New Waves
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National Park Service Emergency Room Provides Care for Kemp's Ridley Turtles

Whenever there's an automobile accident or some other disaster, the first thing we do is call emergency personnel to provide quick assistance.

The same approach is being used on the Texas coast to help save and rehabilitate young turtle hatchlings.

For some time, the National Parks Servie (NPS) has been working with the Mexican government and other Federal and State agencies to increase populations of the endangered Kemp's Ridley sea turtle. Efforts have included attempts to establish a breeding colony at Padre Island, and developing a "head start" program to help young turtles prepare for surviving in the wild.

Recently, the NPS has begun a program to search for turtle hatchlings that have been stranded along the seashore. When the hatchlings are found, they're placed on wet foam in small plastic tubs and taken to a recovery center. Unfortunately, most of the 40 hatchlings that have been found so far needed immediate care because they were weak or injured. In 1990, for example, 53 sea turtle hatchlings were stranded on Mustang Island.

Thanks to a grant from Exxon, the NPS developed and now mans what amounts to a turtle emergency room and rehabilitation center. The Center can hold up to 70 turtles in 20-gallon aquariums. The turtles are given proper diets and are nursed back to health with the help of local veterinarians who donate their time. When they're healthy enough, the turtles are released back into the Gulf. Through these efforts, eight live hatchlings received at the rehabilitation center in 1991 and 1992 were successfully rehabilitated and released. For details, contact Donna Shaver of the NPS at (512) 949-8173.

Texas A&M Surveys Probe Texans' Attitudes About Edwards Aquifer, River Uses

Two recent surveys from Texas A&M University provide insights on how people feel about water-related issues.

Don Albrecht, of the Rural Sociology Department, surveyed agricultural producers and urban residents in the South Central Texas region in 1990 and 1991 to see how they felt about issues concerning management of the Edwards Aquifer.

Albrecht found that the agricultural and urban residents agreed on many fronts: 1) The most important uses of water are crop irrigation, firefighting, medical uses, household uses, and watering livestock, while the least important uses are golf course irrigation, aesthetic uses, and recreational uses; 2) Developing surface water and limiting daytime landscape watering during droughts are the best ways to conserve water; and 3) The Federal government is the agency they would least like to have manage the aquifer.

There would be some disagreements. Urban residents were more concerned than rural residents about environmental issues and endangered species.

The results are published in a report, *The Future of the Edwards Aquifer: An Analysis of the Views of Farmers and the Non-Farm Public*, that was published by the Rural Sociology Department. For details call Albrecht at (409) 845-9781.

In another study, WIlliam Stewart of the Recreation and Parks Department, Charles Samuelson of the Psychology Department, and Dennis Brophy of Northwest College in Wyoming used a suurvey to examine Texans' attitudes concerning river use.

The survey was taken in 1990 and asked respondents to rank the importance of four uses of Texas river water: irrigated agriculture, recreation, industry, and wildlife and fisheries habitat. (Municipal use was not included because it was assumed it would be the top priority, based on previous survey results). The survey showed that irrigated agriculture was the most important use (44%), followed by wildlife and fisheries (30%), recreation (9%), and industry (7%). The results were consistent among both sociodemographic and geographic categories.

Stewart says the survey suggests that Texas' official priorities for water use may be out of touch with public attitudes. Industrial use is now ranked as second most important (behind municipal), but issues regarding fish and wildlife habitat, instream uses, and riparian values are ignored. The survey shows that many Texans believe that these values should be listed as high priority uses.

For details, call Stewart at (409) 845-5330.

Using Rapid Bioassessments to Measure Water Quality in the Seco Creek Watershed

Researchers: Glenn Longley, Calvin Phillips, Victor Castillo, and Lyndon Gilpen, Edwards Aquifer Research and Data Center (EARDC), Southwest Texas State University, San Marcos, TX.

Problem: The Seco Creekwatershedcovers more than 170,000 acres in Bandera Uvalde, and Medina Counties in south central Texas. Rangeland is the major land use (85%),

followed by dryland and irrigated crop production. Because waters from the Creek flow directly into the Edwards Aquifer, there are concerns that agricultural activities may have the potential to contaminate the aquifer.

Objectives: To determine the effects of land use management practices on water quality in Seco Creek using chemical analysis techniques and by measuring populations of fish and benthic-dwelling organisms such as stoneflies and caddisflies.

Methodology: Benthic macroinvertebrates were sampled by dislodging the organisms from the substrate and washing them into a net. Both fast and slow moving riffles were sampled. Organisms were sorted to the family level and the number of organisms in each family were counted. Fish were collected using a seine and an electroshocking unit. Water quality samples were taken for Biochemical Oxygen Demand, Total Organic Carbon, pH, temperature, conductivity, dissolved oxygen, nitrate, sulfate, phosphate, turbidity, total suspended solids (TSS), Fecal Coliform (FC), and Fecal Streptococcus (FS) bacteria.

Results: Data on fish populations and benthic organisms were compared to levels found in the Medina River west of Bandera which served as a benchmark. Chemical levels were compared to established EPA standards. The only indication of decreased water quality was that TSS levels and the ratio of FC to FS bacteria increased after flooding. However, they returned to low levels after the runoff from the flooding stopped. Nitrate levels were much higher below the recharge zone than they were above it, but were still within EPA guidelines. No significant levels of pesticides were found. The number of benthic organisms in the creek was limited in numbers but not in diversity. The numbers of organisms tended to be lowest at high flows. The study has been expanded and is still on-going.

Reference: Longley, Glenn, and Calvin Phillips, *Seco Creek Bioassessment Study: Bandera, Medina and Uvalde Counties*, EARDC, Southwest Texas State University, 1992.

Identifying Sources of Salt-Water Pollution of Groundwater in West Texas

Researcher: Bernd Richter, Alan Dutton, and Charles Krehler, Bureau of Economic Geology, University of Texas at Austin.

Problem: Many soils and shallow groundwater systems have become more saline in West Texas and other areas. This makes the water unusable for many purposes, such as irrigation and drinking water. Identifying whether the pollution is natural or man-made and focusing on which man-made activities are leading to the increased salinity can help provide the information needed to develop measures to reduce future contamination.

Objectives: To: 1) Define the regional hydrogeology of the Concho River Watershed in Irion, Tom Green, Coke, Concho and Runnels Counties, 2) Determine the chemical characteristics of fresh and saline aquifers and subsurface brines, 3) Test sources of

salinity in the field, and 4) Developdiagnostictoolsto recognize and locate sources of salinity in shallow aquifers.

Methodology: Chemical analyses were performed on 1,200 groundwater samples based on information available in technical reports and from databases obtained from the Texas Natural Resources Information System. Shallow aquifers and areas beneath brine disposal pits were sampled for salinity. Brine samples were collected from abandoned and producing oil wells, core holes, injection wells, and oil and gas fields. Groundwater sampling focused on areas with salinity levels greater than 10,000 parts per million. Temperature, pH, and alkalinity were also measured and analyzed. Salinity and hydrochemical concentrations were mapped. Isotopes and ions were analyzed to differentiate different sources of fresh and saline water.

Results: In the eastern part of the study area (Runnels County), evaporation of irrigation water and salty water from a shallow aquifer accounted for most of the increased salinity. In the western part of the study area (Tom Green and Irion Counties), much of the saline and brackish groundwater originates from naturally occurring brines. Abandoned oil and gas exploration holes allowed brine to flow upward and contaminate fresh water aquifers. Salts are still leaching from brine disposal pits into usable groundwater supplies, even though they have not been used for 20 years.

Reference: Rkhter, Bernd, Alan Dutton, and Charles Kreitler, *Identification of Sources and Mechanisms of Salt-Water Pollution Affecting Ground-Water Quality: A Case Study in West Texas*, Bureau of Economic Geology, University of Texas at Austin, 1990.

Analyzing Voting Patterns in Water-Related Amendments

Researcher: Andrew Schoolmaster, Geography Dept., University of North Texas, Denton.

Problem: Since 1957, Texans have voted on 14 constitutional amendments addressing such issues as water development and financing. Five of the eight referendum items that were voted on between 1957 and 1985 were approved. Since 1985, six proposed amendments were ratified. Significant insights can be gained by looking at which blocks of voters, and which geographic regions, voted for and against specific proposed amendments and may yield important clues for future elections.

Objectives: To present a geographic analysis of voting patterns in constitutional amendments decided from 1985 to 1991 and to summarize results of water related referenda from 1957 to 1991.

Methodology: County-wide voting information was entered into a Geographk Information System (GIS) for proposed constitutional amendments that were voted on in 1957, 1962, 1966, 1969, 1971, 1976, 1985, 1987, 1989, and 1991. Additional analysis was performed using primary and secondary sources such as reports in the mass media.

Results: Amendments to fund water development in 1957, 1962, and 1966 were all approved by at least 58% of the voters. In 1969,1976, and 1981, amendments to expand and authorize the Water Development Fund for water development projects were defeated. Voters in arid and semi-arid agricultural regions in south and west Texas that depend on groundwater voted for the amendments, while voters in the more humid eastern parts of the Statevoted against them In 1971 and 1976, voters approved amendments to fund water quality improvements. In 1985 voters approved Proposnion 1 (it increased the amount of money in the Water Devetopment Fund) and Proposition 2 (it created a pilot program to fund loans, grants, and demonstration projects for agricultural conservation). These amendments generated Statewide support because they grouped water development and water quality projects together on the ballot for the first time. Two Constnutional amendments were on the ballot in 1989. Proposition 2 increased the amount of money in the Water Development Fund and allocated 20% of those funds to economically depressed Colonias" along the Texas-Mexico border. it passed by 60% and received widespread support in border counties and in Houston. Proposition 18 authorized the full implementation of the agricultural conservation ban and grant program. it barely passed, getting just over 50°/O of the vote and carrying less than 30% of Texas counties. It was supported in the High Plains and the Lower Rio Grande Valley. In 1991, an amendment to increase funding for the colonias by reallocating previously approved bonds was approved by 54% of the voters. Reference: Schoolmaster, Andrew, "A Geographic Analysis of Water-Related Constitutbnal Amendments in Texas: 1985-1991," *Water Resources Bviletin*, June 1992.

Real-Time Monitoring and Graphical Display of Salinity Data in Nueces Bay Using GIS

Researchers: Daniel Prouty and Gary Jeffress, Conrad Biucher Institute for Surveying and Science (CBISS), Corpus Christi State University, Corpus Christi, TX.

Problem: Real-time data are easier to communicate when displayed graphically. The CBISS at Corpus Christi State University is now involved in gathering real-time data on salinities in Nueces Bay for use by the City of Corpus Christi. The City will use the data to determine water-release rates from the Seale Dam on the Nusces River to Nusces Bay. The CBISS is using a geographic information (GIS) system capable of integrating real-time data and graphically displaying them over a base map.

Objectives: To graphically represent real time and historian data from multiple salinity gages throughout Nusces Bay on a Geographic Information System.

Methodology: Since December 1991, salinity and other parameters have been monitored using "Hydrolab H20" gauges at locations in Nusces Bay. Using a GIS, researchers digitized U.S. Geological Survey 7.5 minute quadrangle maps and plotted gauge locations. A computer at the CBISS collects data at 30-minute intervals from each of the salinity gauges via packet radio. The data are then stored in an ASCII file on the computer system . Users can utilize a menu of options to select the gage and the time interval of interest. The GIS then runs a statistical plotting program . That program

displays a graph of salinity values for the time selected for that gage over the base map of the bay. Users can send that graph to a printer or plotter.

ResuIts: The real-time and graphical display of data allows users faster and easier recognition of patterns and trends regarding salinity levels throughout the bay. This will enable users to more quickly comprehend the effects of water-release rates on salinities of Nueces Bay. The real time display is also useful for monitoring data quality and to check whether data collecting instruments in the Bay are functioning correctly.

Reference: Phelps, Rkhard, and James Dodson, "Nueces Bay Salinity Project," Presented at Annual Update on Bay and Estuary Research," UT Marine Science Inst., Port Aransas, TX,1992.

Impact of Increased Ozone Levels and Acid Rain on the Growth and Physiology of Pine Seedlings in East Texas

Researcher: Tom Boutton, Rangeland Ecology and Management Department, and Richard Flagler, Forest Science Department, Texas A&M University, College Station, TX.

Problem: Recent data from the U.S. Forest Servie and other agencies show that natural pine forests in the Southern U.S. are declining. This has increased the public concern that acid rain and ozone may be responsible for this slower growth. However, few studies have been carried out in controlled settings to actually determine the role of these factors on pine growth.

Objective: To assess the impact of ozone and acid rain on growth, photosynthesis and water use characteristics of short-leaf pine.

Methodology: The study was conducted at the Stephen F. Austin Experimental Forest in Nacogdoches TX. Pine seedlings were placed in 12' wide x 15' high cylinders and were exposed to ozone and simulated acid rain. The chambers had fixed caps that excluded rainfall. Ozone was forced into each chamber from 6 AM to Midnight daily through the use of a manifold. Ozone was generated on-site and was monitored continually. Seedlings were exposed to four levels of ozone (charcoal filtered air, non-filtered ambient air, and ozone levels 1.7 and 2.5 times greater than ambient conditions). Simulated acid rain was produced and was applied to the plants through cone-shaped nozzles mounted at the top of each chamber. Three levels of acid rain (pH of 5.3, 4.3 and 3.3) were utilized. Natural stable carbon isotope ratios were utilized to measure changes in water use efficiency.

Results: After 14 months, shortleaf pine seedlings experienced significant reductions in several areas related to growth. For example, stem diameter, leaf area, leaf biomass, net photosynthesis, and water use efficiency were significantly reduced by exposure to elevated ozone levels. However, acid rain alone did not appear to reduce growth. The combined effects of high ozone (2.5 times higher than ambient levels) and high acid rain (pH of 3.3) reduced net photosynthesis by 87% compared to plants that received

charcoal-filtered air and high acid rain. Carbon isotope analysis suggests that water use efficiency increases at high ozone levels.

Reference: Boutton, Tom, and Richard Flagler, "Growth and Water-Use Efficiency of Shonleaf Pine as Affected by Ozone and Acid Rain," in *Proceedings of the 83rd Annual Meeting of the Air and Waste Management Association*, Pittsburgh, PA, 1990.

Salty Groundwater to be Used to Grow Shrimp, Redfish in West Texas

To many west Texans, the 300 million acre-feet of very salty groundwater that lies beneath their lands has always been viewed as something of a curse. It's largely unusable for irrigation, drinking water, or anything else.

A project being launched in Pecos County hopes to change this curse into a blessing. They plan to use this salty groundwater to raise shrimp and fish in the West Texas desert.

The effort is called the West Texas Aquaculture Project (WTAP) and is a joint venture between Texas A&M University, the General Land Office, the Pecos County Water Improvement District No; 3 (PCWID), and the Pecos County Commissioner's Court.

WTAP is built on 190 acres of land that is owned by the Texas Permanent School Fund and has been leased to the PCWID. Initially, the project involves six ponds, four of which contain 400,000 shrimp and two others that house 40,000 redfish. In the future, as many as 44 ponds are being proposed that could be used for research and demonstration projects including such diverse species as shrimp, redfish, speckled trout sturgeon, bass, blue crabs, and oysters.

The goal of the effort is to test whether a commercial-scale operation can be economically viable. Jim Davis, a fisheries specialist with the Wildlife and Fisheries Department at Texas A&M University is working on the project. He says the researchers already know that fish can be raised in such a facility, but adds that the economics still have to be evaluated before more private ventures enter the area.

People working with the project say the WTAP has advantages over natural conditions in the Gulf of Mexico. They say the west Texas site won't suffer from conditions like low salinities, red tide or oil spills that can occur in the Gulf. Because conditions are more controlled at the site, it will be easy to manipulate what the fish will eat.

For details, call Davis at (409) 845-5777.

TWC Says Free Trade Agreement will Likely Worsen Rio Grande Water Quality

A new study by the Texas Water Commission (TWC) suggests that the much of the Rio Grande is suffering from water quality problems caused by recent industrial expansion, water management practices, and natural causes. The study also voices concerns that

even worse water quality may occur if the North American Free Trade Agreement (NAFTA) is ratified.

The study, which was prepared under the Texas Clean Rivers Act, used existing information to characterize and identify water quality throughout the Rio Grande watershed. It was released in October.

Major water quality problems identified in the report include raw sewage discharged by Mexican cities and that more information needs to be developed to assess the impact of toxic discharges from maquiladoras and other sources on water quality. The study noted that five of the river's 14 segments suffer from high levels of raw sewage, agricultural fertilizers and pesticides, and spills of hazardous and toxic wastes. For details, call the TWC at (512) 463-8464.

Having a Hard Time Catching Fish? Maybe You're Just Going After Smart Ones

Researchers with the Texas Parks and Wildlife (TPWD) are busy at the Heart of the Hills Research Station in Ingram trying to find out why some fish are harder to catch than others.

For example, many experienced fishermen say it's easiest to catch fish when a reservoir is first opened. That is probably because "new" lakes contain a mix of fish that are ease and hard to catch. However, after a lake has been opened for a while, many people say it gets progressively harder to catch fish. That may be because the Dumb" or easy to catch fish have already been caught and only the "smarts or hard to catch fish are left in the lake.

This gave TPWD researchers the idea that some fish may be genetically more difficult to catch. In 1988, TPWD biologists gathered bass samples from a lake that wasn't fished regularly and put them in ponds at the Research Station. TPWD personnel then fished the ponds for a month. Fish that were caught were marked by placing a notch on the fin.

What they found was surprising. The fish range from being "brilliant" (hard to catch) to "dumb" (much easier to catch). Twenty-four "smart" fish never were caught. Meanwhile, many of the "dumb" fish, took the bait and were hooked three or more times in a row.

Just why are some fish easier to catch? After studying three generations of fish, TPWD researchers say catchability appears to be inherited. Fish born to grandparents that were hard to catch were hooked much less often than their "dumb" cousins. Ultimately, the dumb fish could be used for children's fishing derbies and other events.

For details, call Gary Garrett at (512) 866-3356.

Price Tag to Provide Needed Water, Wastewater Services to Colonias Could Reach $700 Million, TWDB Says

A new report by the Texas Water Devebpment Board (TWDB) shows that nearly 280,000 people living along the Texas-Mexico border lack adequate water and wastewater services. It adds that providing those services could cost as much nearly $700 million.

Colonias are substandard residential subdivisions along the Texas-Mexico border that lack basic water and wastewater services. The study estimates there are 1,193 colonias in Texas.

The report noted that most of the money would be needed for wastewater treatment ($467 million), followed by water development and treatment ($147 million), and indoor plumbing ($80 million). However, only $250 million in TWDB bonds, $30 million in other State funds, and $75 million in other Federal funds have been allocated to deal with the problem.

The report also noted that Hidabo County has the largest population living in colonias (109,000 people), the highest number of colonias (715), and the most colonias with inadequate wastewater supplies (715). El Paso County had the highest number of colonias (106) that do not have adequate water supplies. Not surprisingly, the report said it would cost the most to provide the needed improvements in Hidalgo ($163 million) and El Paso counties ($155 million).

The full report, *Water and Wastewater Needs of Colonias in Texas*

Corpus Christi Bay Selected for EPA National Estuary Program

Corpus Christi Bay will be the focus of an extensive five-year, $5 million project to learn more about problems facing the estuary and ways to solve them.

The U.S. Environmental Protectbn Agency announced in October that the Bay had been added to its Natbnal Estuary Program (NEP). Galveston Bay was previously the only Bay in Texas that was being studied under this program.

The goal of the program is to produce a long-range planning and management program for the Bay. This often involves utilizing university scientists to investigate specific problems facing the area.

Alan Berkebile, the Head of the Department at Corpus Christi State University (CCSU), says the selection of Corpus Christi Bay for the NEP should increase the opportunities for research at CCSU and other Texas universities. "Many of our researchers at CCSU have been investigating facets of the Bay including realtime data on water levels and water quality. Aquatic biology has been a major thrust. The exciting thing about the NEP is that it will provide opportunities for intense and expanded studies in many of these areas and should help us gather more data about the Bay than ever before."

Corpus Christi Bay was selected because of concerns about freshwater diversions, shoreline erosion, and declining water quality. In addition to Corpus Christi, neighboring areas including parts of Kennedy, Brooks, Duval, Jim Wells, San Patricio, McMullen, Live Oak, Bee, Rufugb, and Aransas Counties will be included in the study.

Uranium Clean-Up Plan May Increase Pollutant Runoff, Critics Say

A plan to clean up wastes from uranium mining operations in South Texas is facing some opposition, because of fears that it may increase the amount of heavy metals and other pollutants that run off into area streams.

The U.S. Department of Energy is proposing a plan to excavate 5.8 million cubic yards of uranium ore mine tailings from a site near Falls City in Karnes County. The tailings are stored in heaps at the site and emit radon gas and contain uranium, arsenic, selenium and molybdenum. Stormwater runoff from the tailings would be temporarily stored in ponds at the site. The tailings would later be gathered and buried in a single cell. That cell would be coated with a two-foot clay liner that is intended to prevent radon emissions and above-ground contamination.

Some local ranchers are concerned that the plan may increase the amount of stormwater pollutants that would run off the site into local creeks, the Nueces River, and other water bodies. The ponds are designed to hold the maximum amount of runoff that would result from a 24-hour storm event that is predicted to occur over a 10-year period. Critics of the plan contend they may allow pollutants to run off if heavier rains or a series of thunderstorms occur.

The Texas Water Commission approved the permit in October although that is now being appealed by area ranchers.

Preserving Recharge Areas to Edwards Aquifer is Goal of New Program

The Edwards Aquifer Underground Water Conservation District is identifying sensitive land areas that contribute the most recharge to the Aquifer and is hoping that many of these lands can be acquired to protect the water supply and prevent pollution.

The Edwards Aquifer Preservation Program focuses on recharge areas that are most subject to urbanization, primarily in Bexar County. District staff analyzed 94 sub-watersheds to determine which lands were prime recharge areas. Roughly 17,000 acres were identified as providing the most recharge to the Aquifer. The areas were identified by computerizing existing information on the geology of the area.

The District is hoping that area landowners will want to preserve, sell, or donate some crucial recharge areas. For example, if a tract of land is likely to be developed, the landowner could provide a conservation easement which would establish setbacks from recharging streams on-site, or could set aside areas draining into a recharging cave or sinkhole.

For details, contact the District at (800) 292-1047.

Tarleton State Publishes Report on Impact of Dairies on Water Quality

Livestock and the Environment: Rethinking Environmental Policy, Institutions and Compliance Strategies is the title of a report from Tarleton State University.

The report, which was produced by the Texas Institute for Applied Environ mental Research, provides an overview on how dairy operations are affecting surface and ground water quality in the Bosque River Basin in Central Texas. It also includes recommendations for environmental factors that should be considered when locating sites for new dairies. Maps show the location of dairies, soil types, and sampling sites in the region. Institute efforts in research education and policy-setting are also described.

To receive a copy of the report, contact the Institute at (817) 968-9567.

North Texas Scientists Publish Report on Lake Ray Roberts

A comprehensive study of Lake Ray Roberts has been produced by researchers at the Institute for Applied Sdences (IAS) at the University of North Texas.

The report, *Post-lmpoundment Environmental Study of Ray Roberts Lake (Year Two)*, was prepared by a multi-disciplinary team headed by IAS Director Ken Dickson. Dickson coordinated the report and produced sections dealing with fish surveys and limnology. Other scientists that worked on the report include Sam Atkinson of the Center for Remote Sensing and Land Use Analysis (vegetation, habitat, and land use analysis), Andrew Schoolmaster of the Geography Department (social, economic, and recreational resources), Lloyd Fitzpatrick of the Biology Department (avian communities) and Earl Zimmerman of the Biology Department (mammal communities).

The report contains information on land uses and habitat types, terrestrial and aquatic plant and animal life, and a socioeconomic analysis of the impact of the Lake on Pilot Point and other areas.

For details, contact Dickson at (817) 565-2694.

UT Researcher Co-Authors Estuary Salinity Study

George Ward of the Center for Research in Water Resources at the University of Texas at Austin is one of the co-authors of a new report that provides detailed summaries of salinity for all the major bays in Texas.

The report, which was published by the National Ocean Service (NOS), is titled *Analysis of Salinity Structure and Stability for Texas Estuaries*. It includes information on the impact of freshwater inflows on salinity and on how salinity levels vary seasonally and from year to year. To order a copy, call (301) 443-8843.

TWC Studies Outline Water Quality Monitoring

New Texas Water Commission reports deal with water quality monitoring and stream assessments.

An Introduction to Water Quality Monitoring for Volunteers: Handbook for Coordinators outlines how to organize and solicit funding for a monitoring project. Copies are available from the TWC Texas Watch program at 512-239-4720.

An Assessment of Placedo Creek; Garcitas Creek (Above Edal); and Garcitas Creek Ordain the Westem Gulf Coastal Plain Ecoregion (LP 91 -11) describes the water quality of streams that have not been impacted by pollution in DeWitte, Victoria and Jackson counties.

To order any TWC report, call (512) 463-7834.

TWRI Publishes Groundwater in the Great Plains

An easy to read handbook that describes groundwater conditions in the Great Plains states has been produced by Ric Jensen of the Texas Water Resources Institute. *Groundwater in the Great Plains* was produced for the Great Plains Agricultural Council. It contains information on the hydrologic cycle, the nature of groundwater, nitrogen and pesticide use, groundwater quality problems, the amount of water used, irrigated acreage, and changes in depths to the water table.

Copies are $2. To order a copy, call TWRI at (409) 845-1851.

Groundwater in Pal Duro Basin, Carrizo Wilcox, is Focus of UT BEG Reports

Reports dealing with groundwater systems in the Palo Duro Basin and the Carrizo-Wilcox aquifer have recently been published by the Bureau of Economic Geology (BEG) at the University of Texas at Austin.

Regional Hydrodynamics of Vanable Density Flow Systems in the Palo Duro Basin (RI 202) was written by Rainer Senger. It used a simulation model to examine flow patterns of groundwater with varying densities. Saline groundwater, for example, is more dense than fresh water. Groundwater circulation in the region is impacted by the region's topography and by the differences in the density of the waters.

The Wilcox Group and Carnzo Sand in the Sabine Uplift Area: Ground-Water Hydraulics and Hydrochemistry, was written by G.E. Fogg, William Kaiser, and Mary Ambrose. It provides information on groundwater flow patterns and geochemistry. The focus of the report is on how the aquifer is likely to be affected if lignite coal mining increases.

For more information, contact the BEG at (512) 471-1534.

Proceedings of On-Site Wastewater Conference Now Available

The Proceedings of the 1992 Texas On-Site Wastewater Treatment and Research Conference are now available.

The Proceedings contains presentations that were made at the conference which met in August in Austin. Papers cover such topics as how to evaluate innovative systems, performance evaluations of rock and sand filters, microbial rock plant filters, aerating sewage in existing septic tanks, disposal of large flows, low pressure dosed trench systems, mounds, leaching chambers and many other issues.

The Proceedings cost $6. To order a copy, contact Maureen McReynolds with the City of Austin's Center for Environmental Resources at (512) 322-2960.

PET Network Helps Irrigators Plan Water Use

A new service to help farmers in the High Plains to better manage irrigation and water use has been developed by researchers at the Texas A&M University Agricultural Research and Extension Center at Lubbock.

The system is called the potential evapotranspiration (PET) network. Researchers at the Texas Agricultural Experiment Station daily collect climate data at sites at Lubbock Halfway and Lamesa. They use that data to compile daily reports on PET and heat units (HU).

PET estimates the amount of water that would be used through evaporation and plant growth (transpiration). Heat units estimate the amount of heat energy that is available to fuel plant growth. Irrigators can use the reports along with conversion tables for specific crops to determine the amount of water their crops should use. The conversion tables are available at extension offices. The information is then provided to local newspapers and broadcasting stations.

Rose Mary Seymour, an irrigation specialist with the Texas Agricultural Extension Service in Lubbock, says the network will aid farmers. "Farmers using efficient irrigation techniques can apply less water and still produce high yields. Producers that know PET and HU data can more accurately anticipate water needs and apply the right amount of water when they irrigate."

The system is being funded by the High Plains Underground Water Conservation District No. 1 in Lubbock. For details, call Seymour at (806) 746-6101.

Caring for Animals Caught in Oil Spills is Goal of TEEX Course

When many of us think of coastal oil spills, the first images that come to mind are of birds and other animals that are covered from head to toe with an oily, gooey, mess.

Unfortunately, few people have been trained to deal with such disasters. One of the problems has been that few courses have been offered to teach people how to rehabilitate animals that have been injured in such spills.

That is changing shortly, however. The Texas Engineering Extension Service now offers a class on oiled wildlife rehabilitation. The course is scheduled for May 11 -13 in Galveston, but may be offered more often if there is sufficient interest. The goal is to

familiarize participants with techniques on how to rehabilitate wildlife that have been injured in oil spills.

After completing the course, participants should be able to assist in rehabilitation efforts. The three-day course was organized by Andy Tirpak of TEEX's Oil Spill Control School and Randali Davis of the Marine Biology Department at Texas A&M University at Galveston. Guest lecturers provide information on specific topics. Subjects that are taught include how to clean and care for birds, sea turtles and marine mammals that have been caught in oil spills. Information is also included on advanced training, planning, Federal and State regulations, rehabilitation facilities, toxicological effects of hydrocarbons, and veterinary care.

Typically, the class involves classroom work in the morning. In the afternoon, participants get hands-on training. They are taught how to remove crude oil from birds and other animals (the bodies were salvaged and the animals died from causes other than oil spills. Next year, the class will introduce ways to deter wildlife from entering contaminated areas.

For details, call Tirpak at (409) 740-4490.

UT Arlington Study Finds Ways to Make Sludge Less Smelly

Wastewater treatment plants generate large amounts of sludge that often have to be disposed of in landfills. For example, the Trinity River Authority (TRA) adds cement kiln dust to stockpiled sludge to raise the pH and temperature. However, rain falling on stockpiles of sludge that can't immediately be landfilled often produces foul odors.

Finding ways to control the stench without compromising the structural strength of the sludge is the goal of a research project by Andrew Kruzic and Tom Petry of the Civil Engineering Department at the University of Texas at Arlington (UTA) and the TRA.

The study will evaluate quicklime and other alkaline sludge amendments that would reduce odors in wet weather conditions. The alkaline amendments could also extend the life of landfills because they strengthen the structure of the sludge and reduce the amount d soil that needs to be blended with it. The study will also look at whether using the soil amendments would increase the risk that toxic chemicals and heavy metals would leach into groundwater systems.

For details, contact Kruzk at (817) 273-3822.

UT Scientists Explore if Road Construction Increases Runoff

Can large construction projects like expanding a freeway increase runoff and pollution to nearby streams and groundwater systems?

That's the question being investigated by George Ward, Randall Charbeneau, and Joe Wlalina of the University of Texas at Austin's Center for Research in Water Resources.

The project stemmed from the expansion of Loop 1, which circles around Austin, over a section of the environmentally sensitive Edwards Aquifer recharge zone. There was concern that the construction project could increase runoff pollution by removing existing vegetation and by increasing the amount of bare soils. Also, because more cars would travel over the highway when it was finished, it was feared that the amount of oil and grease and other pollutants would increase.

As a result, the Texas Department of Transportation funded the study. The UT researchers will develop baseline data on the water quality of creeks upstream and downstream of the project and will evaluate pollutant loads from similar nearby highways. The effectiveness of temporary and permanent runoff control structures like hay bales, sediment fences, and grease traps will also be evaluated.

Of course, the runoff won't occur unless it rains. To make sure that runoff events are sampled, the researchers will simulate rainfall events on portions of the highway using a sprinkler system. Runoff from those simulated storms will also be analyzed.

Baylor Biologists Study How Bacteria Grow in Texas Lakes

Bacteria growing in lakes and rivers play a vital role in the food chain. They help produce the dissolved organic matter (DOM) that serves as a food source for "particle feeders" which are, in turn, eaten by zooplankton and fish.

Now, Owen Lind and Laura Davalos-Lind of the Biology Department at Baylor University are conducting studies to investigate various factors that influence bacteria production. In particular, they are examining the relationship between clay, dissolved organic matter and bacterial growth in lake ecosystems.

In the study, Lind and Davalos-Lind sampled Lake Brazos and Lake Waco and measured bacteria numbers, size and production as well as clay turbidity and chlorophyll levels. Their results show that in turbid lakes, clays form aggregates with DOM which are significant in determining the rates of bacterial production and the size of individual cells.

The research also suggests that although clays limit the amount of light that penetrates lake waters, they also bind organic matter. This, in effect, creates a 'banquet table' that attracts large numbers of bacteria and increases their production. The net result is that losses in photosynthesis are offset by gains in bacterial populations.

For details, call Lind at (817) 755-2911.

CCSU Researchers Ask, Do Fish Hang Around Worm Reefs?

The salty waters of Baffin Bay and the Upper Laguna Madre have long been recognized for their abundant populations of spotted sea trout, red drum, and other finfish. Many experienced fishermen near Corpus Christi will tell you that the best fishing in the area is near the numerous "worm reefs" in the Bay.

Now biologists at Corpus Christi State University are trying to see if there's scientific evidence to support that claim. David McKee and graduate student Billy Hardegree are trying to find out if fish are more abundant near the reefs than in other parts of the Bay, and if the algae and the invertebrates near the reefs are valuable food sources.

Just what are worm reefs? Worms that are similar to earthworms form tubes from the calcium carbonate that's in the seawater. The worms live in the tubes. Baffin Bay is only one of three areas worldwide where these reefs occur. Ten square miles of the reefs occur in Baffin Bay. Scientists estimate that most of the reefs were formed 1,800 years ago. Recently, however, little or no growth is occurring.

The CCSU study involved sampling the algae, invertebrates, and fish that live on or near the reefs and compared them to areas away from the reefs. Data on the salinity and temperature of the water were also gathered. Preliminary results suggest that the fish may not be more numerous near the reefs than they are in the open bay. Instead, salinity may be the most important factor that influences where finfish are prevalent.

For details, contact McKee at (512) 9942676.

Fish Populations in Laguna Madre are Focus of UT PA Study

How many species of fish are there in South Bay and how do their populations vary among seasons?

These are some of the questions that John Hook, a graduate student at the University of Texas-Pan American addressed in his graduate research. Hook worked under Robert Edwards of the UT-PA Bblogy Department in the project.

Before the Brownsville Ship Channel was built in 1938, South Bay formed the extreme southern tip of the Laguna Madre. However, dredging activities changed the make-up of the Bay by making it more shallow and by reducing the area where the Bay contacts the Laguna Madre.

The study examined whether fish respond to seasonal variations in temperature and salinity. Fish were collected in shallow waters with seine nets and in deeper waters by trawling.

The results showed that the fish populations varied seasonally at some sites. At most of the locations, spotted and flat croakers were most frequent in the spring, bay anchovies were most prevalent in the summer and fall, and gulf menhaden were most common in the winter. Only one site showed a different pattern. There, tidewater silver sides dominated in the fall, while top minnows and killifish (cyprinodontids) were most abundant in the summer and winter.

The study also suggests that the populations of fish in South Bay were more diverse than in some other Gulf estuaries. This may be because the area has a wide array of habitats including seagrass, oyster beds, algal flats, and mangrove stands. Also, circulation

patterns bring fresh seawater from the Gulf of Mexico into the Bay with every incoming tide.

The study also suggests that traditional survey methods that rely on trawling may not count all of the smaller fish that are present. More accurate totals can be obtained by using seines.

For details, call Edwards at (210) 381-3545.

Satellite Images, GIS, May Provide Information to Predict Pollution, North Texas Scientists Hope

Researchers at the University of North Texas are hoping to use satellite images and geographic information systems (GIS) to predict pollution patterns in the Richland-Chambers Creek Reservoir and the upper West Fork of the Trinity River.

The project is being led by Sam Atkinson of the Center for Remote Sensing and Land Use Analyses. First, satellite images will be analyzed and classified using computer-assisted techniques. Then, a GIS will be developed that will use those images to create an electrons database for the region. Based on land use patterns identified in the remotely sensed images, the amount of nitrogen, phosphorus, and sediments that are likely to flow into the waters will be estimated. Locations that contribute the largest amounts of specific pollutants would also be identified.

The information could be useful because these water bodies provide drinking water for customers of the Tarrant County Water Control and Improvement District. The ultimate goal is to monitor changes in land use and pollution potential on a regular basis.

For more information about the study, call Atkinson at (817) 565-2694.

TCU Studies Seek to Develop Microbes to Clean up Pollution

Researchers at Texas Christian University are working to identify and develop microbial organisms that could convert organic pollutants such as crude oil into less harmful by-products.

Leo Newland of the Environmental Science Program and Ken Morgan of the Geology Department are working on a project that utilizes bacteria and microbes to treat greasy wastes from restaurants and other food service companies.

If the program is successful, it could help the environment. Some companies have been dumping grease and food wastes in storm sewers and rivers because they are hard to get rid of . H these firms used microbes, they would not have to dispose of the wastes improperly. Because the microbes reduce the volume of grease, less waste would have to be sent to landfills.

For details, call Newland at (817) 921 -7271.

Organic Carbon Analysis Shows Ship Channel is Getting Cleaner, UT Marine Science Institute Study Says

Researchers at the University of Texas Marine Science Institute at Port Aransas are trying to measure changes in water quality in the Houston Ship Channel by analyzing organic carbon isotopes.

Because so much industry is located nearby, the Houston Ship Channel has historically been plagued by pollution and poor water quality. In the 1960s, for example, it was estimated that 70% of the organic carbon that entered the Channel came from industrial sources. Even now, industries contribute 20% of the organic carbon that flows into the Channel.

Michael Caughey, then a graduate student at the MSI, worked with Richard Anderson and Pat Parker in the study. Water and sediment samples were taken from sites along the Channel. The ratio of C13 to C12 isotopes was determined and the results were compared to studies conducted in the 1960s.

The results show that dissolved organic carbon levels (those found in water) were much lower than in previously studies, suggesting that water quality had improved. Carbon levels in sediments were relatively unchanged. Carbon to nitrogen ratios and isotope analyses suggest that petrochemical residues in sediments are decreasing downstream.

For details, call Parker at (512) 471 4816.