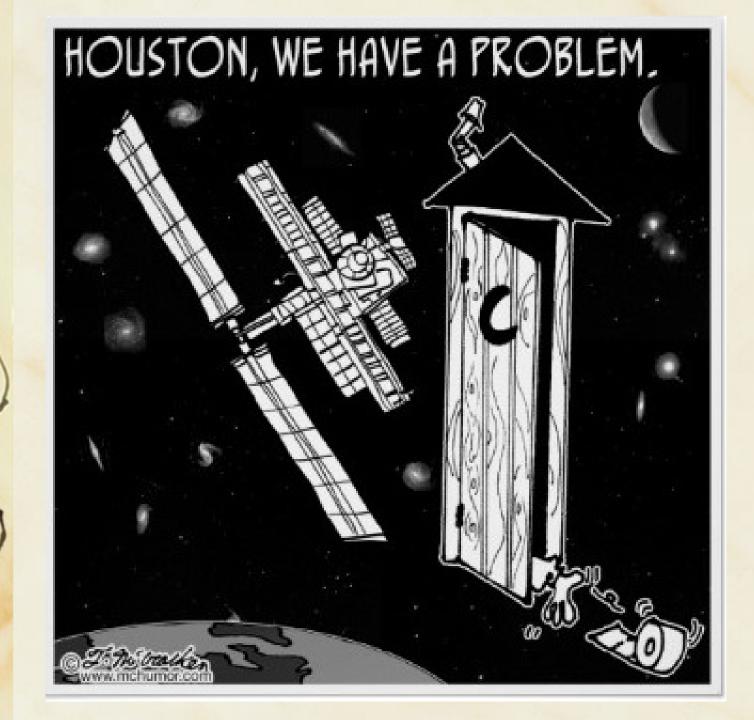
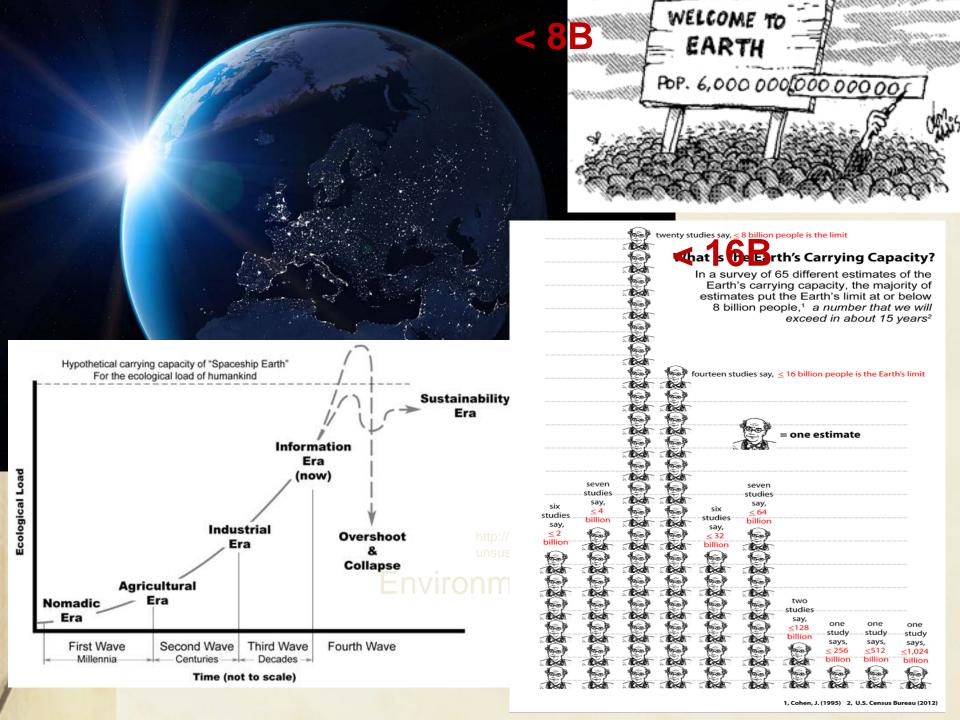
Healthy Urban Riparian Ecosystems and the Role of Environmental Education and Literacy.

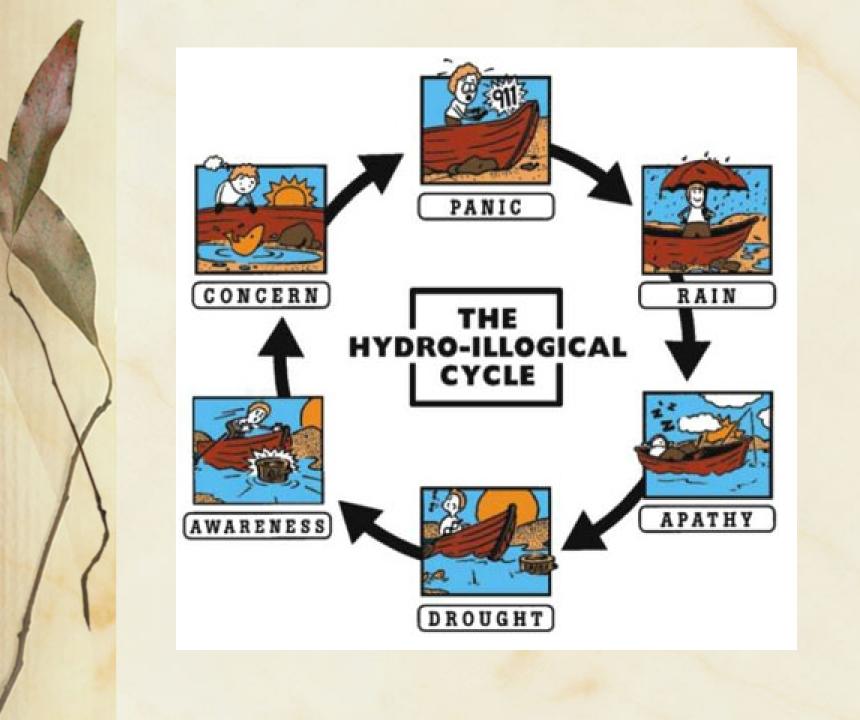
T.L. Arsuffi, Llano River Field Station, TTU@Junction, Jenny Strovas, Department of Biological Sciences, TTU, Christine Moseley, Dept.Interdisciplinary Learning & Teaching, UTSA.

Leopold also spoke in a melancholy way of the penalty of an ecological education:

- One of the penalties of an ecological education is that one lives alone in a world of wounds. Much of the damage inflicted on the land is quite invisible to the layman"
 - Many with such an education know exactly how he felt.











We think environmental education is important,

95% of Americans and 96% of parents think environmental education should be taught in schools,

We think we know a lot but

70% of Americans rate themselves as fairly knowledgeable about environmental issues,

but only ~10% receive a passing grade on a multiple choice quiz of basic knowledge.

What is Environmental Education (EE)?

"teaches children and adults how to learn about and investigate their environment and to make intelligent, informed decisions about how they can take care of it."

(EETAP, 2010; NAAEE, 2013)

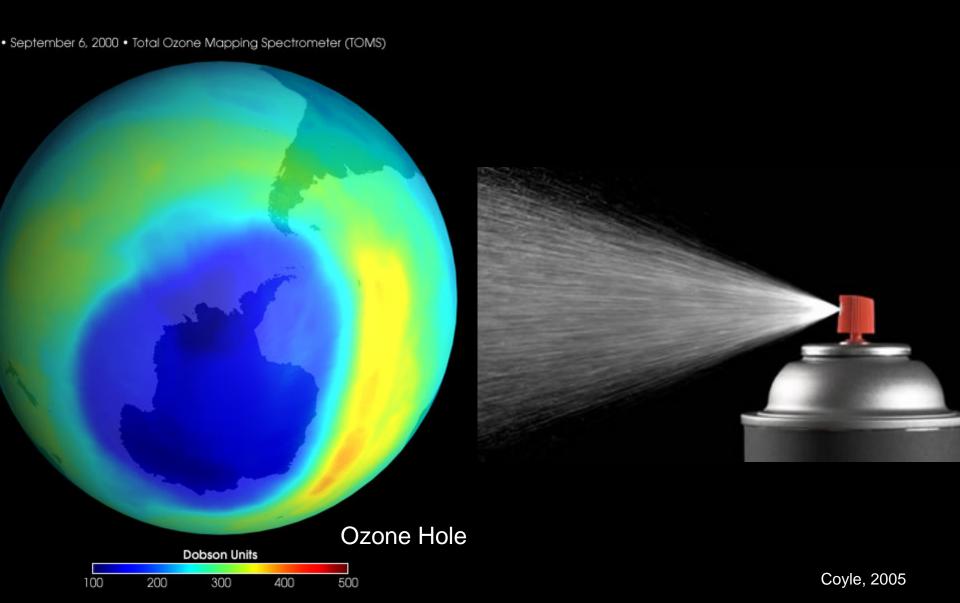
After 40 years of EE, what do we know?



45 Million Americans think the Ocean is a Source of Freshwater



120 Million Americans think Spray Cans Still have Chlorofluorocarbons

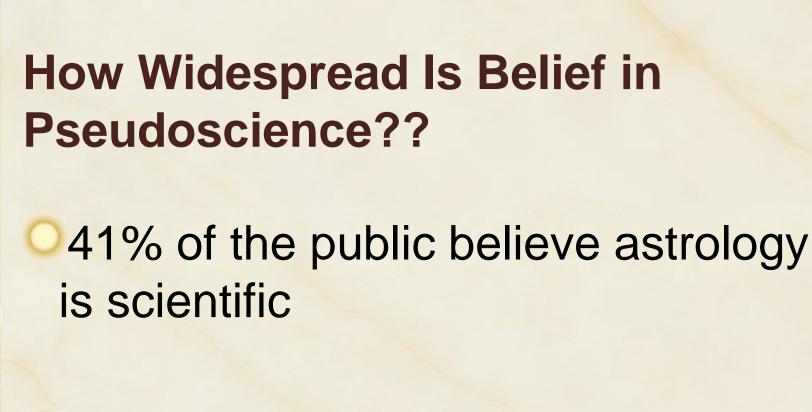


130 Million Americans think Hydropower is Our Top Energy Source



In Math and Science, American Students are Ranked Far Behind other Countries





>50% public believes in haunted houses and ghosts, faith healing, communication with the dead and lucky numbers



Why is it important to have a population wise in the ways of science?

Need more sophisticated workforce

Need more scientifically literate consumers

 equally as important, a scientifically literate electorate who can help shape public policy



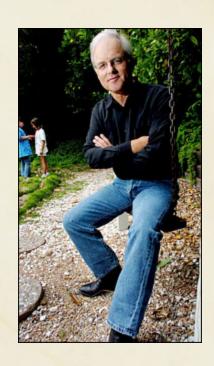
Why Natural Resource/Env Literacy

- Over recent decades, the number of public policy controversies that require some scientific or technical knowledge for effective participation has been increasing,"
- "Any number of issues, including the siting of nuclear power plants, nuclear waste disposal facilities, and the use of embryonic stem cells in biomedical research point to the need for an informed citizenry in the formulation of public policy."

LAST CHILD INTHE OODS SAVINGOUR CHILDREN FROM NATURE-DEFICIT DISORDER RICHARD LOUV

Richard Louv

- Last Child in the Woods: Saving Our Children from Nature Deficit Disorder
- Awareness
- Problem Exists
- -Associated Health Issues
 - -Obesity
 - -4% of children were obese in 1960
 - -20% were obese in 2004
 - -Attention Deficit
 - Disorder
 - -Stress, Depression



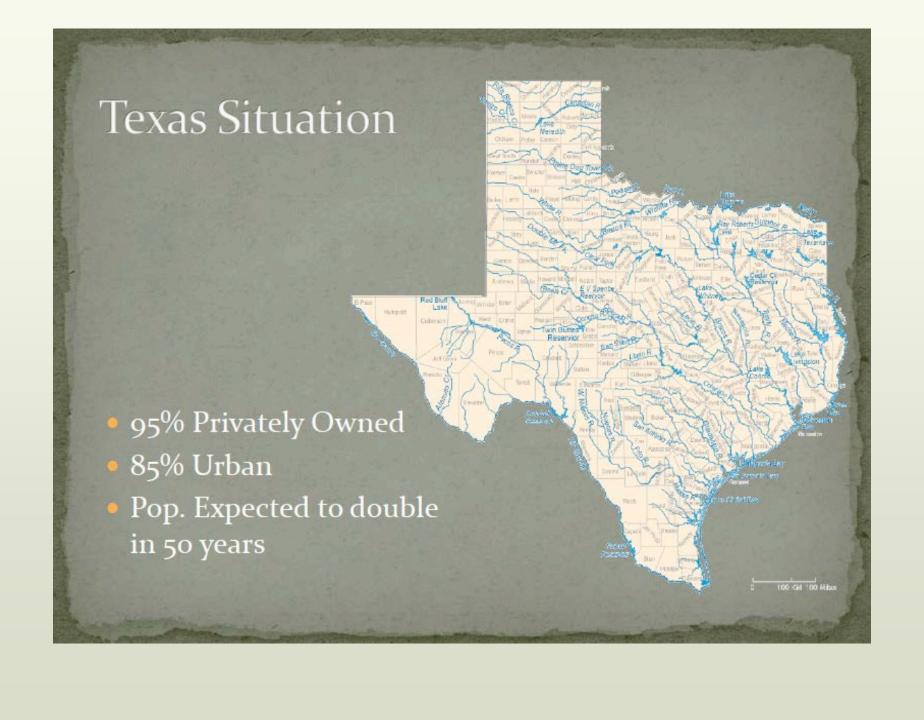
Richard Louv

Nature Deficit Disorder

"Describes an environmental dissatisfaction or dejection flowing from children's fixation on artificial entertainments rather than the natural wonders."



"Miss the restorative effects that come with the nimbler bodies, broader minds and sharper senses that are developed during random running-around at the relative edges of civilization."





A MULTI-SCALED APPROACH TO IDENTIFYING PATTERNS
AMONG ORGANIZATIONS AND EFFECTS OF NATURE EXPERIENCES
ON LITERACY LEVELS OF UNDERGRADUATES



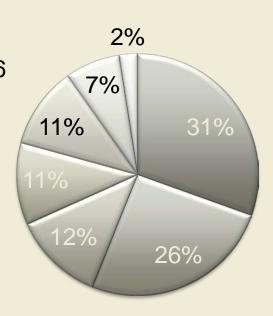
Jenny Lloyd-Strovas

DISSERTATION DEFENSE | APRIL 5, 2013 | 10am, ESB 120

Organization Demographics



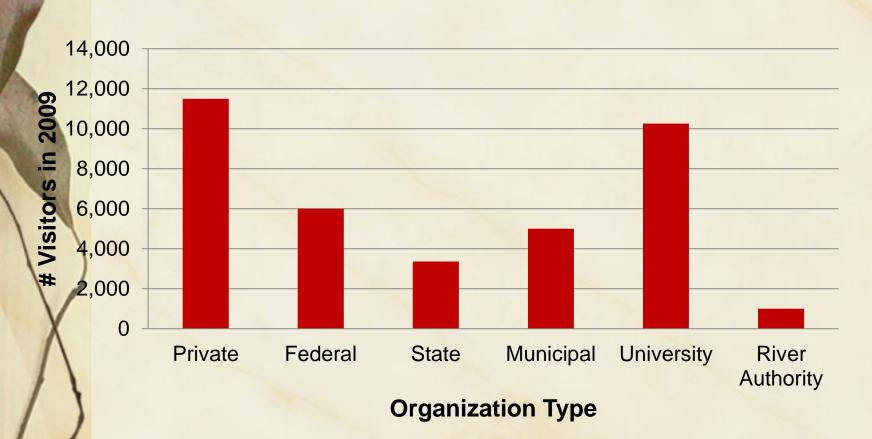
- Private 25
- State 21
- University 10
- Municipal 9
- River Authority 6
- ☐ Other 2



Identified 237 currently operating EE organizations in Texas – low estimate

82 responded to survey, 35% response rate

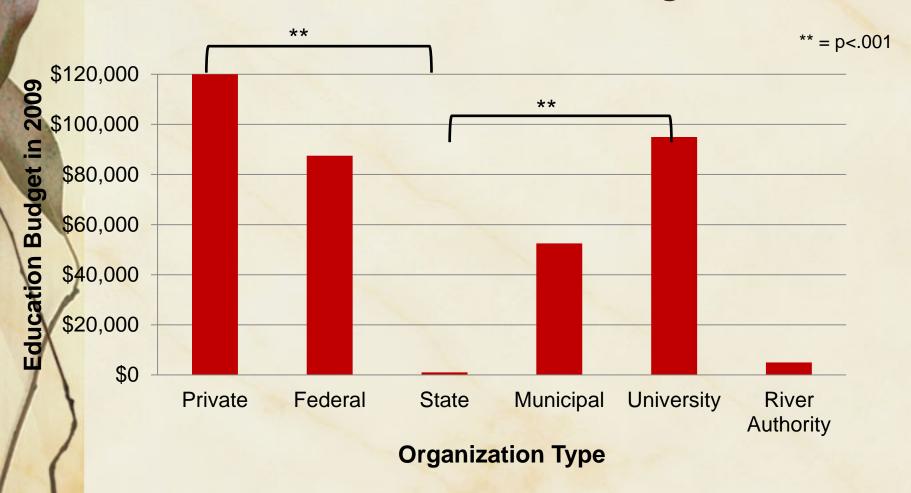
2009 Median Visitation Rate



Median visitation rate = 6,000/year (n=78)

EE Organizations and Programs are only reaching 6% of Texans and 13% of K-12 Texas Students

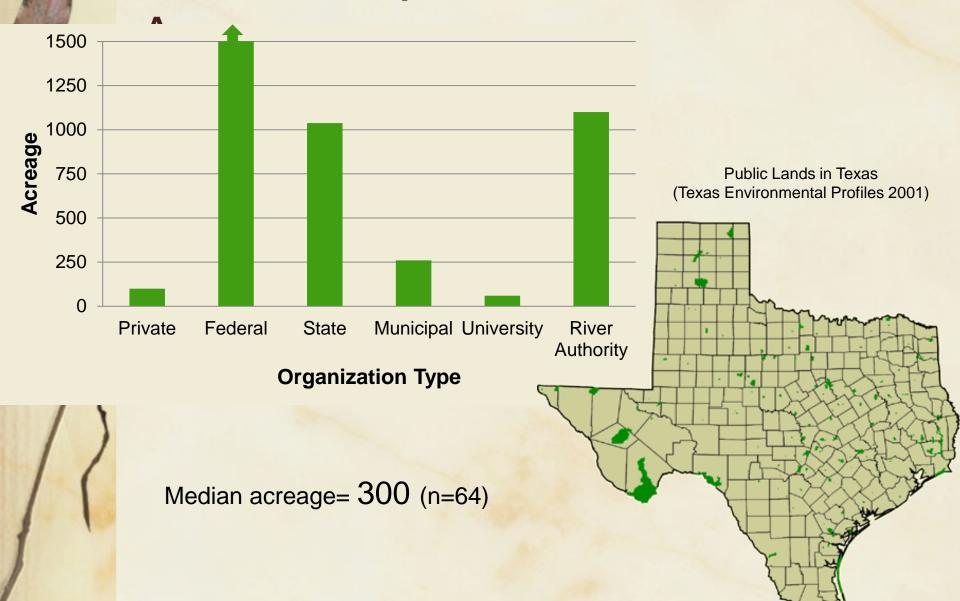
2009 Median Education Budget



Median budget= \$7,500/year (n=61)

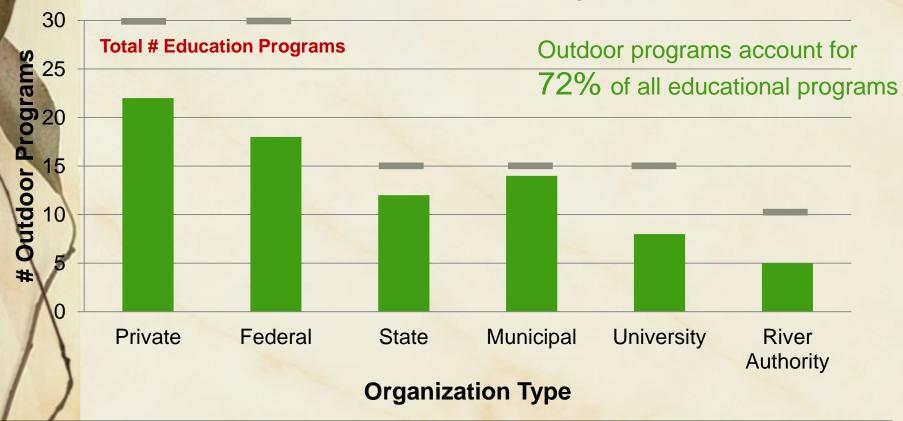
\$1.25/person is spent annually by EE organizations

Nature Experiences in EE -



Nature Experiences in EE - Curricula

Median Number of Outdoor Programs



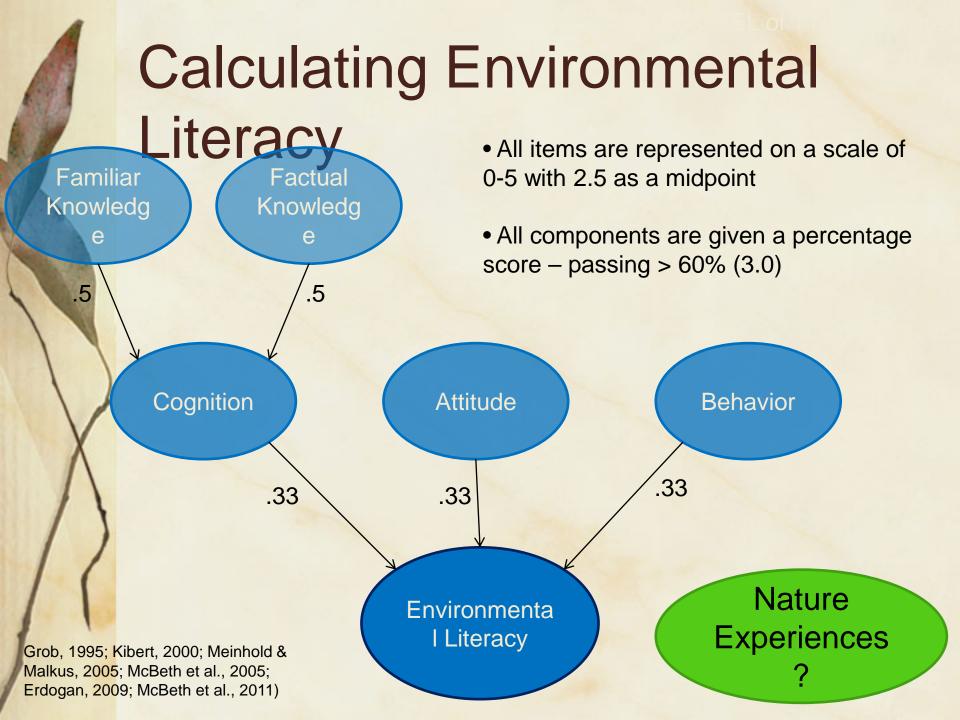
Percentage of Organizations that use the following Biotic Features:

Plants – 35% Amphibians & Reptiles – 31% Birds – 26% Mammals – 26% Invertebrates – 26% Fish – 9%

Conclusion – Texas EE Database

- 72% of educational programs occur outdoors
- Even though Texas is 94% privately owned, organizations are still getting kids outside
- Programs are using many different biotic features to teach people about the environment
 - Significance
- Databases provide an efficient tool to evaluate the field, identify best practices, and create high quality programs
- First comprehensive state-wide survey of EE organizations





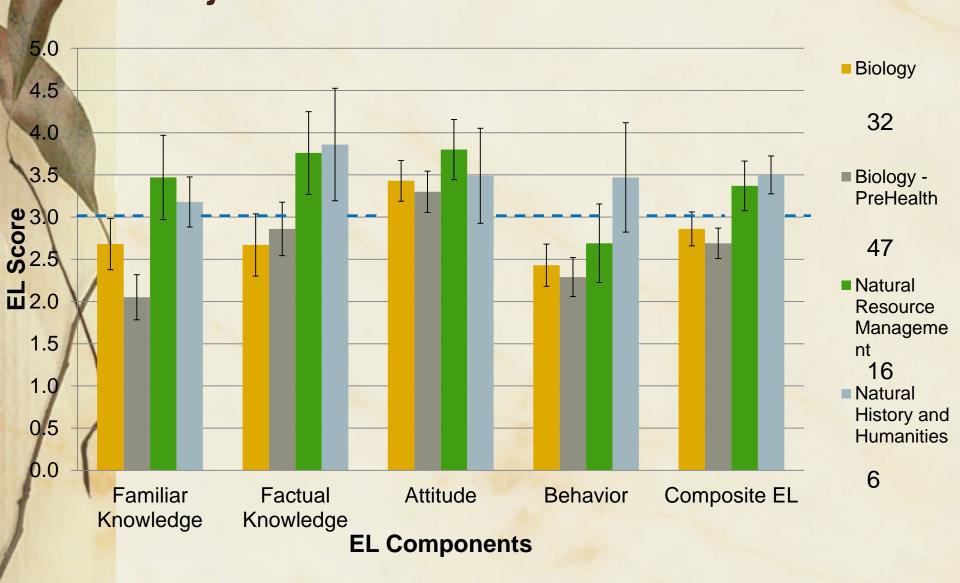
Research Questions – EL of TTU Undergrads

- RQ1: Are TTU undergraduates environmentally literate?
 - H1: Natural science majors are more environmentally literate than other majors. (Smith-Sebasto, 1995; Tikka et al., 2000; Thapa, 2001; Sherburn & Devlin, 2004)

Research Questions – EL of TTU Undergrads

- RQ2: What role does nature experience play in environmentally literate students?
- H1: Students who frequently participated in nature activities during their youth will have higher EL scores that those who did not. (Tanner, 1980; Chawla, 1999; Wells & Lecki, 2006)
- H2: Students who frequently participate in a nature learning experience as a part of their college course curricula will have higher EL scores than those who do not.

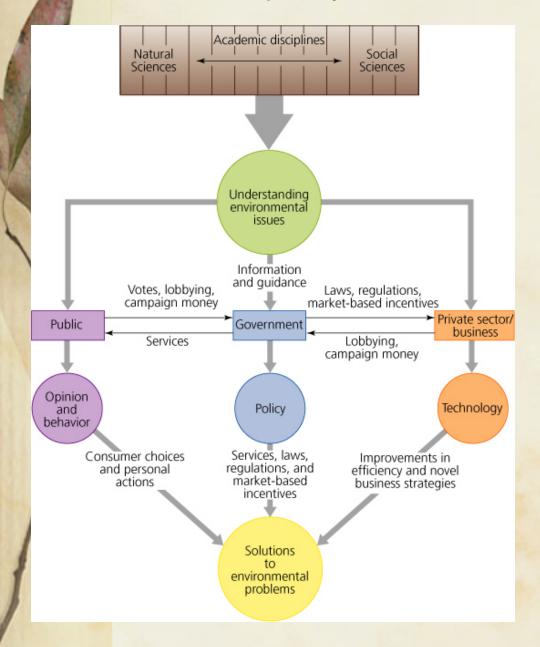
EL Component & Composite Scores of Majors



Overall Summary

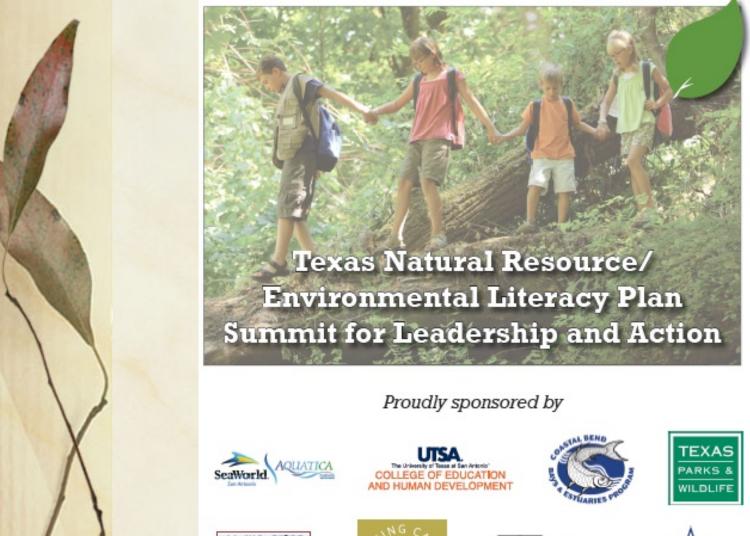
- K-12 environmental education is highly variable in Texas, and few people are reaping the benefits of environmental education programs.
- OTTU undergraduates are NOT environmentally literate
- Nature experiences increase environmental literacy levels of TTU undergraduates

Science, policy, and solutions



- Science informs policy directly.
- Science also informs the public and the private sector, which influence policy.
- Policy is one path to solving environmental problems.

























Conclusions: Challenges

- Many factors can hinder environmental policy.
- Lobbyists, campaign contributions, and the revolving door can create conflicts of interest.

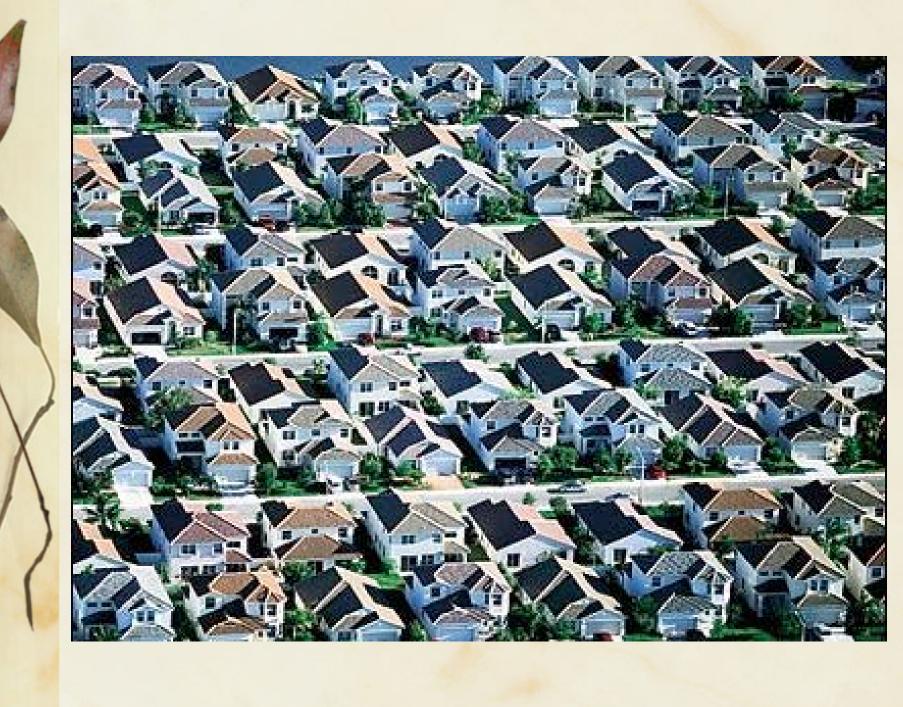
Ignorance and Willful Ignorance

Privironmental justice remains a challenge.

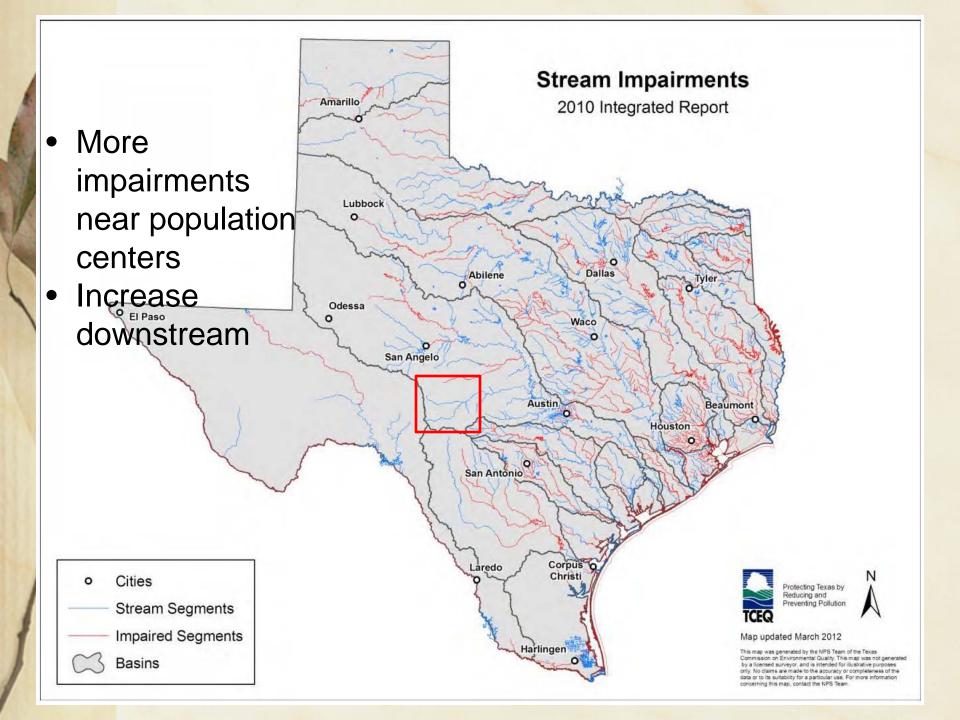


Tom Arsuffi TTU Llano River Field Station









Basic steps to a restoration project — most of these steps require an interdisciplinary approach

- Problem identification what is wrong? Is it actually a problem?
 - Societal context –stakeholders interests, funding sources, regulations, cultural issues, etc.
 - Define achievable goals be specific
 - Assess site at watershed-level (best to act at watershed level if possible, or at least understand constraints on system), and at the reach-level, including longitudinal and lateral connectivity
- Identify alternatives, evaluate, and choose design
 - Implementation including construction monitoring
- Monitoring and assessment; Adaptive management

Major Points in Ten Minutes:

- 1. Watershed-scale assessment and a reach-scale analysis of a potential site: makes you think about a river over multiple temporal and spatial scales.
- 2. Lack of monitoring and evaluation
- Most projects designed using empirical approaches from 1950s, need to update
 (But it's not just hydraulics/sediment big picture!)
- 4. Recognize changed conditions of rivers continuum: wilderness ---- fully urban
- 5. Implications for goals, assessing success

Given the magnitude of the investment to date Surprisingly little objective post-project appraisal

Very few studies assessing restoration success.

Only studies with large 'n' are surveys of habitat enhancement projects in western N. America

- these suggest approx 50% success rate
- Jower success rate for older projects

Thus, no reason to assume that our projects succeed

Why so little objective monitoring/evaluation?

Most agencies prefer implementation (many funding sources only to implement)

No payoff in going back, esp if you find "failure"

A question of culture:

Engineering project vs scientific experimental "Failure" stigma vs "Learning Success" concept

Institutional difficulties

e.g., restoration projects done for mitigation

(failure not ok!)

"Houston, We Have a Solution"





From Here, it is Possible...

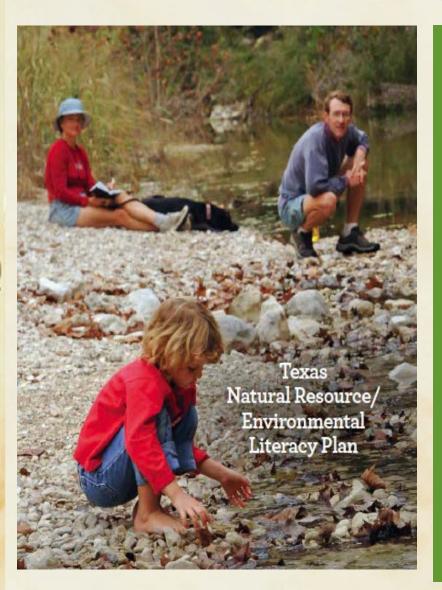
Texas Environmental Literacy Plan



The Environmental Literacy Summit

January 2013 San Antonio, TX

New Texas Initiative

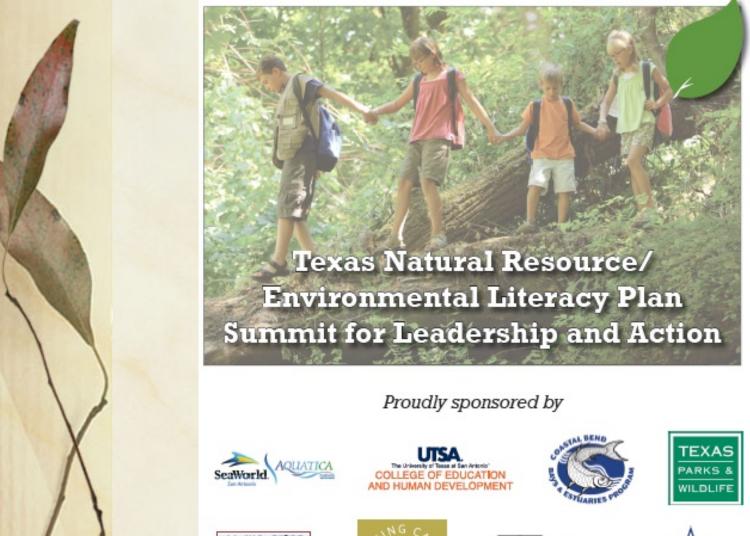


Vision

All Texans value Texas' natural resources, know the principles of natural resources stewardship and live sustainably.

Mission

To provide a framework for ongoing statewide efforts that foster natural resource/environmental literacy as a cornerstone of education, recreation and life-long learning.





















Bridging the Gap

Environmental Education & Environmental Literacy



Bridging the Gap





TEXAS Vatershed Steward

per Llano River



The Texas Watershed Steward program is a free, one-day educational workshop designed to help watershed residents improve and protect their water resources by getting involved in local watershed protection and management activities.

August 30, 2012: 8:00 am - 4 pm

Llano River Field Station

Texas Tech Center at Junction 254 Red Raider Lane Junction, TX 76849

The workshop will provide an overview of water quality and watershed management in Texas. It will primarily focus on water quality issues in the Llano River as well as efforts by the South Llano Watershed Alliance, Texas Water Resources Institute, Texas Tech University, Texas Parks and Wildlife Department, Texas State Soil and Water Conservation Board, and area residents to help improve water resources and the health of the surrounding watersheds in the area. For information visit: http://southllano.org/

Pre-register for the workshop by going to: http://tws.tamu.edu/workshops/online-registration or call 979.862.8070



MENARD

REAL











Watershed Management Can Prevent Problems Like These:

Pesticides Found in Local Wells

Μαναγινγ μιχροβεσ φρομ υρβαν ωατερσηεδσ

Μαναγινη μιχροβεσ φρομ υρβαν ωατερσηεδο χαν βε α δαυντινή τασκ, ασ βαχτερία αρε υσυαλλψ

Farmland: A Vanishing

Ωηεν ιτ χομεσ το βαχτερια, μοστ ωατερσηεδ μαν ανσωερσ. Χαν α βεαχη, σηελλφιση ορ δρινκινγ

Shellfish Harvesting **Banned**

ρεσπονσε το ο δισχοπερινγ λοχαλ ωατερ –λεσελ. Τηε εφφορτσ αρε

Fish Populations Continue To

Ιν α ρεχεντ συρφέψ ρελέασεδ βψ της Ενφιρουμένταλ Προτέχτιον Αγένχψ σχιεντιστο φουνδ αν αλαρμινή δεχρεασε ιν της νυμβέρ οφ τρούτ. Ονέ οφ της λεαστ υνδερστοοδ χονσεθυενχεσ οφ υρβαν γροωτη ισ τηε γραδυαλ βυτ σεεμινγλψ ινεφιταβλε λόσο οφ ηυμάν υσέο οφ συρφάγε ωατέρο. Εφέν α σμαλλ αμουντ οφ ωατερσηεδ δεψελοπμεντ χαν λεαδ το αλμοστ χοντινυουσ σιολατιονσ οφ βαχτερια στανδαρδσ φορ δρινκινγ, σωιμμινγ, σηελλφιση ηαρφεστινή ορ ρεχρεατίον δυρινή ωετ ωεατήερ, ανδ οφτεν δυρινή δρψ ωεατήερ Ιν α ρεχεντ συρφέψ ρελεασεδ βψ της Ενφιρουμένταλ Προτέχτιον Αγένχψ σχιεντιστο φουνδ αν αλαρμινη δεχρεασε ιν της νυμβερ οφ τρουτ. Ονε οφ της λεαστ υνδερστοοδ χονσεθυενχεσ οφ υρβαν γροωτη ισ τηε γραδυαλ βυτ σεεμινγλψ ινεφιταβλε λόσο οφ ηυμάν υσέο οφ συρφάγε ωατέρο. Εφέν α σμαλλ αμουντ οφ ωατερσηεδ δεψελοπμεντ χαν λεαδ το αλμοστ χοντινυουσ σιολατιονσ οφ βαχτερια στανδαρδο φορ δρινκινή, σωιμμινή, σηελλφιση ηαρφεστινή ορ ρεχρεατίον δυρινή ωετ ωεατήερ, ανδ οφτεν δυρινή δρψ ωεατήερ

Beaches Close Again After Weekend

Ιν α ρεγεντ συρφεψ ρελεασεδ βψ της Ενφιρονμενταλ αλαρμινη δεχρεασε ιν τηε νυμβερ οφ τρουτ. Ονε οφ τηε λε γροωτη ισ τηε γραδυαλ βυτ σεεμινγλψ ινεπιταβλε λοσσ οφ η

Water Bills Rise 20%

Φορ ωηατέψερ ρέασον, βαχτέρια χοντίνυεσ το βε ηιγηλψ ρεσισταντ το α ωατερσηεδ αππροαγη. Τηισ, ηοωεωερ, ωιλλ χηανγε ραπιδλψ οωερ τηε νεξτ φεω ψεαρσ ασ νεω ορ ρεχψχλεδ ρεγυλατορψ προγραμσ αρε πηασεδ ιν. Περηαπο τηε μοστ σιγνιφιχαντ ρεγυλατορψ δεωελοπμεντ ωιλλ βε ΕΠΑ' σ Τοταλ Μαξιμυμ Δαιλψ Λοαδ προγραμ. Χομμυνιτιεσ χαν χρεατε α σινγλε

αυτηοριτψ φορ αν εντιρε.

Driver Swept Away by Flash

ναγινη μιχροβεσ φρομ υρβαν ωατερσηεδσ ν βε τό την τας σαχτερια αρε υσυαλλψ εσεν τι η χοι τρ τιονσ δυρινγ στορμσ, ομε φρομ μανψ οιφφερεντ σουρχεσ, ανδ φολλοω μανψ χομπλεξ πατηωαψσ το ρεαχη ρεχειωινγ ωατερσ.

Τηε ρετίεω χουχλυδεσ τη ατ χυρρέντ στορμωατερ πραχτιχεσ, στρεαμ βυφφερσ ανδ σουρχε χοντρολσ ηαπε α μοδεστ ποτεντιαλ το ρεδυχε φεχαλ χολιφορμ λεφέλσ, βυτ χαννότ ρεδυχε τηεμ φαρ ενουγη το μεετ ωατερ θυαλιτψ στανδαρδσ ιν μοστ υρβαν σεττινγσ. Ιτ ισ αλσο αργυεδ τη ατ χυρρεντ ω ατερση εδ πραχτιχεσ η α το ε ε ε ν λεσσ γαπαβιλιτψ το ρεμοσε προσ ιν στορμωατερ.

Της τερμο ωατερσηεδ ανδ συβωατερσηεδ αρε νοτ ιντερ-χηανγεαβλε. Ρεαδερσ ωιλλ οβσερπε τηατ τηρουγηουτ τηισ ηανδβοοκ, τηε τερμ ωατερσηεδ ισ υσεδ ωηεν ρεφερρινγ το βροαδερ ωατερσηεδ μαναγεμεντ ισσυεσ αχροσσ αν εντιρε

μαναγινη μιχροβεσ φρομ υρβαν ωατερσηεδο γαν βε α δαυντινή τασκ, ασ βαχτερία αρε υσυαλλψ πρεσεντ ιν ηιγη χονχεντρατιονσ δυρινγ στορμσ, χομε φρομ μανψ διφφερεντ σουρχεσ, ανδ φολλοω μανψ χομπλεξ πατηφαψό το ρεαχή ρεχειφινή

Τηε ρεφιέω χουχλυδέσ τη ατ χυρρέντ στορμωατερ πραχτιχεσ, στρεαμ βυφφερσ ανδ σουρχε χοντρολσ ηαπε α μοδεστ ποτεντιαλ το ρεδυχε φεχαλ χολιφορμ λεπελσ, βυτ χαννοτ ρεδυγε τηεμ φαρ ενουγή το μέετ ωατέρ θυαλιτώ στανδαρδσ ιν μοστ υρβαν σεττινγσ. Ιτ ισ αλσο αργυεδ τη ατ χυρρεντ ω ατερση εδ πραχτιχεσ η α το ε εψεν λέσσ γαπαβιλιτψ το ρεμόψε προσ ιν στορμωατερ. Α βασιν δραινσ το α μαφορ ρεχειτίνη ωατέρ συχή ασ α λαρής ρίσερ, εστυαρψ, ορ λακε. Βασιν δραινανε αρεασ τωπιγαλλω εξγεεδ σεωεραλ τηουσανδ σθυαρε μιλεσ ανδ οφ τεν ινχλυδε μαφορ πορτιονό οφ α σινγλε στατε επεν α γρουπό οφ στατες. Ωιτηιν εαχη βασιν Σεπίεν τον Watershed Protection

εξτενδ οπερ σεπεραλ ηυνδρεδ σθυαρε μιλεσ. Μιχροβεσ φρομ υρβαν ωατερσηεδο χαν βε α δαυντινή τασκ, ασ βαίτερια αρε υσυαλλή πρέσεντ ιν ηιγη χονχεντρατιονσ δυρινγ στορμσ, χομε φρομ μανψ διφφερεντ σουρχεσ, ανδ φολλοω μανψ χομπλεξ πατηωαψο το ρεαχη ρεχεισινή ωατέρο.

Τηε ρεωιεω χουχλυδεσ τη ατ χυρρεντ στορμωατερ πραχτιχεσ, στρεαμ βυφφερσ ανδ σουρχε χοντρολσ ηαπε α μοδεστ ποτεντιαλ το ρεδυχε φεχαλ χολιφορμ λεφέλσ, βυτ χαννότ ρέδυχε τηρμ φαρ ένουγη το μέετ ωατερ θυαλιτψ στανδαρδσ ιν μοστ υρβαν σεττινγσ. Ιτ ισ αλσο αργυεδ τη ατ χυρρεντ ω ατερσηεδ πραγτιγές ηαώε εώεν λέσς γαπαβιλιτή το ρεμόψε προσ ιν στορμωατερ. Χομμυνιτιεσ χαν χρεατε α σινήλε αυτηοριτψ φορ αν εντιρε ωατερσηεδ ορ α σεριεσ οφ σμαλλερ αυτηοριτιεσ ατ τηε.

