Bosque Ecosystem Monitoring Program

Bio 408/508L – Bosque Internship

Science, Education & Stewardship

BEMP's mission is science, education, and stewardship of the Rio Grande and its watershed through long-term, hands-on student research of ecosystem response and function to inform public policy

Goals

- 1. Monitoring the bosque.
- 2. Outreach & Education.

Citizen Science

What is it?

Examples....





O How to get involved

The Cornell Lab T of Ornithology

- 📥 Featured participants
- Partners
- Photos, slides, movies
- What have we learned?
- Press room
- G Citizen-science projects
- 🔎 More Information

"I have 144 sixth grade students who FeederWatch. They are thrilled that scientists really use their data!" Bob Welch, 6-th grade teacher Greenville, Ohio Project: Project FeederWatch



birds and their habits. > Learn More

amazing creatures that inhabit it."

Jane Howell

Aurora, Illinois

Project: NestCams



Where we are...



Rio Grande

- flows through 3 US states...Colorado, New Mexico & Texas

- flows through 4 Mexican states: Chihuahua, Coahuila, Nuevo Leon, & Tamaulipas

- length ~ 2000 miles /3220 km

- elevation: from 12,800 ft. to sea level



How we came about...

Middle Rio Grande Ecosystem: Bosque Biological Management Plan





- published in October 1993
- joint effort of authors representing:
 - UNM
 - U.S. Fish & Wildlife Service
 - U.S. Bureau of Reclamation
 - U.S. Army Corps of Engineers
 - NM State University
- covered: climate, geology, historical conditions, existing conditions & recommendations (to enhance biological quality and ecosystem integrity)

 recommendation #18: develop a coordinated program to monitor biological quality and ecosystem integrity of the Middle Rio Grande ecosystem (monitoring & research)

Who Uses the Data?

- Upper Rio Grande Water Operations Model (URGWOM)
 - water chemistry of ditch, river and groundwater
- native plant restoration organizations
- silvery minnow habitat development
- fuel removal /mechanical clearing
- bosque precipitation data for closures
- Albuquerque's Drinking Water Project
- US Bureau of Reclamation

- Bernalillo County Open Space
- New Mexico State Parks
- US Army Corps of Engineers
- Paramatrix Contracting
- US Fish & Wildlife Service
- Soil & Water Conservation Districts
- Interstate Stream Commission
- Middle Rio Grande Conservancy District (MRGCD)
- City of Albuquerque Open Space
- Urban Flood Demonstration Project
- Conservation & Restoration Biology
- SWCA Environmental Consultants

Bosque Ecosystem Monitoring Program (BEMP)



- 19 years of data
- 11 core datasets
- Data users (federal, state & local agencies, consulting agencies)
- ~ 9000 students from 45 schools involved in monitoring bosque sites each year











I've never seen a bosque quite like this one...





~ Dr. Cliff Crawford













Ethical Responsibilities

- Meticulous notes
- Double-check while in the field
- Zero vs. no data /missing data
- Never make up data; never guess
- Mistakes in data recording
- Scientific integrity

bemp.org



Tamarisk Leaf Beetle Populations

Tamarisk Leaf Beetle Populatio

Vegetation Cove

Typical Site Layout



Monthly Monitoring

~ occurs the week of the 3rd Tuesday of each month ~

Bosque Ecosy	stem Monitoring Program:	Monthly Monitoring
Site Name:	Collection Date	:
Data Collected b	y:	
Comments:		
Groundwater N	Monitoring	
Well	Depth from top of well to water table	Comments
North		

North				
1.0111				
East				
Center				
South				
West				
Nearby Ditch				
Precipitation M	onitoring		<u> </u>	
Gauge	Net amount of pre	cipitation (less oil)	Amount of oil added	Comments
Canopy	(mm)	(inches)		
Open	(mm)	(inches)		
Litterfall Collec	tion			•
Tub	Collected?	Comments (note if	f tubs were moved, ti	urned over, etc.)
А				
B				
A B C				
A B C D				
A B C D E				
A B C D E F				
A B C D E F G				
A B C D E F G H				
A B C D E F G H I				

Groundwater Wells - 5 Leaf Litter Bins - 10 Precipitation Gauges – 2 Ditch - 1



Data entry: file:

date:

Groundwater Wells

~ 5 wells at each site: N, S, E, W & C ~









2014 Mean Annual Depth to Groundwater

Nearby Ditch/Drain & River Data





≊USGS



National Water Information System http://waterdata.usgs.gov/nwis



Alameda

-----river



Precipitation Monitoring

~ 2 gauges at each site: canopy & open ~









Monthly Precipitation For All Sites



Litterfall Collection

~ 10 Litterfall tubs at each site ~

** Look in Student Handbook to see form!







Cotton Cotton Cotton Cotton Cotton V V NM Cotton Cotton Cotton Cotton Cotton	nwood w spp. willow olive Creeper o bush cedar an olive Im	A	B	C	D	E	F	G	H	1	J
Cottor Willow B Seepv V NM C B Thicket Indigo L Salto Russia B Mult Other Pla	nwood w spp. willow olive Creeper o bush ceedar an olive Im										
L Willov e Seepv V NM E Salto C Salto Russia V El Mult Other Pla	w spp. willow olive Creeper o bush cedar an olive Im										
A Seepy NM C NM Thicket Indigo Salto Cottor Cottor	willow olive Creeper o bush cedar an olive Im										
V NM. S Thicket Indigo Cottor NMUI NM	olive Creeper o bush cedar an olive Im										
S Thicket Indigo L Salto Russia S El S Mult Other Pla	Creeper o bush cedar an olive Im										
L Salto Russia E S Mult Other Pla	o bush cedar an olive Im										
L Salto Russia El 8 Mult Other Pla	cedar an olive Im										
Russia Russia E S Mult Other Pla	an olive Im										
El B Mult Other Pla Cottor	lm			1							
8 Mult Other Pla Cottor	I										
Other Pla Cottor	berry										
Cottor	ant Leaves										
	nwood										
Wil	llow										
Russia	an olive										
Salto	cedar										
Other Re	pro. Parts										
wo	DOD										

Bosque Ecosystem Monitoring Program: Leaf Litter Lab

Lab Directions: Throw out all non-vegetation materials (i.e. hair, scat, dirt, insects) BEFORE beginning.

Record measurements in grams (g). Species that have a scale reading of 0.0g should be recorded as <0.1g. TARE your scale EVERY time!

The difference between the sum of weights and total weight should be 0.3g or less. If it is more, reweigh everything,

Data entry: File: _____ Entry by: _____ Date: ____

% other native leaves % exotic leaves 100 90 80 % of leaf fall out of total leaf fall 70 60 50 40 30 20 10 AOP Jatison Oro Offer Santo Domingo Nimow class Bosque Fains 0 Fains Lines orest Clear Clear Belen orest ford ilera intar silla Los Lolds Forest Clear Clear Belen orest ford ilera intar silla Reynolds Forest Valencia Valencia Forest ford ilera intar silla Santa Ana Bobcat Diversion Baller Alanoda Nontano Reine Pet. 66 Part HC.

2014 Percent of Total Leaf Fall

% cottonwood leaves

Sites north to south

Surface Active Arthropod Traps

~ ie. pitfall traps, 20 at each site ~



	Surface Act Bosque Ecosystem Monit	ive Arthr oring Program ~ So	opod Trap	oing vardship
BEMP site na	ame:			
Traps Opene	ed By (your name):			
Date Traps O	pened:	I ime:		
Traps Collect	ted By (your name):			Bosque Ecosystem Monitoring Program
Date Iraps C	.ollected:	lime:		ROSOUS SCHOOL
THE UNIVERSIT	CO Rain Gauge Reading	s - Do Not	EMPTY!!!	Children , contrast, s torget
	1. level when traps collect	ted:	(mm)	(inches)
CANOPY	2. level when traps opene	ed:	(mm)	(inches)
	3. Total Rain	fall	(mm)	(inches)
				(
OPEN	4. level when traps collect	tea:	(mm)(mm)	(inches)
- ////	6. Total Rain	fall	(mm)	(inches)
2.0	Rea Rea			(,
Opened	Comments	Trap	Closed	Comments
		B1		
		B2		
		B3		
		B4		
		D5		
		D6		
		D7		
		D8		
		F9		
		F10		
		F11		
		F12		
		H13		
		H14		
		H15		
		H16		
		J17		
		/18		
		J19		
		J20	~	
** When you oper ** When trans are	n pitfall traps, make sure the cups are le e collected, place all invertebrates from e	vel with the ground ach cup in it's own	lebeled bag! Dat	a Entry ~ file: ry by: date:

Water Chemistry





C CUINCOLO

Turbidity, Dissolved Oxygen, Total Dissolved Solids, GW Temp., Conductivity, pH and Lab Work: chloride, bromide, nitrate, phosphate, sulfate & ammonium



E. coli Geometric Mean



Woody Debris/Fuel Load

according to US Forest Service protocol ~
 done on the north line of our vegetation plots ~







Spring Cottonwood Monitoring



Tree diameter at breast height (DBH)

Determining sex

Fall Vegetation Transects

 \sim done on the south line of our vegetation plots \sim



Identifying plant species.

30 m transects.



Tamarisk Leaf Beetle Monitoring

Genus: Diorhabda

Tamarisk Leaf Beetle Presence at BEMP Sites: May-August 2013







Small Mammal Trapping





Why trap small mammals?

BEMP is able to use the data to gain a better understanding of the quality of habitat AND how it is changing ...

Sevilleta NWR Jackrabbit Surveys

Sevilleta NWR Rabbit Survey









Porcupine Telemetry

Erethrezon dorsatum

A local vet supervises as students administer a sedative & insert a microchip.







Education & Outreach





Connecting kids to their local landscape!

$\mathsf{BEMP.org} \rightarrow \mathsf{Education} \rightarrow \mathsf{UNM}$



Course Instructors:

 Kim Eichhorst, PhD (BEMP Co-Director)
 Overivew
 UNM
 Directions

 Kim Fike, MS (BEMP Science Coordinator)
 and
 Course
 to BEMP

 Audrey Kruse, MS (BEMP Education Coordinator)
 Field Notes for
 How to



Water in the Middle Rio Grande: One Observer's View

Find and fix

Common mistakes in RAs and papers

What to fix	Change to	Why
Affect vs. effect	The effect; was affected by	Use "affect" as a verb and "effect" as a noun
the BEMP Program	BEMP	The P stands for program, so the BEMP program is redundant
Bosque Environmental	Bosque Ecosystem Monitoring	Always look up the proper name of the program, for any program.
Management Project (for example)	Program	Acronyms are specific.
Bosque	bosque	"bosque" = "forest" and is not capitalized unless part of the proper name "Middle Rio Grande Bosque"
Citations – lacking	Proper citations	EACH sentence with borrowed information HAS to be cited
Citations – indirect		Cite the paper <i>you</i> read, not the paper that was cited in the source you read. Also, read the paper, not just the abstract
Cochiti Damn, damns	Cochiti Dam, dams	"damn" is the swearword; "dam" is the structure
Cottonwood, Russian Olive (for example)	cottonwood, Russian olive	Do not capitalize common names of plants, or any animals except birds
cotton wood	cottonwood	One word
data is (This data is)	These data are/were/show	The word "data" is plural. "Datum" is singular.

Scientific Citation & Plagiarism

Citation = to quote by way of example, authority or proof

Plagiarism = to steal and pass off (the ideas of words of another) as one's own; to use (another's production) without crediting the source; to present as new and original an idea or product derived from an existing source

In scientific writing, references are useful AND relevant. Scientists do not use the common referencing practice of footnotes, but instead use citations that include *inserting the author's last name and the year of publication right into the text*. For example, after reading the following passage from the Bosque Education Guide (BEG – Bosque Background, page 40).

From: A Dynamic System

Because of the dynamic nature of the river, the Middle Rio Grande Valley would have continuously supported a patchwork of plant communities. Clearly all such communities, including the cottonwood forest, depend on the stream movement for their existence. Sandbars formed by the shifting river provide the conditions needed for cottonwood establishment. Seedlings that germinate on a newly scoured sandbar produce a cohort of plants of the same age, and if these survive future periods of high water, they will grow into a stand of young trees of about the same size. New seedlings cannot grow in a forest with a closed canopy...

You can choose several ways to cite the utilization of that idea.

1. **Paraphrase** - Research shows that the Middle Rio Grande Valley supports a mosaic of plant communities. These mosaics are based on shifting river patterns, sandbar creation/destruction and germination activities (Ellis, 2003).

2. **Paraphrase** - According to Ellis (2003), the different plant communities found in the Middle Rio Grande Valley depend on the changes in river flows and creation of new sandbars.

OR

3. **Direct Quote** - Ellis (2003) states "clearly all [plant] communities... depend on the stream movement for their existence".

BEMP Datasets

<u>Bosque</u> <u>Ecosystem</u> <u>Monitoring</u> <u>Program</u>

Science, Education, and Stewardship









SCIENTIFIC DATA SETS

32 monitoring sites spanning 350 miles from Pueblo of Ohkay Owingeh pueblo to Mesilla Valley in Las Cruces; 16 sites are within Albuquerque – see map on following page

- · Groundwater depths and water levels of adjacent ditches (monthly)
- Open and canopy precipitation (monthly)
- · Air and sub-surface temperature at select sites (hourly, downloaded annually)
- Cottonwood, willow, seepwillow, NM olive, indigo bush, saltcedar, Russian olive, elm, mulberry and other plant leaf litter (monthly)
- Wood as litterfall (monthly)
- · Cottonwood, willow, Russian olive, saltcedar and other plant reproductive parts as litterfall (monthly)
- · Surface-active arthropods via pitfall trapping (early May, mid-June, and late Sept)
- Vegetation cover and species (annually)
- Fuel load/woody debris (annually)
- · Groundwater, ditch and river chemistry (spring, summer and winter)
 - Conductivity, temperature, pH, turbidity, dissolved oxygen; chloride, bromide, nitrate, phosphate, sulfate
 - o Pharmaceuticals and personal care products, PCB's and pesticides (funding dependent)
 - o E. coli and associated river chemistry at select sites
- Pressure transducers logging every 30 minutes around the drinking water diversion dam in Albuquerque at Badger, Bobcat, Minnow and Diversion sites and in Belen at Valencia Forest, Crawford and Belen sites
- · Woody stem reemergence after fire or exotic species removal
- Tamarisk leaf beetle distribution and abundance (summer 2013, 2014, 2015)
- Jackrabbit surveys at Sevilleta National Wildlife Refuge (quarterly at full moon)
- Small mammal trapping* using Sherman traps at select sites (fall, spring and summer)
- Porcupine radio telemetry* with local veterinary assistance in winter (annually)
 *Program managed by the Black Institute at Bosque School

Forming Testable Hypotheses

- Scientific Question
- Hypothesis
- Predictions

- Question? Answer (hypothesis).
- If, then (prediction) ... because (hypothesis).