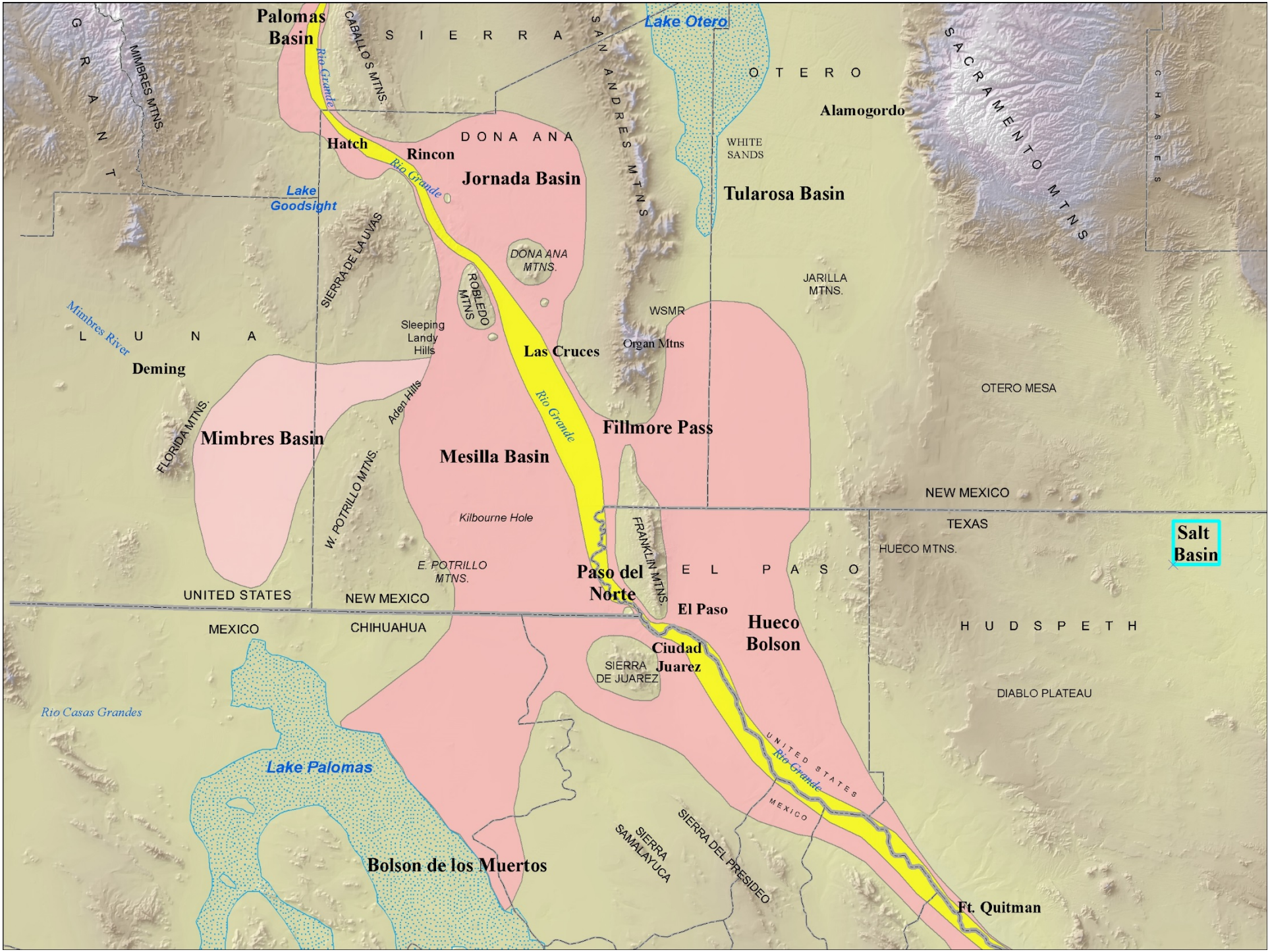
1. Ajuste Geológico General
2. Hidrogeología
3. Discusión aguas subterráneas Calidad

Información

El primer grupo de cinco diapositivas introduce el excenario geológico y geomórfico regional y local. Incluye un mapa hidrogeológico 1916 de la parte occidental del condado de Luna de DH Darton, uno de los más importantes de los Estados Unidos geólogos del Servicio Geológico de principios del siglo 20.



Índice de mapas de Sistemas Acuíferos de la Región de Nueva México Suroeste


Palomas Basin
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MIMBRES MTNS.
Rio Grande
Alamogordo
Hatch
Rincon
D O N A A N A
Jornada Basin
WHITE SANDS
Tularosa Basin
Lake Goodsight
SIERRA DE LA UVAS
DONA ANA MTNS.
ROBLEDO MTNS
JARILLA MTNS.
Mimbres River
L U N A
Sleeping Landy Hills
WSMR
Organ Mtns
Las Cruces
Deming
OTERO MESA
Aden Hills
FLORIDA MTNS.
Mimbres Basin
Fillmore Pass
Mesilla Basin
W. POTRILLO MTNS.
NEW MEXICO
Kilbourne Hole
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Salt Basin
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E. POTRILLO MTNS.
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DIABLO PLATEAU
Rio Casas Grandes
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Lake Palomas
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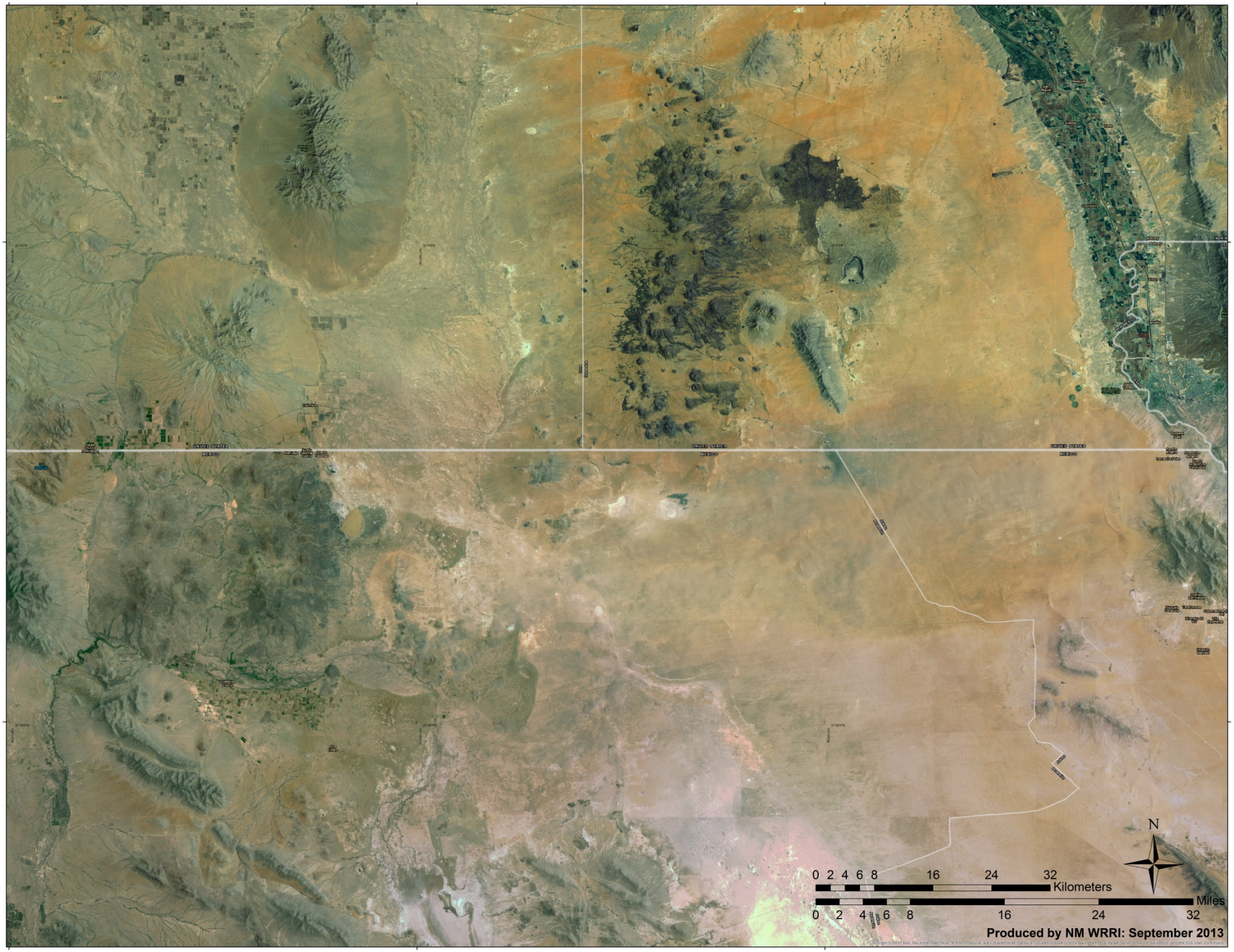
SIERRA DEL PRESIDIO
Bolson de los Muertos
Ft. Quitman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Palomas
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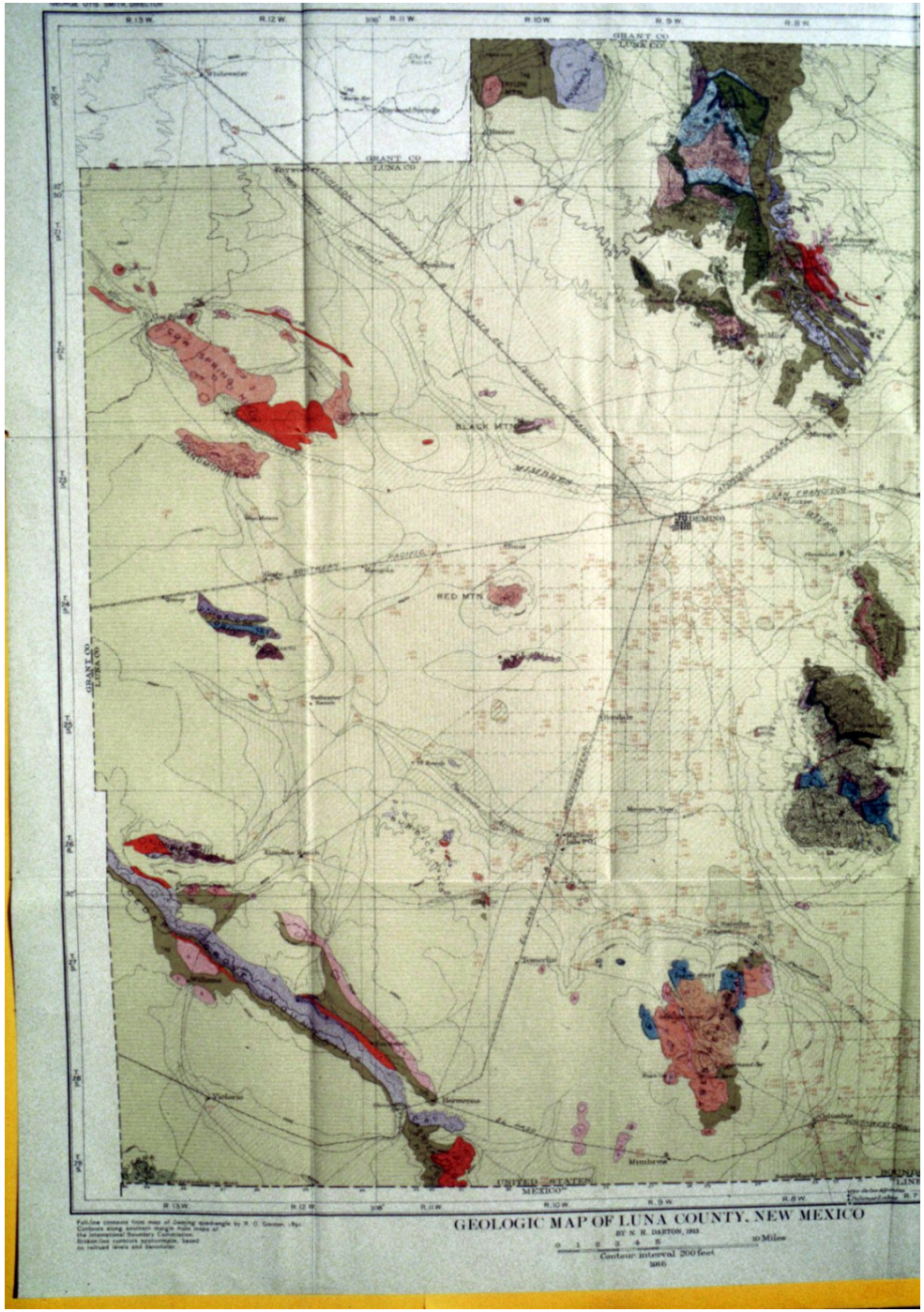
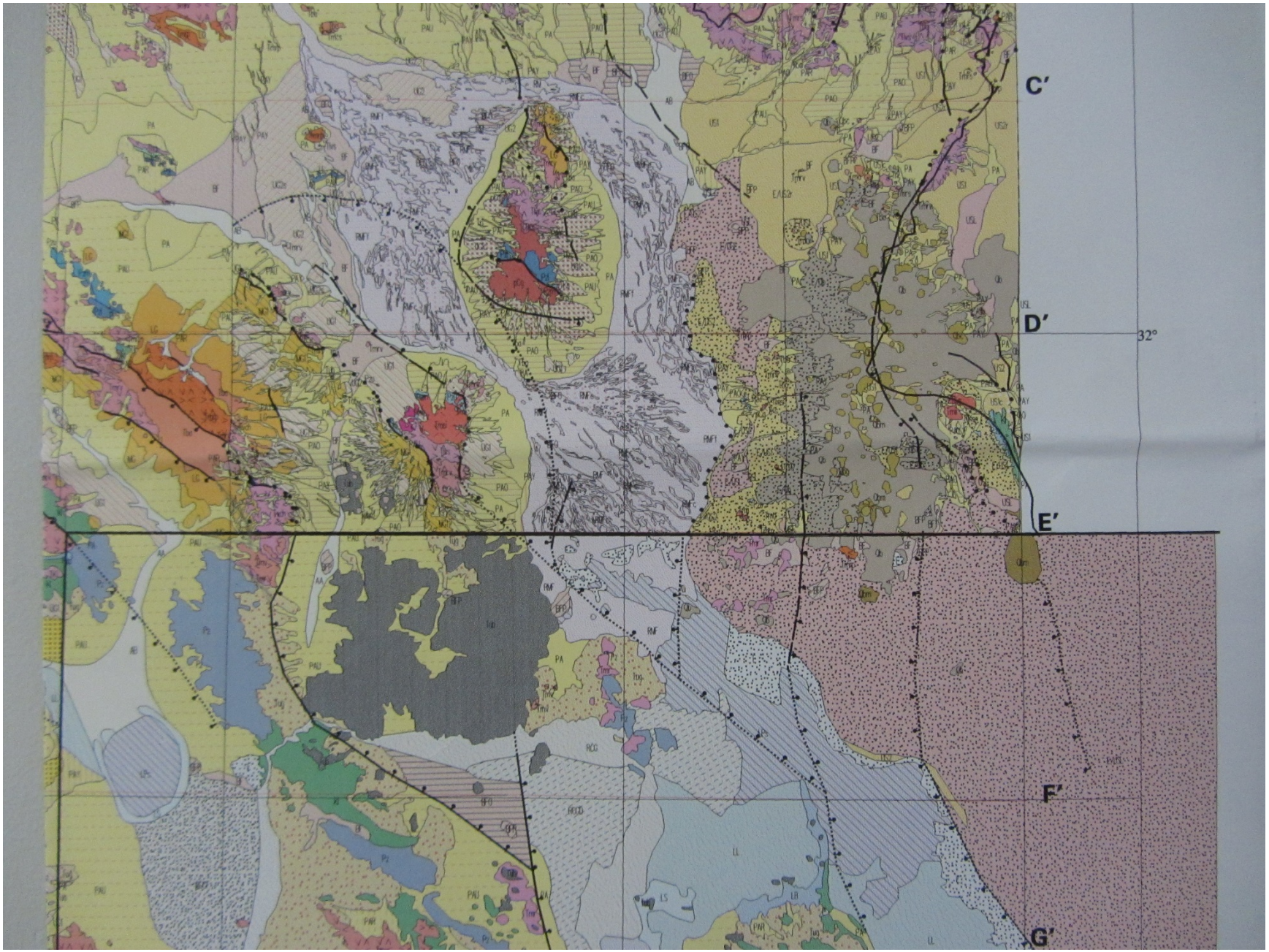


La parte occidental de NH Darton de (1916) Mapa Geológico del Condado de Luna, con localizaciones del agua-bien y contornos que muestran la profundidad de las aguas subterráneas. (del USGS Boletín 618)

Información

El segundo grupo de diapositivas ilustran el entorno hidrogeológico de la región SW New Mexico-NW Chihuahua tanto desde la perspectiva del subsuelo (mapa y cross-section) de superficie y . Los sistemas de acuíferos de la cuenca Mimbres sur (incluyendo el área de Columbus-Palomas) son representados con más detalle en las dos últimas diapositivas (de Hawley y otros, 2000, informe NMWRRI sobre Acuíferos Trans - Internacional de Límites).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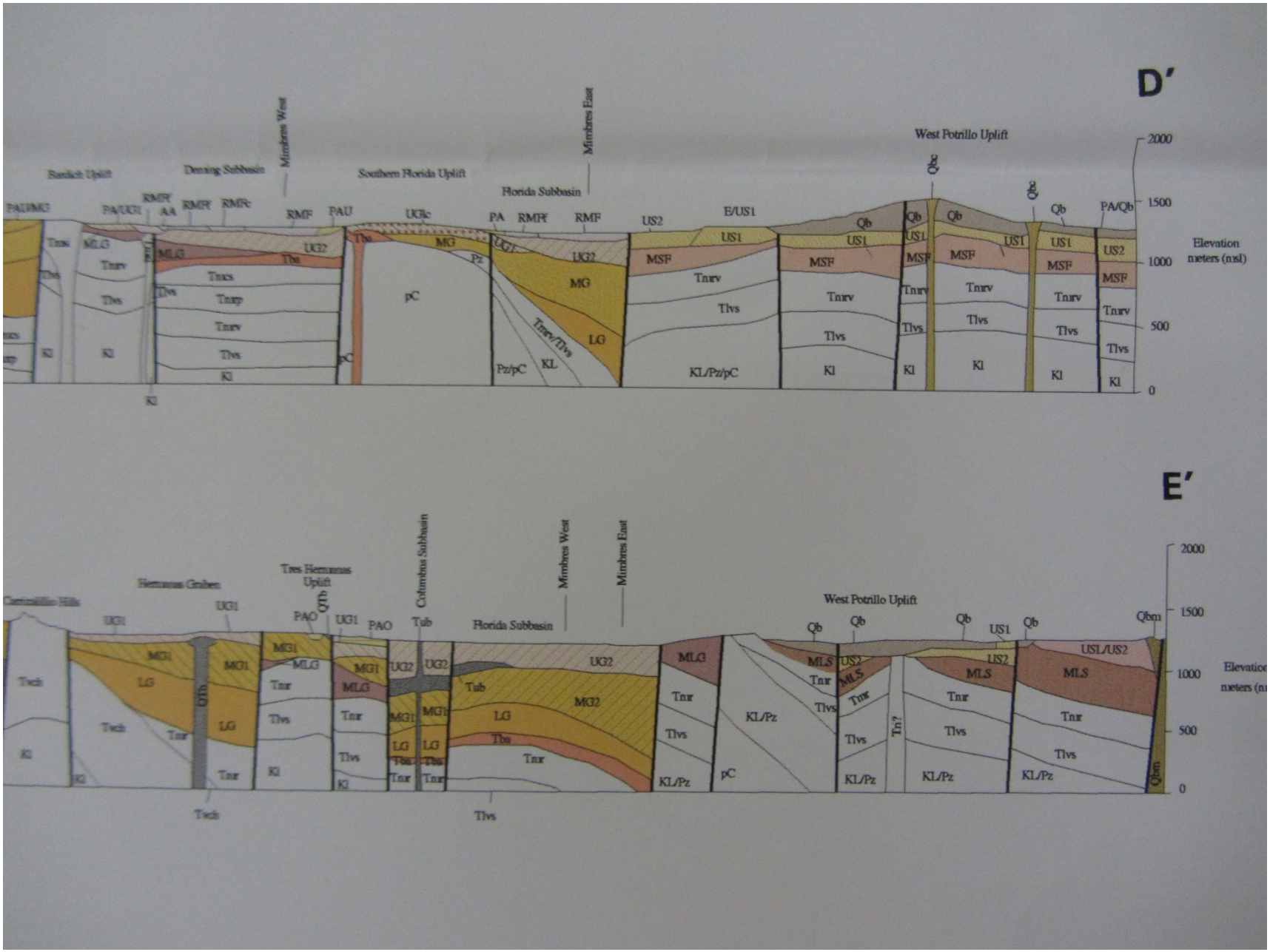
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Mimbres West
Southern Florida Uplift
Florida Subbasin
Mimbres East
West Potrillo Uplift
Elevation meters (nsl)
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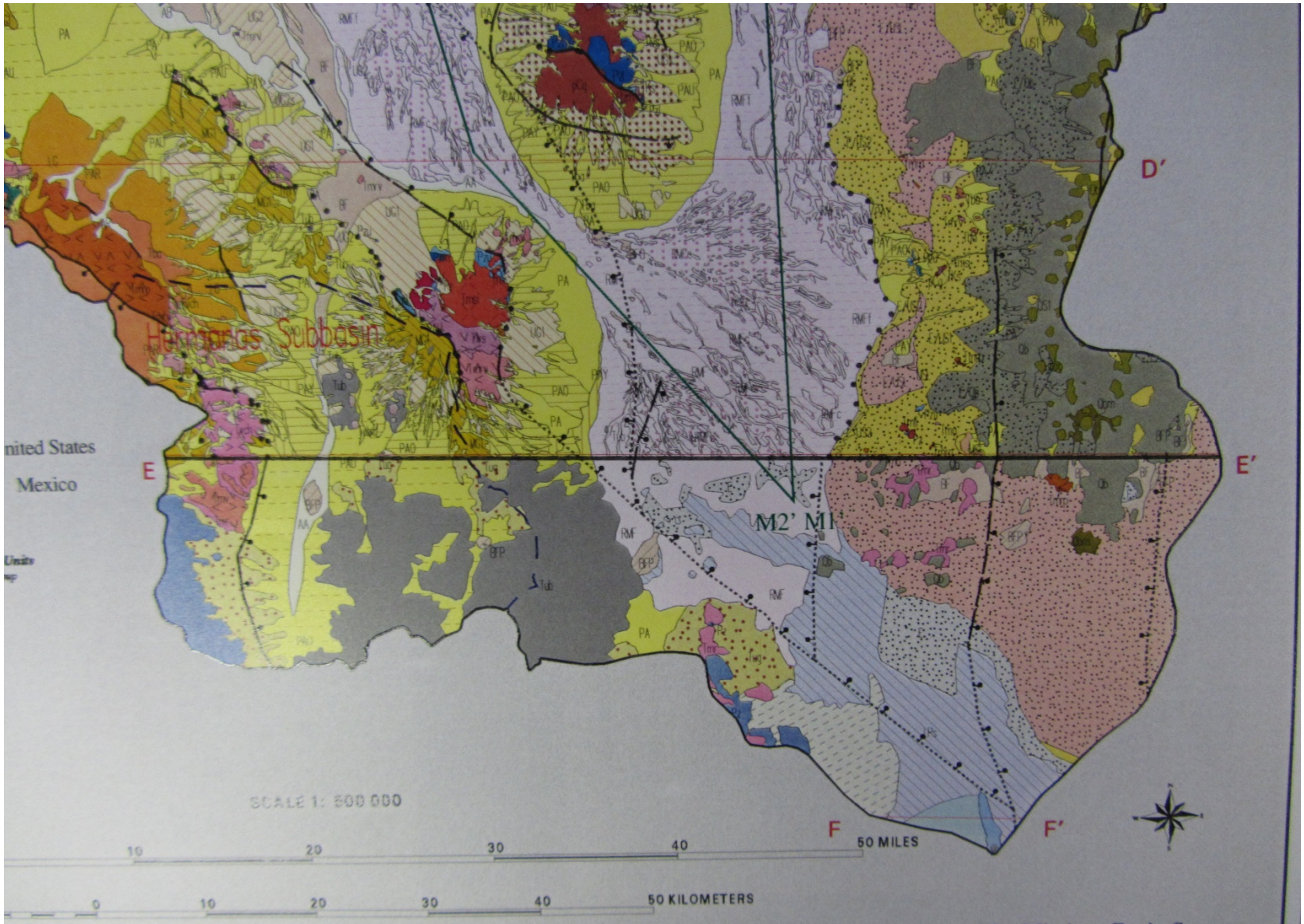
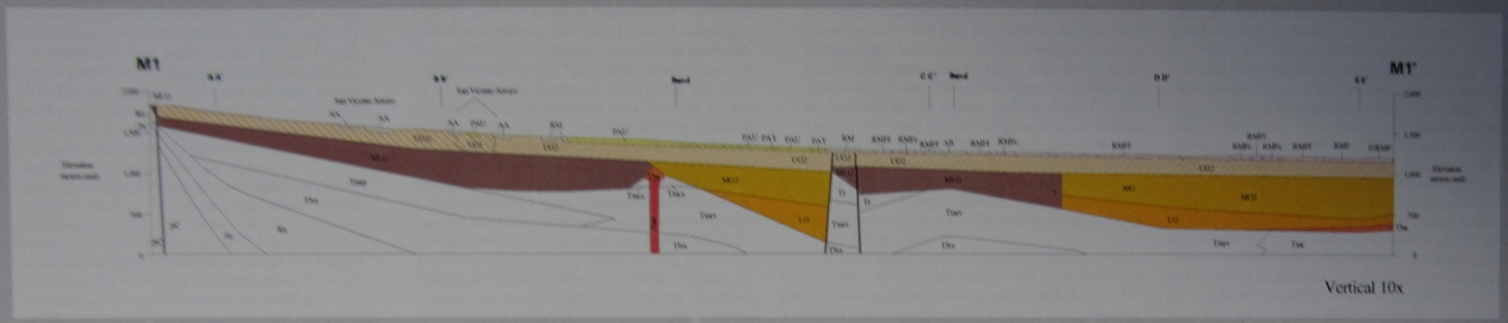


Figure 4- 2a. Hydrogeologic map of the Mimbres Basin System.



Profile Explanation

AA - Alluvial deposits in axial arroyo channel systems; facies *b* (like *3a*)

AB - Unchannelled alluvial deposits of axial basin floodways; facies *b and c* (like *3*)

PAU - Older and younger piedmont-slope deposits and correlative Upper Gila (UGU) and Upper Santa Fe piedmont facies (*5 to 8*), undivided

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RM - Channel, floodplain and low terrace deposits of the Lower Mimbres River; mostly facies *a* and *b*

RMF, URMF - Fluvial-fan deposits of the ancestral and modern Mimbres River, undivided; up to 20 m thick and primarily in vadose zone; facies *a*

RMFc - Fluvial-fan deposits of the Mimbres River, coarse-grained facies; mostly facies *a2*

RMFf - Fluvial-fan deposits of the Mimbres River, fine-grained facies; **mostly facies *a3* and *c***; includes extensive gypsiferous and alkali impregnated sediments in the Florida subbasin

UGU, UGIs - Proximal to distal, Upper Gila Hydrostratigraphic Units, piedmont slope facies, undivided; mostly facies *3*

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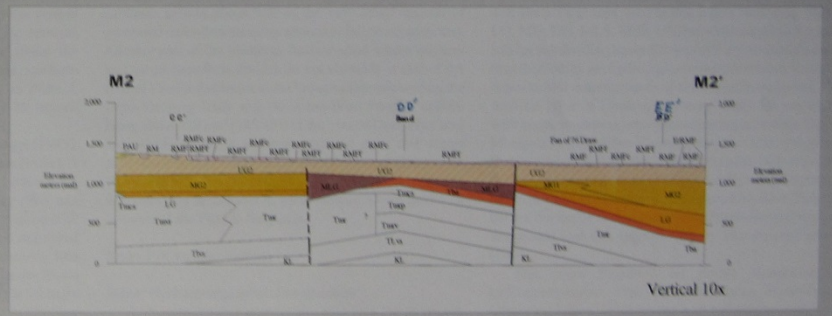
LG - Upper Tertiary Lower Gila Hydrostratigraphic Units (HSUs), undivided (surfaces and basin-floor facies *4, 7, 8, 9, and 10*; basin-fill unit is mostly buried in central basin area)

MGLG - Middle and Lower Gila undivided HSUs, may be characterized

Tmp - Middle Upper Tertiary Basalts (includes rhyolite tuffs)

Tw - Upper Tertiary volcanics interbedded with and underlying *3-4*



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10 20 30 40 50 KILOMETERS

Figure 4-2b. Hydrostratigraphic profile for the Mimbres Basin.

Información

Este diagrama de Stiff-slide hidroquímica ilustra el deterioro general de la calidad del agua subterránea hacia el sur (aumento de la salinidad) de la cabecera del río Mimbres (divisoria continental) del área de recarga del agua subterránea de alta calidad para el cumplimiento transfronterizo zona este de Columbus-Palomas. De Hibbs, Lee, y Hawley (1999), y Hawley y otros (2000)

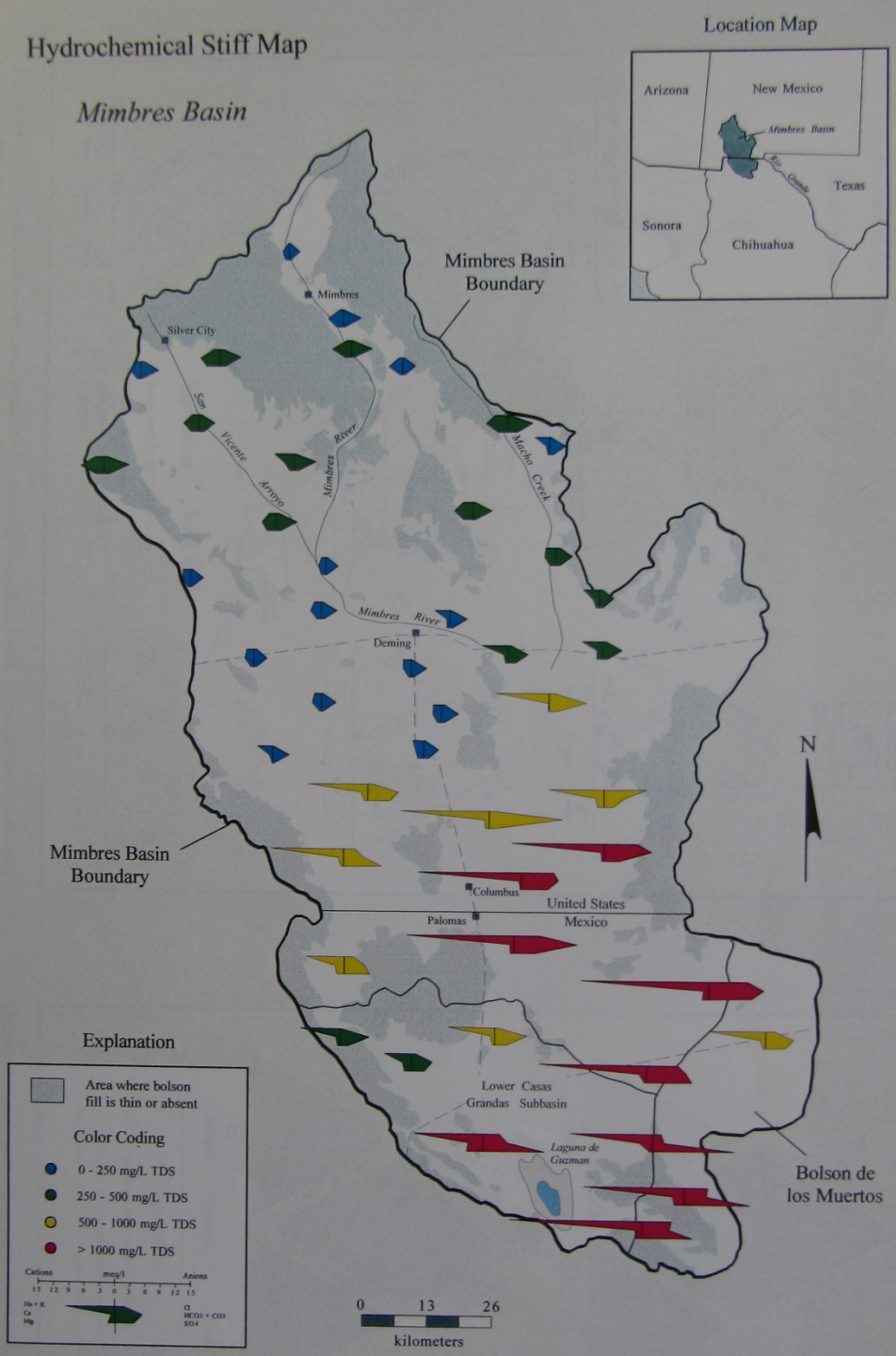

Figure 4-5. Hydrochemical stiff map for the Mimbres Basin, and associated basins, showing stiff diagrams color coded by TDS ranges (source of data: U.S. Geological Survey; Comision Nacional Del Agua; Instituto Nacional de Estadistica, Geografia e Informatica).

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EVOLUTION OF HYDROCHEMICAL FACIES IN THE MIMBRES BASIN AQUIFER SYSTEM: A TRANSBOUNDARY RESOURCE

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ABSTRACT

The Mimbres Basin aquifer system is a transboundary system in southwestern New Mexico and northern Chihuahua, Mexico. Water bearing strata in the basin and associated subbasins include consolidated bedrock units in the northern highlands, and Tertiary and Quaternary basin (bolson) fill units in the central to southernmost portions of the basin. Recharge occurs mostly from ephemeral recharge along mountain fronts and from infiltration beneath perennial streams. Under predevelopment conditions, ground water flowed north-to-south from the northern highlands, across the international border, to phreatic playas and alkali flats in Mexico where ground water discharged by evaporation. Extensive ground-water development has currently altered the directions of ground-water flow locally toward pumping centers near Deming and Columbus, New Mexico, and Palomas, Mexico.

Hydrochemical facies in the basin developed as a result of water-rock interaction and evaporation along flowpaths. Hydrochemical facies vary from calcium-bicarbonate ground waters with total dissolved solids (TDS) less than 500 mg/L in the northern half of the basin, to sodium-bicarbonate ground waters with TDS greater than 500 mg/L in the central part of the basin, to sodium-sulfate and sodium-sulfate-chloride ground waters with TDS greater than 1,000 mg/L in the southernmost segment of the basin. Different hydrochemical facies and higher TDS developed as ground water flowed north-to-south. The primary processes responsible for hydrochemical evolution and salinization include gypsum and halite dissolution, exchange on clay particles of bound sodium for calcium and magnesium in solution, and evapotranspiration from vegetation and evaporative discharge at phreatic playas.

KEY WORDS: Hydrochemical facies, salinization, transboundary aquifer, phreatic playa

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In this sequence, the first ion in any coupled pair is the dominant chemical species (e.g, HCO_3 is dominant in the couplet, $HCO_3 + SO_4$). While partly a function of longer residence times along flowpaths, the Chebotarev sequence is also a function of contact of ground water with different rock and sediment types, combined with evaporative discharge processes. Other rocks, such as volcanic and intrusive igneous rocks that contain pyroxene, amphibole, and feldspars probably contribute smaller amounts of dissolved ions to ground waters in the basin.

CONCLUSIONS

The findings of this study have implications for use and development of ground-water resources. The Mimbres Basin aquifer system supplies ground water to border communities in southwestern New Mexico and northern Chihuahua, Mexico. Ground water in the northern half of the Mimbres Basin is usually less than 500 mg/L TDS. Near and extending across the New Mexico-Mexico border, ground water is usually greater than 500 mg/L TDS, reaching concentrations greater than 1,000 mg/L in the southernmost part of the study area. Analysis of the natural origin of solutes in ground water provides a background for assessing anthropogenic change. Also, recognition of the relationships between ground-water quality and position along flowpaths provides insights about source rocks and characteristics of the aquifer flow regime.

ACKNOWLEDGMENTS

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INTRODUCTION

Study Area

The Mimbres Basin aquifer system is an interconnected group of geohydrologic subbasins that covers an area of about 13,300 km^2 (5,140 mi^2), and includes parts of the United States and Mexico. Approximately 11,400 km^2 (4,410 mi^2) of the basin system is in southwestern New Mexico. Most of the area lies within the Mexican Highland section of the Basin and Range physiographic province, which is characterized by isolated north to northwest-trending mountain ranges rising from extensive bolson plains (Hawley, 1986). The northernmost part of the basin system extends into the Mogollon-Datil section of the Transition Zone and is dominated by high volcanic plateaus and north to northwest-trending mountain ranges. The entire southern boundary of the Mimbres Basin aquifer system is poorly defined in terms of both surface and subsurface-flow regimes. Parts of the Mimbres Basin aquifer system east and southeast of the Columbus-Palomas area merge southward with (1) the extensive ephemeral-lake plains (vadose and phreatic playas) of the northwestern Bolson de los Muertos, and (2) the fan-delta complex of the terminal Rio Casas Grandes that presently flows into the topographically closed and undrained, or partly drained basin of Laguna Guzman (Figure 1). We include segments of the Casas Grandes Basin and Bolson de los Muertos in our southern study area because of the questionable boundary definition and probable commingling of ground waters between these basin systems (Figure 1). These latter segments include an additional 3,670 km^2 (1,420 mi^2) in the Mexican part of the study area.

The Mimbres Basin aquifer system supplies ground water to the border communities of Deming, Columbus and Palomas and to a host of smaller communities and settlements in the United States and Mexico. The use of ground water includes agriculture, municipal, industrial, and public drinking water supply.

Study Goals

Recognition of the relationships between ground-water quality and position along flowpaths in arid basins provides the basis for this study (Mifflin, 1968). Active recharge areas are usually characterized by ground water with fairly low concentrations of dissolved ions, dominantly calcium, magnesium, and bicarbonate. Zones of lateral flow are often characterized by a decrease in the relative concentrations of calcium and magnesium ions and by an increase in sodium (and sometimes potassium) ions by cation exchange. Sulfate and chloride ions often become more important constituents along zones of lateral flow and at discharge areas due to evaporation and dissolution of evaporite minerals (Mifflin, 1968). Thus, considerable insight about aquifer flow regimes and recognition of source rocks are often provided by an assessment of ground-water chemistry at the basin scale. Our goal is to therefore perform an analysis of the ground-water chemistry in the Mimbres Basin aquifer system along its full transboundary extent, and to use this information to correlate to geologic and hydrogeologic interpretations of flow regimes.

To set the stage for hydrochemical analysis, we first provide a summary of the general hydrogeology of the study region, including a discussion of the hydrogeologic setting and recharge and discharge areas. Next, we move into a discussion of general hydrochemical facies at the basin

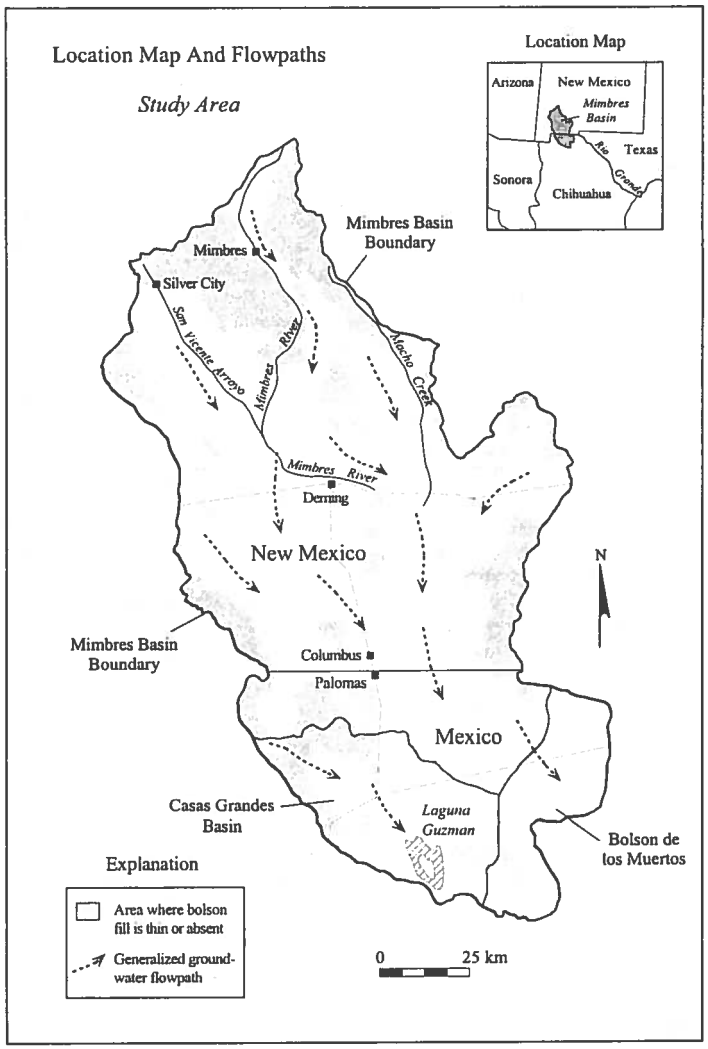


Figure 1. Study area location map, showing generalized flowpaths for predevelopment ground-water flow.

Dissolution of specific minerals is a function of their spatial locations in the basin (Figure 7). Chloride occurs in rainwater, and precipitates in soils as halite when rainwater evaporates (Hem, 1985; Sami, 1992). The halite can be dissolved by runoff and carried into ground water along arroyos and other recharge areas. Evaporation of ground water by natural discharge and by irrigation recycling further concentrates salts in soils and ground water. Gypsum and halite are present along the basin floor in the southern half of the basin, having precipitated in various phreatic playas. Gypsum and halite dissolve when meteoric ground waters come into contact with these evaporite minerals. Carbonates are present in the mountains and precipitate as caliche along mountain fronts and at interior locations in the basin. Carbonates are important sources of calcium, magnesium, and bicarbonate where meteoric waters come into contact with these relatively soluble rocks (Figure 7).

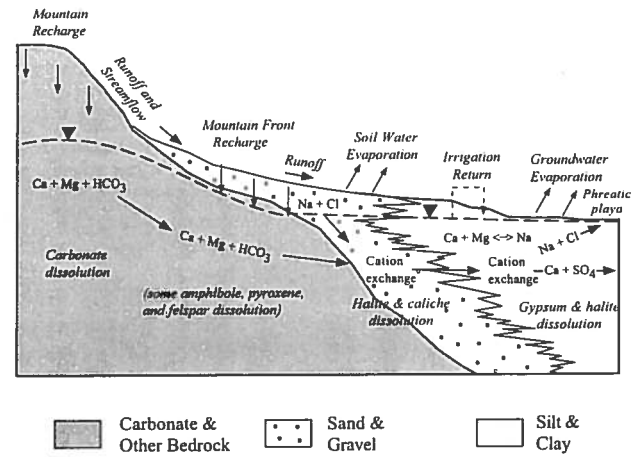


Figure 7. Conceptual hydrochemical evolution diagram illustrating chemical reactions and processes that influence the hydrochemistry in the study area.

Dissolution and weathering of these rocks and minerals produce an evolutionary trend from calcium-bicarbonate waters in the northern highlands, to sodium-bicarbonate waters at intermediate locations, to sodium-sulfate and sodium-sulfate-chloride waters at the southern limits of the study area. The modified Chebotarev (1955) sequence is thus exhibited:

Distance along flowpath →

$$HCO_3 \rightarrow HCO_3 + SO_4 \rightarrow SO_4 + HCO_3 \rightarrow SO_4 + Cl$$

Residence time →

lie just above the line. An additional, but relatively small amount of calcium and sodium ions from feldspar weathering could explain the slight excess of sodium and calcium in Figure 5c.

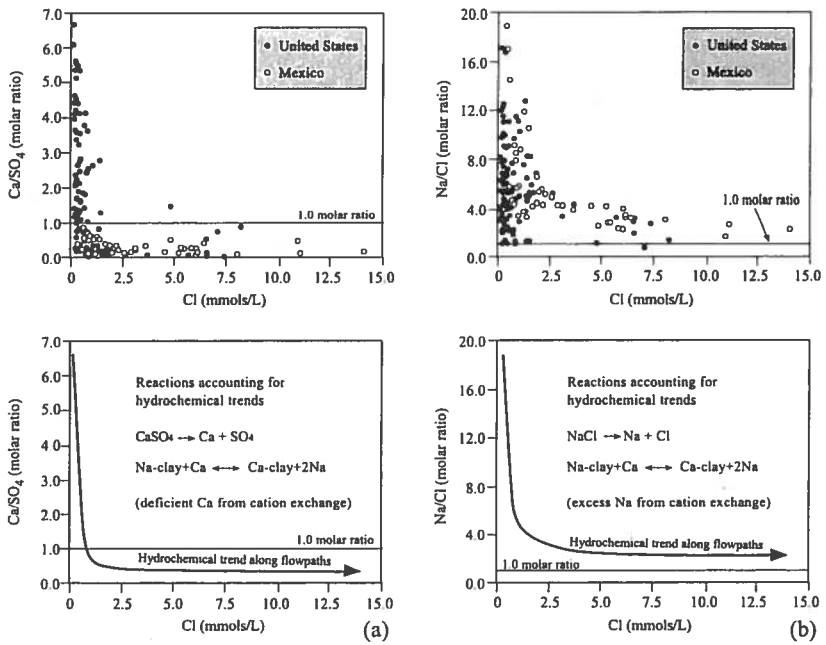


Figure 6. Additional cation/anion scatter plots that show the important influence of gypsum dissolution (a) and halite dissolution (b) on ground-water chemistry in the study area. Upper diagrams show raw data and lower diagrams show interpreted hydrochemical trends.

DISCUSSION

The previous analysis indicates that several simple reactions and processes control the water chemistry of the Mimbres Basin aquifer system, including dissolution of calcite and calcite cement, dissolution of dolomite, and dissolution of gypsum and halite. Cation exchange, favoring exchange of Ca for bound Na is also an important process in the aquifer system. Pyroxene, amphibole, and feldspar dissolution are probably less important sources of dissolved ions due to their lower solubilities. Clay minerals are important weathering products of these minerals however, and provide the exchange sites for divalent-monovalent cation exchange.

scale, and set upon the task of explaining the processes responsible for the origin of solutes. Sources of hydrochemical data used for these analyses included New Mexico Environment Department public drinking water data, USGS ground-water quality data, and Comision Nacional Del Agua (CNA) ground-water quality data, contained in Instituto Nacional de Estadistica, Geografia e Informatica (INEGI) water quality sheets.

HYDROGEOLOGY

Hydrogeologic Setting and Recharge Areas

A large variety of bedrock and basin-fill units are found in the Mimbres Basin aquifer system including Precambrian, Paleozoic and Mesozoic rocks, lower Tertiary igneous intrusive and extrusive units, and Gila and Sante Fe Group basin-fill (Seager et al., 1982; Drewes et al., 1985; Seager, 1995). The term "system" stresses the physiographic, geologic, and hydrogeologic complexity of the large area that makes up the Mimbres Basin watershed, and "basin-fill" refers to all water-bearing deposits emplaced during Late Cenozoic filling of structural basins in the region. The bulk of this intermontane basin-fill consists of unconsolidated to partly indurated alluvial deposits, with some interbedded lacustrine and eolian sediments. Locally, the fill also includes important aquifer zones made up of igneous rocks (primarily basaltic flows and intrusions) emplaced during the interval of Basin and Range extension. Basin-fill aquifers are usually unconfined where deposits are unconsolidated, relatively coarse-grained, and located in the upper part of the zone of saturation. However, leaky-confined to confined hydrologic conditions occur where fine-grained or partly indurated lithofacies are present.

The Mimbres Basin aquifer system is typical of most arid to semiarid regions in that only a very small percentage of basin-wide precipitation and surface runoff contributes to ground-water recharge. Data interpretations by Hanson et al. (1994) indicate that this contribution is less than 1.5% of the average annual precipitation (about 1.3 x 10^9 m^3, 3,160,000 ac-ft). Using the "mountain-front-runoff method" of Hearne and Dewey (1988), with adjustment for surface outflow from the upper Mimbres River basin, Hanson et al. (1994) estimate that the mountain-front component of annual recharge is about 6.62 x $10^7 m^3$ (55,300 ac-ft).

The most effective zones of recharge to basin-fill zones occur in four major settings:

- Along losing reaches of the upper Mimbres River channel.
- Percolation losses from major arroyos, such as the reach of San Vicente Arroyo starting about 8 km (5 mi.) downstream from Silver City (Figure 1).
- Areas of direct ground-water discharge from bedrock aquifer systems in highland areas to basin-fill aquifers at lower elevations. This component of mountain-front recharge may be very large, particularly near valleys and canyons draining high-mountain terrains.
- Underflow (ground water draining) from adjacent basins.

All major upland areas with relatively high precipitation-runoff regimes are located in the northern part of the basin system. Moreover, there is general agreement that most of the recharge to the basin-fill aquifer is in that area (Darton, 1916; Trauger, 1972; Hanson et al., 1994). Estimates of the distribution of mountain-front recharge throughout the basin system by Hanson et al. (1994) also indicate that most recharge to the basin-fill aquifer system is derived from the highland areas and from the upper Mimbres River basin (including the San Vicente Arroyo system) north of Deming. In fact, there may be little effective recharge contribution from many upland areas in the southern part of the basin system.

Movement and Discharge Components

Ground water in the Mimbres Basin aquifer system generally moves from the northern highlands to the interior basins and southward toward the Mexico border (Figure 1). Isolated interior mountains also locally modify the regional flow pattern by adding minor amounts of recharge and altering the width and depth of the basin-fill aquifer. The ultimate sink for ground water moving across the international boundary was discharge by evapotranspiration in ephemeral lakes and phreatic playas of the Bolson de los Muertos area (primarily in Salinas de la Union at the southern end of "El Barreal"). Some of this flow is now intercepted by intensive aquifer development in the Columbus-Palomas area.

Most losses from the flow system in predevelopment times were due to evapotranspiration from: (1) alluvial flats and playa lakes in the central part of the study area; and (2) evaporation from playa lakes and alkali flats in the southern portion of the basin system. These processes had a profound influence on the origin of hydrochemical facies in the basin system. Other smaller discharge components included evaporation losses from streams and rivers, transpiration from native vegetation, and underflow across the southern basin boundary. These latter losses were minor compared to the evapotranspiration losses in the central and southern part of the basin system prior to the historic period of intensive ground-water use by irrigated agriculture.

GROUND-WATER QUALITY AND ORIGIN OF SOLUTES

General Hydrochemistry

Standard hydrochemical constituents in the basin system are presented graphically as spatial pattern diagrams after the method developed by Stiff (1951). Concentrations of cations are plotted to the left of a vertical axis and anions are plotted to the right of the axis, with all values presented in meq/L. These diagrams allow the determination of "hydrochemical facies" in which the dominant cation/anion pair(s) is shown (e.g., Na-SO_4-Cl facies). Stiff diagrams are placed at the appropriate well location on x-y maps and are coded by total dissolved solids (TDS) concentrations.

Ground water in the northern half of the Mimbres Basin is usually less than 500 mg/L TDS (Figure 2). Ground water is especially dilute (<250 mg/L TDS) along the Mimbres River. Near and extending across the New Mexico-Mexico border, ground water is usually greater than 500 mg/L TDS, reaching concentrations greater than 1,000 mg/L in the southernmost part of the study area. The Stiff map indicates that hydrochemical facies change from mostly Ca-HCO_3 type waters north

(Ca + Mg - SO_4 - 0.5HCO_3) (Figure 5c). The quantity (Na - Cl) represents excess Na coming from sources other than halite dissolution (i.e., subtracting Cl from Na would give a value of zero if Na is produced solely from halite dissolution) (equation 8):

$$NaCl = Na + Cl \tag{8}$$

The term (Ca + Mg - SO_4 - 0.5HCO_3) would give a value of zero if calcium, dolomite, pyroxene, amphibole, and gypsum were the only minerals to dissolve (equations 1 to 5) (Figure 5c). Insofar as the quantities (Na - Cl) and (Ca + Mg - SO_4 - 0.5HCO_3) are not zero, the positive and negative values of these sums represent the amount of monovalent and divalent cations that are involved in cation exchange (equations 6 and 7).

The 2:1 exchange line in Figure 5c shows how much Na is contributed from cation exchange (positive [Na - Cl] values). The exchange line is plotted from equations 6 and 7, where it is shown that two Na ions are released in the aqueous solution for each divalent cation that is bound to the surface of a clay particle. Most of the points plot very close to the 2:1 exchange line and nearly all points have positive (Na - Cl) values (Figure 5c). The reasonable fit of most data points to the 2:1 exchange line suggests that equations 1 through 7 account, to a major extent, for the origin of solutes in the Mimbres Basin. The positive values of (Na - Cl) reflect excess Na caused by cation exchange.

Gypsum and halite dissolution chemistry is important in certain parts of the aquifer system and less important in other areas. The influence of gypsum dissolution and simultaneous removal of Ca by cation exchange is important as ground-water flows across the international border. Most ground-water samples have (Ca/SO_4) molar ratios greater than 1.0 for salinities less than 0.75 mmols/L Cl (Figure 6a). Most molar (Ca/SO_4) values are less than 1.0 for salinities greater than 0.75 mmols/L Cl. These trends suggest that gypsum dissolves at higher salinities, which produces an equal molar contribution of Ca and SO_4 (equation 3). Calcium is removed simultaneously by cation exchange, resulting in (Ca/SO_4) molar ratios less than 1.0. Many data in the United States plot above the 1.0 molar line, whereas all data in Mexico plot below the 1.0 molar ratio line (Figure 6a). Thus, ground water in Mexico is influenced substantially by gypsum dissolution.

A plot of molar (Na/Cl) vs Cl (Figure 6b) also reveals the important influence of halite dissolution (equation 8) on ground-water chemistry at higher salinities. Points trend downward toward the 1:1 (Na/Cl) molar ratio line, especially at salinities greater than 2 mmols/L Cl. Nearly all of the points plot somewhat above the 1:1 ratio line for salinities greater than 2 mmols/L Cl (Figure 6b). Halite dissolution combined with an excess of Na from cation exchange are shown to exert additional controls on ground-water chemistry in the basin system, as implied by several other lines of evidence.

Clays in basin fill are derived from chemical attack by hydrogen ions on common minerals, such as feldspars. Shown for the reactions that produce kaolinite,

$$2NaAlSi_3O_8 + 9H_2O + 2H^+ = Al_2Si_2O_5(OH)_4 + 2Na + 4H_4SiO_4 \tag{9}$$

$$CaAl_2Si_2O_8 + H_2O + 2H^+ = Al_2Si_2O_5(OH)_4 + Ca \tag{10}$$

these feldspar weathering reactions produce additional sodium and calcium in solution. This may explain the slight excess of calcium and sodium ions shown along the cation exchange line in Figure 5c. Following the cation exchange line closely, many points, especially above 4 mmols/L (Na - Cl),

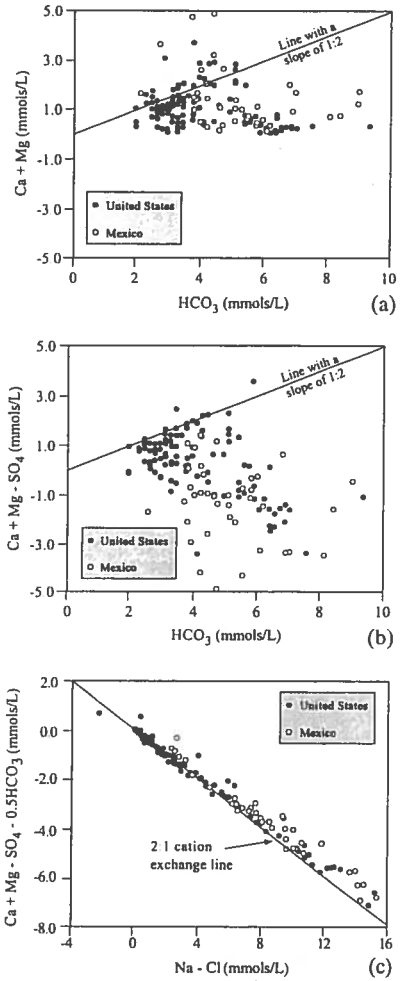


Figure 5. A series of cation/anion scatter plots for ground waters in the study area. These data suggest that dissolution of calcite, dolomite, halite, and sulfate, along with cation exchange, are the dominant processes that control ground-water chemistry.

moles of HCO_3), pyroxene (2 moles of [Ca+Mg] to 4 moles of HCO_3) and amphibole (2 moles of Ca, 5 moles of Mg, and 14 moles of HCO_3) (Figure 5a). Several of the points plot near the 1:2 line, but many of the points plot well below the line. Other points plot above the 1:2 line, indicating an additional source of Ca and Mg (Figure 5a).

To account for excess Ca due to possible dissolution of gypsum, the quantity (Ca + Mg - SO_4) is plotted against HCO_3 (Figure 5b). Since HCO_3 is not dissolved or precipitated by gypsum dissolution (equation 3), subtracting SO_4 from Ca simply accounts for any excess Ca derived from dissolution of gypsum. The points in Figure 5b *would* plot along the 1:2 line if the *sole* hydrochemical reactions in the aquifer system included dissolution of carbonates and carbonate cement, weathering of accessory pyroxene and amphibole minerals, and dissolution of gypsum. Most of the points plot well below the 1:2 line, indicating that some other process is removing Ca and Mg from solution.

A likely process for removal of Ca and Mg from solution is cation exchange. Cation exchange removes Ca and Mg from ground waters by substitution for bound Na on clays (Drever, 1982):

$$Na_2\text{-clay} + Ca^{+2} = Ca\text{-clay} + 2Na^+ \quad (6)$$

$$Na_2\text{-clay} + Mg^{+2} = Mg\text{-clay} + 2Na^+ \quad (7)$$

The forward reaction may account for deficient Ca and Mg in ground waters (Figure 5b). To test the influence of cation exchange on the hydrochemical signature of ground water, the molar quantities (Na - Cl) are plotted against

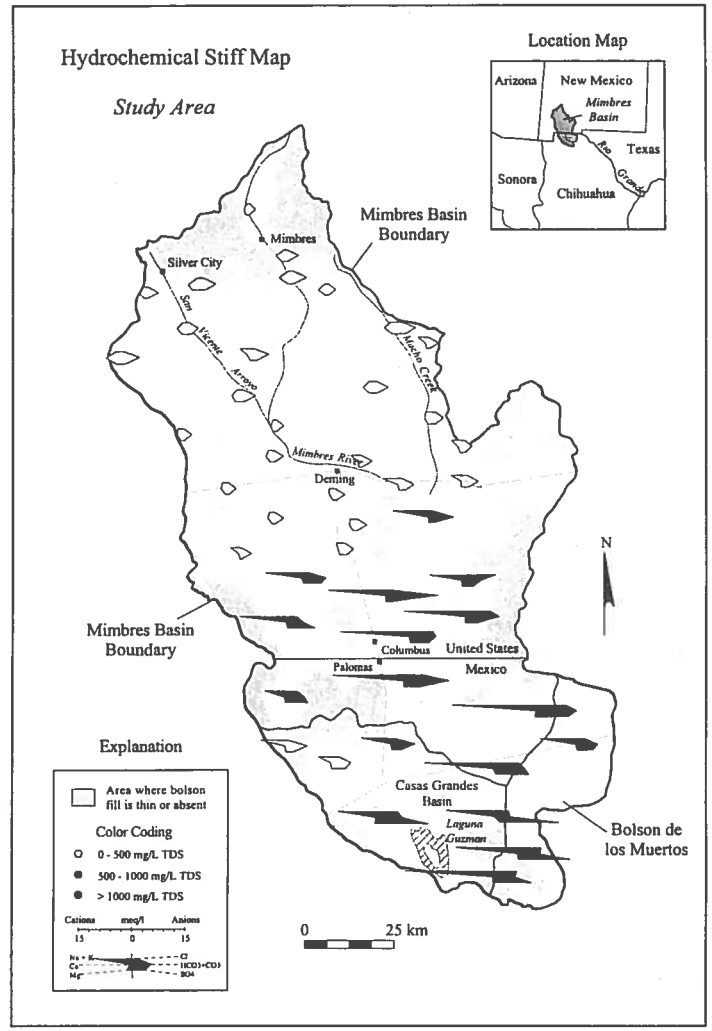


Figure 2. Hydrochemical Stiff map for the study area, showing Stiff diagrams coded by ranges of total dissolved solids (TDS).

of Deming, to Ca-Na-Mg-HCO_3 and Na-HCO_3 waters near Deming, to Na-HCO_3 and Na-SO_4-Cl-HCO_3 facies between Columbus and Laguna Guzman. At the southernmost part of the study area, ground waters are mostly a Na-SO_4-Cl type facies (Figure 2).

The Stiff map suggests an apparent evolutionary hydrochemical trend as groundwater flows south across the Mimbres Basin aquifer system. To evaluate this apparent trend further, the water quality data are plotted on Piper plots (Piper, 1944). Piper plots express cations as meq/L percentages of total cations on a trilinear diagram. Similarly, anions are plotted by their respective percentages on a separate trilinear diagram. The two points from any specific analysis are then projected onto a central diamond-shaped plot that is parallel to the upper edges of the trilinear diagrams. This method helps to identify hydrochemical mixing trends and evolutionary trends along flowlines.

North-to-south hydrochemical trends shown in the Stiff map are also observed in the Piper plot (Figure 3). The plot indicates that ground water evolves from mostly Ca-HCO_3 type waters, to Ca-Na-Mg-HCO_3 type waters, to Na-SO_4-Cl-HCO_3 and Na-SO_4-Cl type waters as ground water flows southward from the United States into Mexico. Sulfate is an especially dominant constituent in ground waters in Mexico (Figures 2 and 3).

Saturation Indices

Mineral saturation states were computed to determine if a thermodynamic condition exists for dissolution of gypsum, halite, and carbonate rocks and cement in the Mimbres Basin aquifer system. The geochemical modeling program PHREEQC (Parkhurst, 1995) was used to compute a saturation index, which represents the degree of equilibrium between water and minerals on the basis of the amount of dissolved ionic species in solution, and the amount that would be present if the water-solute system were at equilibrium between water and minerals at the sample temperature. Equilibrium with respect to a given mineral is indicated by a value of zero. Negative values suggest undersaturation and positive values reflect oversaturation.

Saturation indices were computed for 41 ground water analyses in the U.S. portion of the Mimbres Basin. These analyses include temperature and pH measurements, which are required for computation of saturation indices using PHREEQC (Parkhurst, 1995). The absence of temperature measurements in Mexico precludes the use of Mexican ground-water data for computation of saturation indices.

PHREEQC analyses indicate that ground water is typically at equilibrium with respect to calcite and dolomite, although there is a much wider range of values for the latter (Figure 4). Despite the high sulfate content of many samples near Columbus, none of the samples appears to be consistently within the range of values indicating equilibrium with respect to gypsum. In all cases, waters are undersaturated with respect to halite.

Origin of Solutes

The data in the Stiff map and Piper plot (Figures 2 and 3) suggest evolutionary hydrochemical trends along a north to south transect. Calcium and magnesium are the dominant cations in the northern part of the Mimbres Basin aquifer system. Sodium becomes the more dominant cation as ground-water flows to the south. Bicarbonate becomes less abundant proportionally to sulfate and chloride in ground waters to the south.

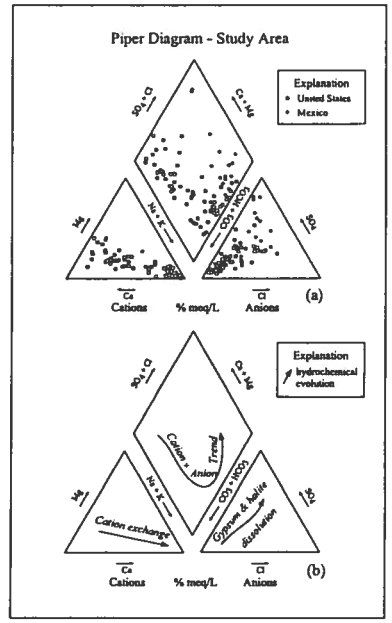


Figure 3. Hydrochemical Piper plot for ground-water in the United States and Mexico (a); and possible evolutionary trends (b) in the study area.

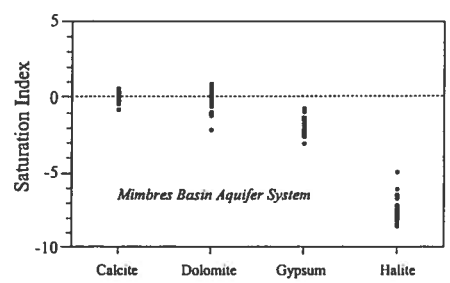


Figure 4. Range of saturation indices of calcite, dolomite, gypsum, and halite in the study area.

The most likely sources of Ca and Mg in ground waters in the Mimbres Basin aquifer system include dissolution of the relatively soluble minerals calcite, dolomite, and gypsum:

$$CaCO_3 + H_2O + CO_2 = Ca + 2HCO_3 \quad (1)$$

$$CaMg(CO_3)_2 + 2CO_2 + 2H_2O = Ca + Mg + 4HCO_3 \quad (2)$$

$$CaSO_4 \cdot 2H_2O = Ca + SO_4 + 2H_2O \quad (3)$$

The minerals pyroxene and amphibole are less soluble and produce smaller amounts of Ca and Mg by dissolution:

$$CaMg(Si_2O_6) + 4CO_2 + 6H_2O = Ca + Mg + 4HCO_3 + 2Si(OH)_4 \quad (4)$$

$$Ca_2Mg_5Si_8O_{22}(OH)_2 + 14CO_2 + 22H_2O = 2Ca + 5Mg + 14HCO_3 + 8Si(OH)_4 \quad (5)$$

If Mg and Ca originated solely from the dissolution of carbonates and carbonate cement, and from the weathering of accessory pyroxene and amphibole minerals, the ratio of (Ca+Mg) to HCO_3 would be 0.5 (Sami, 1992). Plotting the quantity (Ca + Mg) against HCO_3 and drawing a line with a slope of 1:2 gives the amount of calcium and magnesium derived from dissolution of calcite (1 mole Ca to 2 moles HCO_3), dolomite (2 moles of [Ca+Mg] to 4

MONEY IN YOUR POCKET

Funded by

U.S. Environmental Protection Agency's U.S.-Mexico Border Program

COLUMBUS DEMOGRAPHICS

As of Census 2010:

- 1,665 people, 536 households, and 411 families residing in the village.
- Of those, 917 were 16 years or over and, of those, 443 were actively employed in the labor force
- 553 households out of which 215 or 38.9% had children under the age of 18 living with them
- The average household size was 3.01 (down from 3.29 in 2010) and the average family size was 3.63
- $14,759 median household income (US dollars)
- $8,171 per capita income for the village, with more than 50% of the population below the poverty line.

WATER RATES

Columbus	
$0.00302	Avg. cost per gallon
17,287.74	Avg. gallon/household/month
52.29	Avg. monthly water bill
3.01 or 3.29 or 4.0	Avg. # persons per household
4.8	Est. persons per meter
120.05	Avg. gallon per person/day
16.81	Est. leakage per household/person/day
Reality check: multiple households on a single connection	
504.23	avg. leakage incorporated into monthly water bill/person
3601.61	avg. gallons per person/month
120.05	avg. gallons per person/day
$67.29	avg. monthly water bill with $15 base rate added

COLUMBUS VS. LAS CRUCES

Columbus		Las Cruces
$0.00302	Avg. cost per gallon	$0.001557
17,287.74	Avg. gallon/household/month	19,000
52.29	Avg. monthly water bill	29.58
3.01 or 3.29 or 4.0	Avg. # persons per household	2.47
4.8	Est. persons per meter	
120.05	Avg. gallon per person/day	179.49
16.81	Est. leakage per household/person/day	25.13
Reality check: multiple households on a single connection		
504.23	Avg. leakage incorporated into monthly water bill/person	753.85
3601.61	Avg. gallons per person/month	5,384.62
120.05	Avg. gallons per person/day	179.49
$67.29	Avg. monthly water bill with $15 base rate added	$31.03

POTENTIAL SAVINGS IN COLUMBUS

Extra cost/person/month	$1.51
Extra cost/4-person household/month	$6.05
Savings per year/4-person household	$72.61

Columbus Homeowner Conservation Workshop
Sept. 28, Saturday

(Please insert "X" in the column that best represents your answer)	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No answer		
Workshop was a good use of your time?	26	2					92.86	strongly agree
Workshop was useful?	25	2	1				89.29	
Workshop was well organized?	26	1		1			92.86	
Meeting facility was convenient?	25	2	1				89.29	
Speakers were informative and helpful?	22	3	2	1			78.57	
Did we cover specific topics that should have been covered?	22	3	1	1		1	78.57	
Were handouts and presentations useful?	20	3	1		1	3	71.43	
Overall, did we meet your expectations?	24	3	1				85.71	
TOTALS	**190**	**19**	**7**	**3**	**0**	**1**	84.82	overall

Should we emphasize something more?

I would like to know more about improving our water rate schedule.
Liked everything.
I wish I had known this stuff earlier!
Better food.
Good job! Thanks
Good to know that NMSU is doing good work.
Could we fix the toilet in the center while you are here?
More on about our aquifer. How long will it last?

Should we emphasize something less?
Dr. Hawley is over my head.
I liked just about everything that you said.
Too many slides

What did you learn that you did not know prior to the workshop?
Lots of information on how to reuse water too.
Thank you very much for coming to Columbus. This was helpful for me and my wife to learn how to reduce our bills
I found out about our water rates. They are high!
I learned about gray water and what I could do with it.
I did not know why we should be careful about it.
I like the idea of lowering my water bill!
I learned about our ground water and out geography
I live near an extinct volcano, but it is safe.
Learned a lot! Thanks!

Requests to Erin Ward after Columbus Household Water Conservation Workshop, September 28.

How Message Left	Request	Name, if Left
in person during workshop	Electronic copy of presentation; Mr. Long said he is blind and could not read the slides during the presentation	jacklong4235@yahoo.com
voice mail	Return call to explain water bill	Phil Skinner
voice mail	Electronic copy of presentation	nmchevrier@yahoo.com
voice mail	Request to repeat the workshop	no name given
voice mail	Call from water utility office	Bobby Gomez called with homeowner question

Summary

Palomas, Chihuahua, Home Water Filter Demonstration

Task

Presentation to Palomas officials and residents of home filter for removal of contaminants specific to the region's municipal groundwater. Pilot project to determine community acceptance of these in-home water filter.

Activities

WRRI's Erin Ward and Chemical Engineering student Joshua Gomez traveled to Palomas on several occasions to demonstrate a prototype of a low-cost, easy-to-assembly home water filter. The filters were designed to remove high concentrations of naturally occurring fluoride and arsenic found in the Palomas water supply. If adopted by the community, the filters will allow access to better quality supplies for residents who must haul containers of water from one of three purification taps. During the course of the project, the Palomas water utility began charging five pesos for each five-gallon container filled at the city's taps. If the NMSU home water filters are adopted, the devices also will allow access to cleaner water for residents who cannot afford the five-peso charge.

Measurable Results

Project members found the home water filters were accepted by Palomas *promotoras* and, significantly, were adopted for use by Palomas public school science teachers. The teachers scheduled their own workshop at the Border Partners building in Palomas to demonstrate to other community members how to assemble the filters.

It seems possible that adoption of these homemade filters will continue in Palomas. Based on earlier research, household use of the filters is estimated to reduce fluoride concentrations in home tap water by 90% and reduce arsenic by a minimum of 20-30%. However, laboratory testing of water from in-situ filters will be required to confirm these estimates.

El agua es esencial para la vida

Para mantenerse hidrado

- la mujer promedio debe consumir 2,9 litros de líquidos al día
- el hombre promedio debe consumir 2,9 litros de líquidos al día

El agua en palomas no es totalmente segura para beber

- la cantidad de arsénico y fluoruro exceden las normas de agua potable

Nuestro objetivo es ayudar a las personas que no pueden acceder al agua potable.

Agradecimientos

Esta investigación no hubiera sido posible sin Erin Ward, del Instituto de Investigación del Agua de Nuevo México, Pedro Edmunds de Socios Fronterizos, y el Dr. Shuguan Deng Universidad Estatal de Nuevo México.

Gracias por todo lo que han hecho ustedes.

El apoyo prestado por

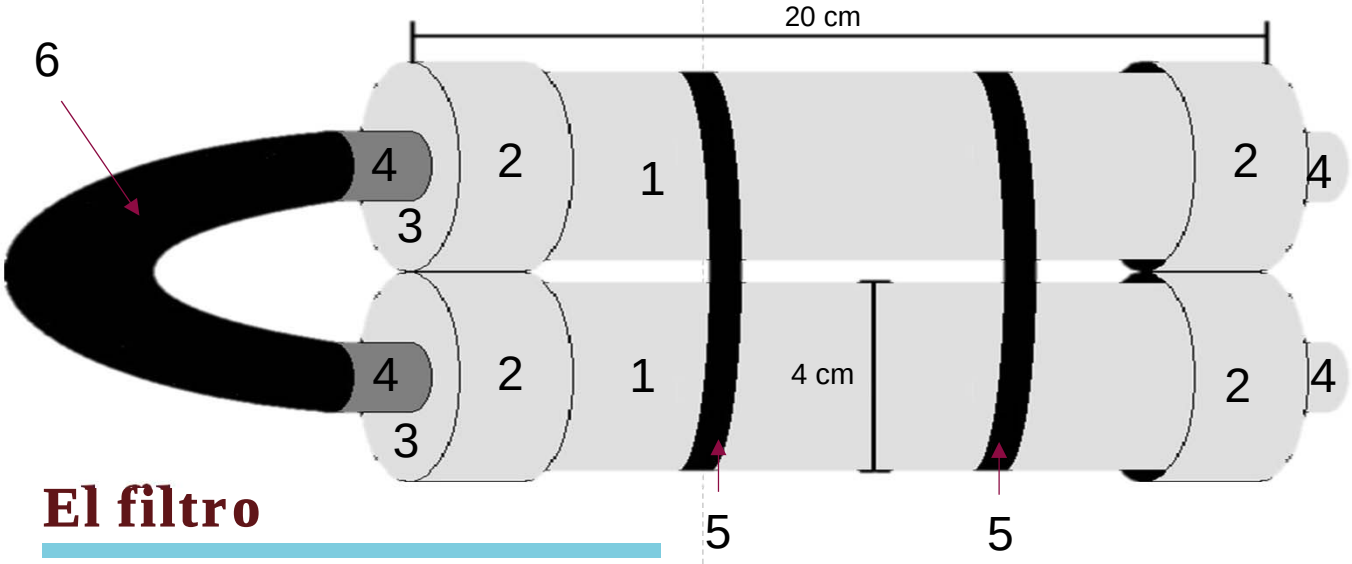
INFORMACIÓN SOBRE EL AGUA Y UN MODO DE MEJORAR LA CALIDAD DEL AGUA

Calidad del agua

- El estándar para el arsénico es de 50 partes por billón en México.
- El estándar para el fluoruro es de 1,5 partes por millón en México.
- En Palomas, el arsénico en el agua varía entre 40 y 100 partes por billón.
- En Palomas, el fluoruro en el agua varía entre 20 y 40 partes por millón.

Problemas de salud de fluoruro y arsénico

- Cuando el **arsénico** se consume más que el estándar establecido puede causar daños en la piel o problemas con los sistemas circulatorios, y puede haber un mayor riesgo de contraer cáncer.
- Cuando el flúor se consume más que el estándar establecido puede causar enfermedad de los huesos (incluyendo dolor y sensibilidad de los huesos); los niños pueden obtener dientes moteados.



El filtro

- El filtro está hecho de tubos de PVC y mangueras del grifo.
- En el interior, el filtro utiliza alúmina activada y carbón activado para eliminar contaminantes.

Materiales necesarios:

1. 2 tubos de PVC 20 cm de largo con un diámetro de 4 cm
2. 4 acoples a el diámetro de las tuberías
3. 4 bujes a el tamaño del acoplamiento con un reductor de 1/2 pulgada.
4. 4 tornillos de manguera de 1/2 pulgadas
5. 2 hose clamps
6. 2 mangueras de 1/2 pulgada
7. malla de aluminio
8. PVC tubería cemento
9. alúmina avtivated
10. carbono avtivated

Por estos hechos de la calidad del agua, la investigación se está implementando en la Universidad Estatal de Nuevo México para eliminar el arsénico y el fluoruro del agua corriente usando el filtro diseñado anteriormente.


TRIDON
ALTRO
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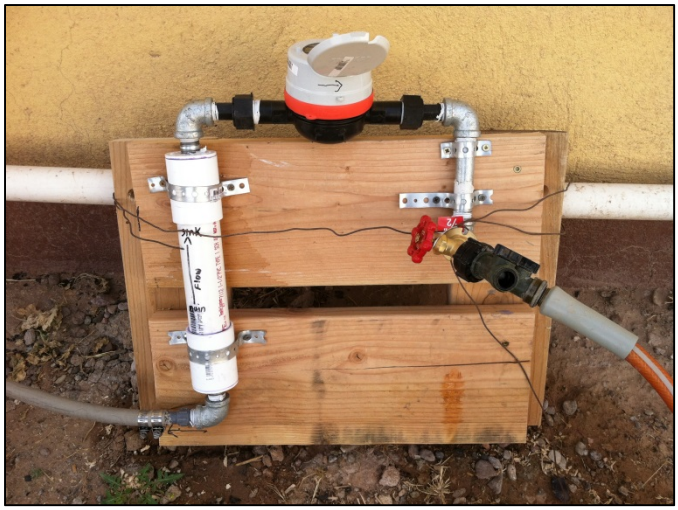

Palomas Water Filter Installation

Top photo shows assembled water filter attached to Palomas community garden irrigation system. The photo below shows part of the community garden, which is located behind the public library seen in the background. Photo at bottom shows Peter Edmunds and NMSU Chemical Engineering student Joshua Gomez installing the filter.

NMSU Chemical Engineering student Joshua Gomez at Border Partners office in Palomas demonstrating how to construct a simple, low-cost home water filter for *promotora* Marisol Guillen and public school science teachers.

Palomas science teacher demonstrates how to construct a low-cost water filter for home use.