

# Vegetation Sampling for the Middle Rio Grande

Resampling the 1984 Hink and Ohmart Transects



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# **Vegetation Sampling for the Middle Rio Grande: Resampling the 1984 Hink and Ohmart Transects<sup>1</sup>**

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## **Introduction**

The Albuquerque District of the U.S. Army Corps of Engineers (Corps) is currently investigating flood control measures along the Rio Grande from Albuquerque through Belen, New Mexico. The objective of the Middle Rio Grande Flood Control Project is to reduce the potential for property damage and loss of life resulting from high-magnitude flows in the Rio Grande. In the 1980s, the Corps contracted for biological surveys throughout the middle Rio Grande valley (Hink and Ohmart 1984<sup>3</sup>; hereafter "H&O"). Currently, Hawks Aloft, Inc. (hereafter "HAI"), is conducting bird surveys along original or similar H&O transects. Vegetation sampling is required to determine existing vegetation conditions, analyze changes in vegetation characteristics over the past 20 years, and assess potential impacts of proposed flood control measures. To this end, Natural Heritage New Mexico has been engaged by the Corps and began vegetation sampling on the HAI transects in the summer of 2005. The objective of this vegetation sampling is to provide information on current riparian vegetation characteristics for use in ecological analyses, impact assessment and to aid in on going management of the Bosque ecosystem.

## **Methods**

To enable comparisons with past data, the vegetation sampling follows the original methodology of H&O to every extent possible. Some modifications were made to enhance future repeatability of data collection while not compromising the analysis with the historical data. Regardless, all vegetation parameters addressed in the original H&O study were collected, with the exception of foliage density, which was measured by HAI.

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<sup>3</sup> Hink, V.C., and R.D. Ohmart. 1984. Middle Rio Grande Biological Survey. Prepared for U.S. Army Corps of Engineers, Albuquerque, NM. (Contract No. DACW47-81-C-0015).

## Transect Set Up

Sixteen of the 46 Hawks Aloft transects were sampled in 2005 (Table 1 and Figure 1). Locations based on GPS, provided by HAI, were used to locate the start and end points of the transects. The 2500-foot vegetation transects were set in straight lines, with slight changes in angle at the 500-foot points as necessary to ensure closure on the end point. These lines were as close to the HAI bird transects as possible and only varied from the bird survey path when necessary to maintain the straightness of the line. The vegetation lines were set using 100 m tapes with compass angles and GPS points created by NHNM in an ArcGIS geodatabase from the GPS points provided by HAI. The downstream, southern end of each line was designated as the "0" end. Metal-tagged rebar pegs were placed every 250 feet with two inches extending above ground (unless they were close to a trail, in which case they were flush with the ground with only the tag above). There are a total of 11 rebar per line. A GPS point was taken at every rebar with a hand-held Garmin receiver with an accuracy of  $\pm 10$  m. An overview of the basic transect layout is shown in Figure 2. Four photographs were taken at each transect; one from each end down the line, two from the center towards each end. Exact locations for the photographs were determined by visibility along the transect line, and recorded.

## Tree-Count Quadrats

Along the main vegetation transect line, trees and shrubs were counted in 100 x 50-foot quadrants starting at "0" and alternating right, then left down transect until the end or 2500 foot mark for a total of 25 quadrats (e.g. 0-100 right, 100-200 left, 200-300 right, etc.). Some transects were shorter than 2500 feet, and thus had fewer than 25 tree-count quadrats. One-sided transects along levees were read consecutively on the forest side. Data from each tree quadrat was recorded separately. The tree quadrat lines were set using a 90-degree angle from the main line and 50-foot tapes.

All individual trees and shrubs over two feet tall were counted by species within diameter root crown (DRC) size classes of <2 inches, 2-6 inches, 6-12 inches, 12-18 inches, and >18 inches. Diameters greater than 18 inches were individually measured to the nearest inch. Boles that emerged separately from the ground (not touching) counted as separate individuals except for multi-stem shrub species such as saltcedar (*Tamarix ramosissima*), New Mexico olive (*Forestiera pubescens* var. *pubescens*), seepwillow (*Baccharis salicina*), coyote willow (*Salix exigua*), golden currant (*Ribes aureum*), southern jimmyweed (*Isocoma pluriflora*), rubber rabbitbush (*Chrysothamnus nauseosus*), and snakeweed (*Gutierrezia sarothrae*). Following the H&O methodology, shrubs had to be four feet apart to count as separate individuals, and in very dense stands each 4 x 4 foot square was considered to represent one individual. For saltcedar and New Mexico olive, individual stems greater than two inches DRC were still recorded. Height classes were 2-10 feet and >10 feet. Morphological condition categories included live, snag, resprout, and stump.

Table 1. Transects surveyed in 2005, with NHNM PlotID, Hawks Aloft, Inc. transect name, date survey initiated, general location and transect type.

NMNH PlotID	Hawks Aloft Name	Length (ft)	General Location	Date Read*	Treatment	Notes
05CE001	KW01	2500	Montano Bridge - mature forest east of Bosque School	8/10/2005	untreated	beaver activity
05CE002	KW02	2500	Montano Bridge - along levee east of Bosque School	8/15/2005	understory cleared (except last tree count quad 2400)	1-sided on levee (east only)
05CE003	NE03	2500	Rio Grande Nature Center	8/16/2005	naturally sparse understory	
05CE004	NW13	2250	Rio Rancho Open Space - bar on river edge	8/19/2005	some understory clearing and partial burn at north end of transect	
05CE005	NW14	2500	Rio Rancho Open Space - forest	8/23/2005	some understory clearing, partial burn at north end of transect	split into two parts at 1500 ft due to partially dead forest
05CE006	NE02	2500	Rio Grande Nature Center	8/30/2005	some understory clearing	
05CE007	KW04	2000	Montano Bridge - burned area to north and south of bridge	8/31/2005	burned then cleared and pole planted	cut by bridge at 500 ft
05CE008	SE14	2500	Bosque Farms- levee on E side of river	9/6/2005	understory cleared (except last tree count quad 2400)	1- sided on levee (west only)
05CE009	SE33	2500	Hispanic Cultural Center bosque	9/7/2005	partial burn, understory cleared, few pole plants	
05CE010	NE09	2250	Paseo del Norte Bridge - northeast terrace	9/8/2005	saltcedar removed to west of transect	1-sided (west only), transect split into 2 parts at 1250 ft
05CE011	SE34	1500	Rio Bravo Bridge - southeast terrace	9/9/2005	understory cleared	short transect
05CE012	SE31	2500	Tingly Beach - forest edge by constructed wetlands	9/12/2005	altered by wetland construction and understory clearing	1-sided (east only)
05CE013	SW07	500	Los Lunas Bridge - northwest terrace	9/15/2005	partially altered by construction of mitigation pond	very short transect surrounding a mitigation pond - both sides read
05CE014	GS16	2500	Sev Wildlife Refuge	9/19/2005	untreated	salty flats
05CE015	GS15	2500	Sev Wildlife Refuge	9/21/2005	untreated	salty flats
05CE016	GS14	2500	Sev Wildlife Refuge	9/23/2005	untreated	salty flats

\*Date Read - date transect survey was begun, some transects required more than one day to survey

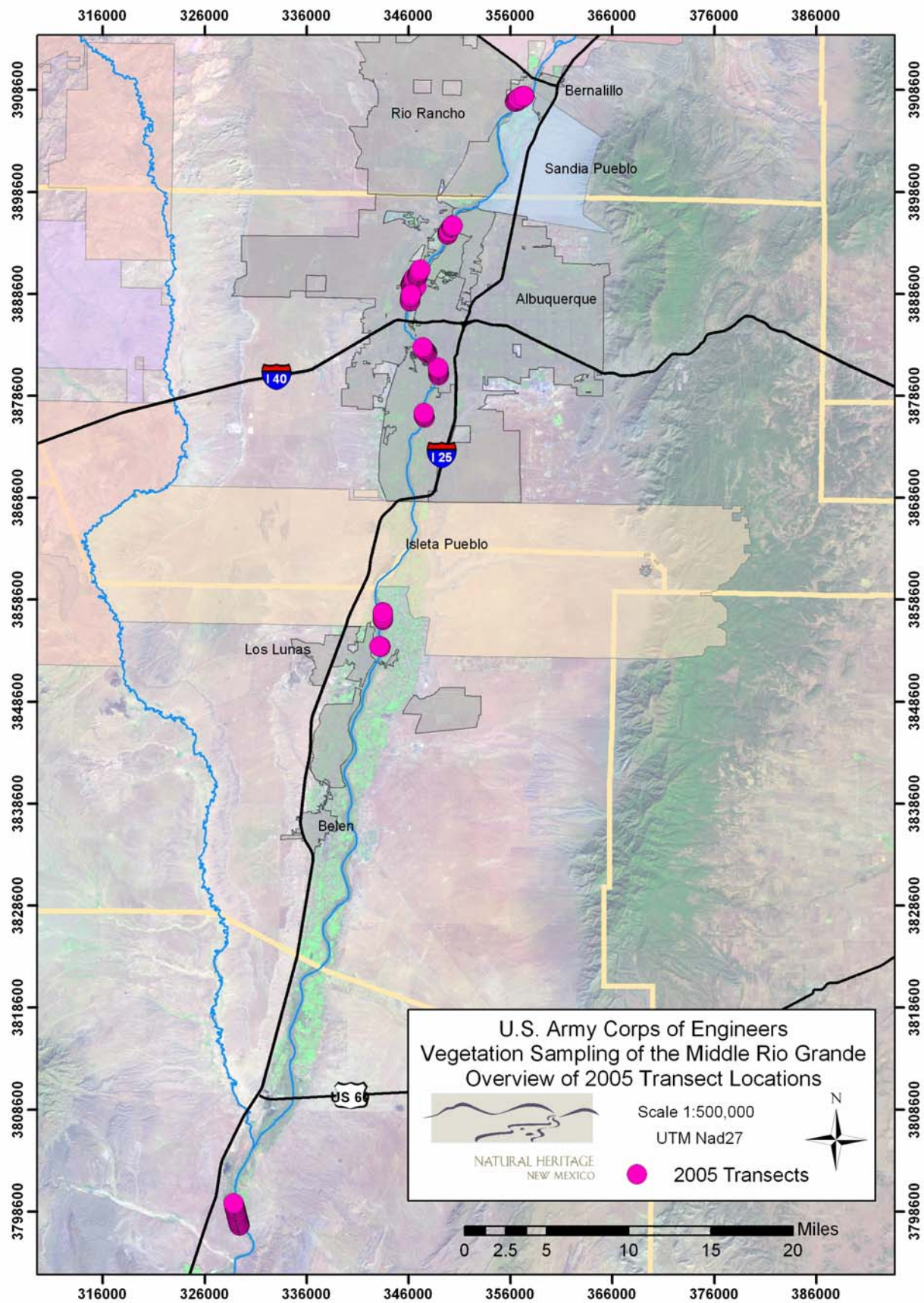


Figure 1. Overview map of the transects surveyed in 2005.

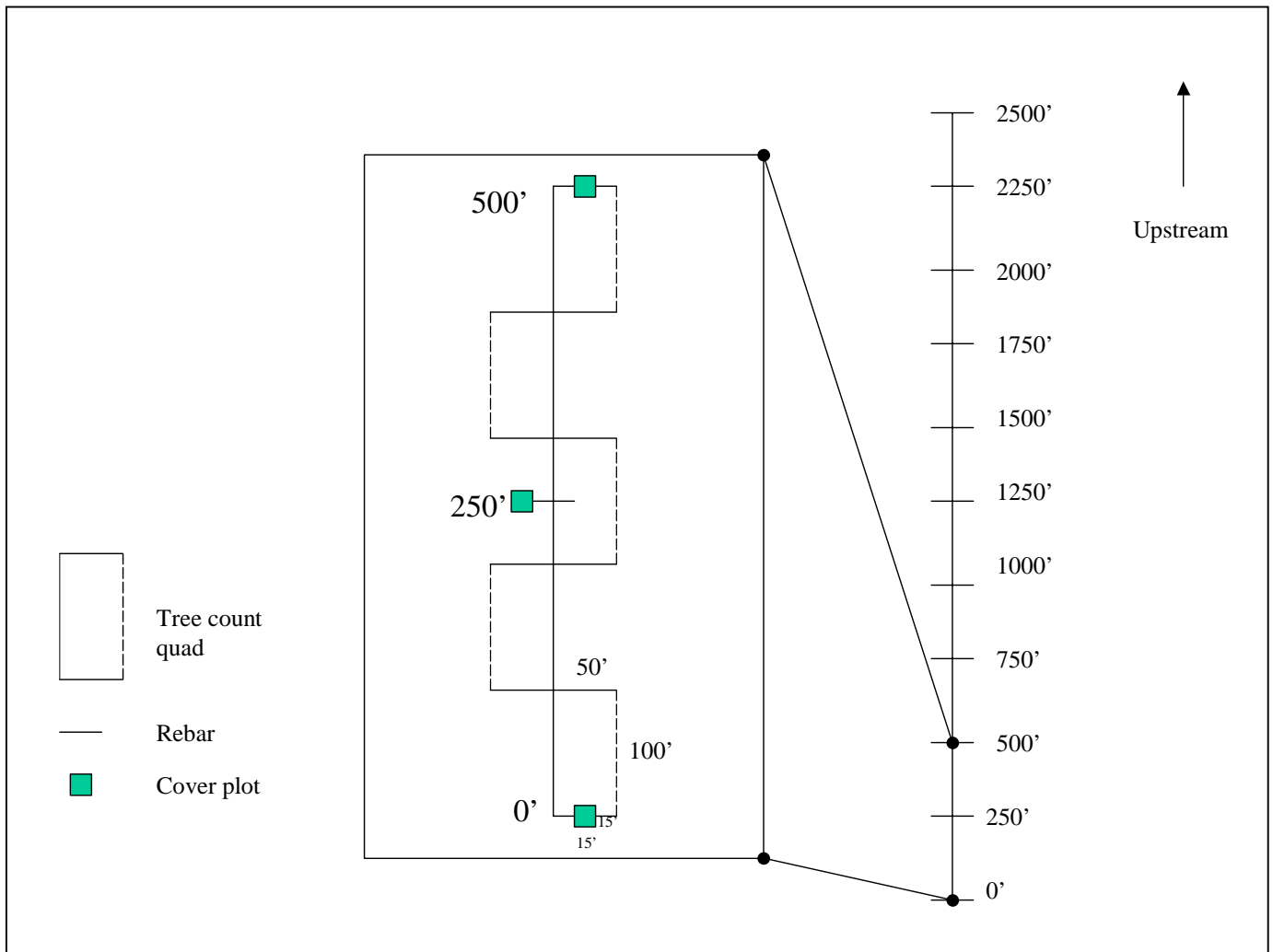


Figure 2. Overview of standard transect layout.

### Vegetation-Cover Quadrats

The original H&O methodology called for the placement of a pair of vegetation cover plots 50 feet apart from each other at 500-foot intervals along the transect. Hence, the two plots tended to be highly spatially auto-correlated. To overcome this, we modified the design to place a single cover plot at every 250-foot rebar along the transect from the 0-foot rebar to the 2250-foot rebar. This allowed for a more random and representative sample of the entire transect, while the total number of plots remained the same at 10 per transect. Plots were placed alternating right and then left down the line, so that the number of plots to either side of the line also remained the same, excepting one-sided lines where all plots were placed to the same side. The vegetation cover plots were 15 x 15 feet square, with their center placed 25 feet from the main vegetation transect line. The plot locations were measured out from the main line with a tape, and pin flags were used to delineate the corners of the plot.

Canopy cover was measured by species in three layers, 0-2 feet, 2-15 feet and >15 feet. Total species canopy cover was given for the layer in which that species was most prominent. For example, with a tall annual forb such as the common sunflower (*Helianthus annuus*), where the majority of sunflower cover for a given plot was over two feet, all sunflower cover for that plot was given in the 2 to 15-foot category. Cover for woody species over 15 feet in height was measured in two ways. The first was from the original H&O methodology, using a spherical densiometer, and taking measurements in four cardinal directions from the center of each plot. However, the spherical densiometer only provides an overall cover for a plot, and not an estimate by species. Thus, an ocular estimate of cover for each species over 15 feet in height was also estimated in each direction for each plot. The spherical densiometer also estimates cover on a distance greater than the bounds of a 15 x 15-foot plot, so the two measurements of cover are often not congruent.

To evaluate overall diversity, besides recording all species and their cover values within the vegetation cover plots, a species list for entire vegetation transect line was compiled to account for the presence of rarer species. Across all transects surveyed in 2005 a total of 172 species were observed; 9 tree species, 16 shrubs, 54 graminoids and 93 forbs (Appendix A). Voucher specimens will be deposited at the University of New Mexico Herbarium.

## **Database**

Natural Heritage New Mexico created and populated a Microsoft Access database for all of the data collected in 2005. The database has a total of 15 tables, seven of which were created just for the USACE Rio Grande Bosque monitoring data, with an additional eight supporting tables from the NHNM Ecology database (Figure 3, Appendix B). A copy of the database, including all the 2005 data, is provided on the CD included with this report. The CD also includes a readme.txt file with instructions for use of the CD, a complete set of the photos from 2005, and a digital copy of this report.

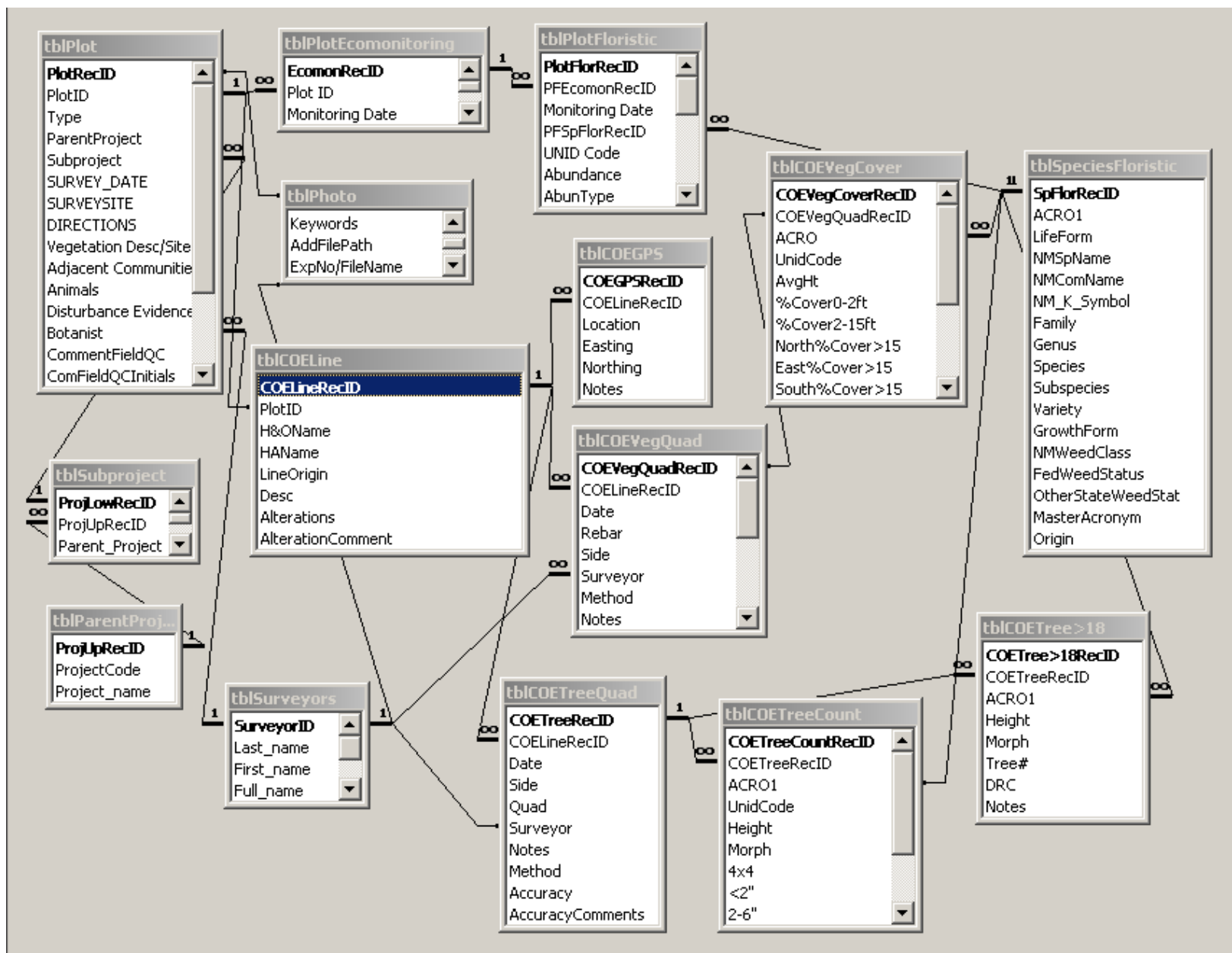


Figure 3. USACE Middle Rio Grande vegetation sampling database tables and their relationships to each other.



## Appendix A: Species list for 2005 Middle Rio Grande Bosque Vegetation Sampling.

Species Name	Common Name	NHNM ACRO	Kartez Symbol	Origin
<b>Trees</b>				
<i>Ailanthus altissima</i>	tree of heaven	AILALT	AIAL	Introduced
<i>Elaeagnus angustifolia</i>	Russian olive	ELAANG	ELAN	Introduced
<i>Juniperus monosperma</i>	oneseed juniper	JUNMON	JUMO	Native
<i>Morus alba</i>	white mulberry	MORALB	MOAL	Introduced
<i>Populus deltoides</i> ssp. <i>wislizeni</i>	Rio Grande cottonwood	POPDELW	PODEW	Native
<i>Robinia pseudoacacia</i>	black locust	ROBPSE	ROPS	Native
<i>Salix amygdaloides</i>	peachleaf willow	SALAMY	SAAM2	Native
<i>Salix gooddingii</i>	Goodding's willow	SALGOO	SAGO	Native
<i>Ulmus pumila</i>	Siberian elm	ULMPUM	ULPU	Introduced
<b>Shrubs</b>				
<i>Amorpha fruticosa</i>	desert indigobush	AMOFRU	AMFR	Native
<i>Artemisia filifolia</i>	sand sagebrush	ARTFIL	ARFI2	Native
<i>Atriplex canescens</i>	fourwing saltbush	ATRCAN	ATCA2	Native
<i>Baccharis salicina</i>	false willow	BACSal	BASA	Native
<i>Campsis radicans</i>	trumpet creeper	CAMRAD	CARA2	Introduced
<i>Chrysothamnus nauseosus</i>	rubber rabbitbrush	CHRNAU	CHNA2	Native
<i>Forestiera pubescens</i> var. <i>pubescens</i>	New Mexico olive	FORPUBP	FOPUP	Native
<i>Isocoma pluriflora</i>	southern jimmyweed	ISOPLU	ISPL	Native
<i>Lonicera japonica</i>	Japanese honeysuckle	LONJAP	LOJA	Introduced
<i>Lycium torreyi</i>	squawthorn	LYCTOR	LYTO	Native
<i>Parthenocissus vitacea</i>	Virginia creeper	PARVIT	PAVI5	Native
<i>Prosopis pubescens</i>	screwbean mesquite	PROPUB	PRPU	Native
<i>Ribes aureum</i>	golden currant	RIBAU	RIAU	Native
<i>Salix exigua</i>	coyote willow	SALEXI	SAEX	Native
<i>Tamarix ramosissima</i>	saltcedar	TAMRAM	TARA	Introduced
<i>Yucca baccata</i>	banana yucca	YUCBAC	YUBA	Native
<b>Graminoids</b>				
<i>Artemisia dracunculoides</i>	wormwood	ARTDRA	ARDR4	Native
<i>Gutierrezia sarothrae</i>	broom snakeweed	GUTSAR	GUSA2	Native
<i>Mahonia repens</i>	Oregongrape	MAHREP	MARE11	Native
<i>Opuntia phaeacantha</i>	tulip pricklypear	OPUPHA	OPPH	Native
<i>Aristida purpurea</i>	purple threeawn	ARIPUR	ARPU9	Native
<i>Bouteloua barbata</i>	sixweeks grama	BOUBAR	BOBA2	Native
<i>Bouteloua gracilis</i>	blue grama	BOUGRA	BOGR2	Native
<i>Bromus catharticus</i>	rescuegrass	BROCAT	BRCA6	Introduced
<i>Bromus inermis</i>	smooth brome	BROINE	BRIN2	Introduced
<i>Bromus japonicus</i>	Japanese brome	BROJAP	BRJA	Introduced
<i>Bromus tectorum</i>	cheatgrass	BROTEC	BRTE	Introduced
<i>Carex emoryi</i>	Emory's sedge	CAREMO	CAEM2	Native
<i>Carex praegracilis</i>	clustered field sedge	CARPRA	CAPR5	Native
<i>Carex</i> spp.	sedge	CAREX	CAREX	Native
<i>Cenchrus longispinus</i>	longspine sandbur	CENLON	CELO3	Native
<i>Chloris verticillata</i>	tumble windmill grass	CHLVER	CHVE2	Native
<i>Cynodon dactylon</i>	bermudagrass	CYNDAC	CYDA	Introduced
<i>Cyperus esculentus</i>	chufa flatsedge	CYPESC	CYES	Native

Species Name	Common Name	NHNM ACRO	Kartez Symbol	Origin
<b>Graminoids cont.</b>				
Cyperus odoratus	fragrant flatsedge	CYPODO	CYOD	Native
Cyperus spp.	flatsedge	CYPERU	CYPER	
Cyperus squarrosus	bearded flatsedge	CYPSQU	CYSQ	Native
Distichlis spicata	inland saltgrass	DISSPI	DISP	Native
Echinochloa crus-galli	barnyardgrass	ECHCRU	ECCR	Introduced
Eleocharis palustris	common spikerush	ELEPAL	ELPA3	Native
Eleocharis spp.	spikerush	ELEOCH	ELEOC	
Elymus canadensis	Canada wildrye	ELYCAN	ELCA4	Native
Elymus elymoides	bottlebrush squirreltail	ELYELY	ELEL5	Native
Elytrigia elongata	tall wheatgrass	ELYELO	ELEL6	Introduced
Eragrostis pectinacea	tufted lovegrass	ERAPEC	ERPE	Native
Festuca arundinaceae	tall fescue or K-31	FESARU	FEAR3	Introduced
Hesperostipa neomexicana	New Mexico needlegrass	HESNEO	HENE5	Native
Hilaria jamesii	galleta	HILJAM	HIJA	Native
Hordeum murinum ssp. glaucum	smooth barley	HORMURG	HOMUG	Introduced
Juncus arcticus var. balticus	Baltic rush	JUNARCB		Native
Juncus spp.	Rush	JUNCUS	JUNCU	Native
Juncus torreyi	Torrey's rush	JUNTOR	JUTO	Native
Leptochloa spp.	sprangletop	LEPTOC	LEPTO	
Muhlenbergia asperifolia	alkali muhly	MUHASP	MUAS	Native
Oryzopsis hymenoides	Indian ricegrass	ORYHYM	ORHY	Native
Panicum capillare	witchgrass	PANCAP	PACA6	Native
Panicum hallii	Hall's panicgrass	PANHAL	PAHA	Native
Panicum obtusum	vine mesquite	PANOBT	PAOB	Native
Pascopyrum smithii	western wheatgrass	PASSMI	PASM	Native
Phragmites australis	common reed	PHRAUS	PHAU7	Native
Poa arida	plains bluegrass	POAARI	POAR3	Native
Poa pratensis	Kentucky bluegrass	POAPRA	POPR	Native
Polypogon monspeliensis	annual rabbitsfoot grass	POLMON	POMO5	Introduced
Schoenoplectus pungens	common threesquare	SCHPUN	SCPU10	Native
Sorghum halepense	johnsongrass	SORHAL	SOHA	Introduced
Sporobolus airoides	alkali sacaton	SPOAIR	SPAI	Native
Sporobolus compositus var. compositus	tall dropseed	SPOCOMC	SPCOC2	Native
Sporobolus cryptandrus	sand dropseed	SPOCRY	SPCR	Native
Sporobolus flexuosus	mesa dropseed	SPOFLE	SPFL2	Native
Vulpia octoflora	sixweeks fescue	VULOCT	VUOC	Native
<b>Forbs</b>				
Amaranthus palmeri	carelessweed	AMAPAL	AMPA	Native
Ambrosia acanthicarpa	flatspine burr ragweed	AMBACA	AMAC2	Native
Ambrosia psilostachya	Cuman ragweed	AMBPSI	AMPS	Native
Anemopsis californica	yerba mansa	ANECAL	ANCA10	Native
Aphanostephus ramosissimus	plains dozedaisy	APHRAM	APRA	Native
Apocynum cannabinum	Indianhemp	APOCAN	APCA	Native
Artemisia ludoviciana	Louisiana sagewort	ARTLUD	ARLU	Native
Asclepias subverticillata	whorled milkweed	ASCSUB	ASSU2	Native

Species Name	Common Name	NHNM ACRO	Kartez Symbol	Origin
<b>Forbs cont.</b>				
<i>Asparagus officinalis</i>	garden asparagus	ASPOFF	ASOF	Introduced
<i>Astragalus</i> spp.	milkvetch	ASTRAG	ASTRA	Native
<i>Atriplex argentea</i>	silverscale saltbush	ATRARG	ATAR2	Native
<i>Bassia hyssopifolia</i>	fivehorn smotherweed	BASHYS	BAHY	Introduced
<i>Bidens frondosa</i>	devil's beggartick	BIDFRO	BIFR	Native
<i>Bidens</i> spp.	beggartick	BIDENS	BIDEN	
<i>Calibrachoa parviflora</i>	seaside petunia	CALPAR	CAPA47	Native
<i>Chamaesyce parryi</i>	Parry's sandmat	CHAPAR	CHPA28	Native
<i>Chamaesyce serpyllifolia</i>	thymeleaf sandmat	CHASER2	CHSE6	Native
<i>Chenopodium fremontii</i>	Fremont's goosefoot	CHEFRE	CHFR3	Native
<i>Chenopodium incanum</i>	mealy goosefoot	CHEINC	CHIN2	Native
<i>Chenopodium leptophyllum</i>	narrowleaf goosefoot	CHELEP	CHLE4	Native
<i>Chenopodium pratericola</i>	desert goosefoot	CHEPRA	CHPR5	Native
<i>Chenopodium</i> spp.	goosefoot	CHENOP	CHENO	
<i>Cirsium</i> spp.	thistle	CIRSIU	CIRSI	Native
<i>Cirsium vulgare</i>	bull thistle	CIRVUL	CIVU	Introduced
<i>Convolvulus arvensis</i>	field bindweed	CONARV	COAR4	Introduced
<i>Conyza canadensis</i>	Canadian horseweed	CONCAN	COCA5	Native
<i>Cressa truxillensis</i>	spreading alkaliweed	CRETRU	CRTR5	Native
<i>Croton texensis</i>	Texas croton	CROTEX	CRTE4	Native
<i>Cryptantha</i> spp.	catseye	CRYPTA	CRYPT	
<i>Cucurbita foetidissima</i>	Missouri gourd	CUCFOE	CUFO	Native
<i>Cycloloma atriplicifolium</i>	winged pigweed	CYCATR	CYAT	Native
<i>Dalea lanata</i> var. <i>lanata</i>	woolly prairieclover	DALLANL	DALAL	Native
<i>Datura</i> spp.	thornapple	DATURA	DATUR	
<i>Dimorphocarpa wislizeni</i>	spectacle pod	DIMWIS	DIWI2	Native
<i>Equisetum laevigatum</i>	smooth horsetail	EQULAE	EQLA	Native
<i>Erigeron divergens</i>	spreading fleabane	ERIDIV	ERDI4	Native
<i>Erigeron flagellaris</i>	trailing fleabane	ERIFLA	ERFL	Native
<i>Euthamia occidentalis</i>	western goldenrod	EUTOCC	EUOC4	Native
<i>Gaillardia pulchella</i>	firewheel	GAIPUL	GAPU	Native
<i>Gaura coccinea</i>	scarlet beeblossom	GAUCOC	GACO5	Native
<i>Gaura parviflora</i>	velvetweed	GAUPAR	GAPA6	Native
<i>Glycyrrhiza lepidota</i>	American licorice	GLYLEP	GLLE3	Native
<i>Helianthus annuus</i>	common sunflower	HELANN	HEAN3	Native
<i>Helianthus petiolaris</i>	prairie sunflower	HELPET	HEPE	Native
<i>Heliotropium convolvulaceum</i>	phlox heliotrope	HELCON	HECO5	Native
<i>Ipomopsis longiflora</i>	flaxflowered gilia	IOLON	IPLO2	Native
<i>Kochia scoparia</i>	common kochia	KOCSCO	KOSC	Introduced
<i>Lactuca serriola</i>	prickly lettuce	LACSER	LASE	Introduced
<i>Lactuca tatarica</i> var. <i>pulchella</i>	blue lettuce	LACTATP	LATAP	Native
<i>Lappula</i> spp.	stickseed	LAPPUL	LAPPU	Native
<i>Limonium limbatum</i>	Transpecos sealavender	LIMLIM	LILI4	Native
<i>Machaeranthera canescens</i>	hoary aster	MACCAN	MACA2	Native
<i>Machaeranthera pinnatifida</i>	lacy tansyaster	MACPIN	MAPI	Native

Species Name	Common Name	NHNM ACRO	Kartez Symbol	Origin
<b>Forbs cont.</b>				
<i>Machaeranthera tanacetifolia</i>	tanseyleaf aster	MACTAN	MATA2	Native
<i>Melilotus officinalis</i>	yellow sweetclover	MELOFF	MEOF	Introduced
<i>Mentzelia multiflora</i>	manyflowered mentzelia	MENMUL	MEMU3	Native
<i>Nama hispidum</i>	bristly nama	NAMHIS	NAHI	Native
<i>Nepeta cataria</i>	catnip	NEPCAT	NECA2	Introduced
<i>Oenothera elata</i> ssp. <i>hirsutissima</i>	Hooker's eveningprimrose	OENELAH	OEELH	Native
<i>Oenothera pallida</i>	pale eveningprimrose	OENPAL	OEPA	Native
<i>Phacelia</i> spp.		PHACEL	PHACE	Native
<i>Physalis virginiana</i>	Virginia groundcherry	PHYVIR	PHVI5	Native
<i>Plantago patagonica</i>	woolly plantain	PLAPAT	PLPA2	Native
<i>Polanisia dodecandra</i> ssp. <i>trachysperma</i>	sandyseed clammyweed	POLDODT	PODOT	Native
<i>Polygonum lapathifolium</i>	curlytop knotweed	POLLAP	POLA4	Native
<i>Polygonum</i> spp.	knotweed	POLYGO	POLYG4	
<i>Psoralegium lanceolatum</i>	lemon scurfpea	PSOLAN	PSLA3	Native
<i>Ratibida tagetes</i>	green prairie coneflower	RATTAG	RATA	Native
<i>Rumex crispus</i>	curly dock	RUMCRI	RUCR	Introduced
<i>Salsola tragus</i>	prickly Russian thistle	SALTRA	SATR12	Introduced
<i>Senecio riddellii</i>	Riddell's ragwort	SENRID	SERI2	Native
<i>Sisymbrium</i> spp.	hedgemustard	SISYMB	SISYM	
<i>Solanum elaeagnifolium</i>	silverleaf nightshade	SOLELA	SOEL	Native
<i>Solanum nigrum</i>	black nightshade	SOLNIG	SONI	Introduced
<i>Solanum rostratum</i>	buffalobur nightshade	SOLROS	SORO	Native
<i>Solanum triflorum</i>	cutleaf nightshade	SOLTRI	SOTR	Native
<i>Solidago canadensis</i>	Canada goldenrod	SOLCAN	SOCA6	Native
<i>Sonchus asper</i>	spiny sowthistle	SONASP	SOAS	Introduced
<i>Sphaeralcea incana</i>	gray globemallow	SPHINC	SPIN2	Native
<i>Sphaeralcea</i> spp.	globemallow	SPHAER	SPHAE	Native
<i>Sphaerophysa salsula</i>	alkali swainsonpea	SPHSAL	SPSA3	Introduced
<i>Suaeda nigra</i>	bush seepweed	SUANIG	SUNI	Native
<i>Symphyotrichum ericoides</i>	heath aster	SYMERI	SYER	Native
<i>Taraxacum officinale</i>	common dandelion	TAROFF	TAOF	Introduced
<i>Townsendia annua</i>	annual townsend daisy	TOWANN	TOAN	Native
<i>Tragopogon</i> spp.	salsify	TRAGOP	TRAGO	Introduced
<i>Tribulus terrestris</i>	puncturevine	TRITER	TRTE	Introduced
<i>Typha</i> spp.	cattail	TYPHA	TYPHA	
<i>Verbascum thapsus</i>	common mullein	VERTHA	VETH	Introduced
<i>Verbena bracteata</i>	bigbract verbena	VERBRA	VEBR	Native
<i>Veronica anagallis-aquatica</i>	water speedwell	VERANA	VEAN2	Native
<i>Xanthium spinosum</i>	spiny cocklebur	XANSPI	XASP2	Introduced
<i>Xanthium strumarium</i>	rough cocklebur	XANSTR	XAST	Native

## Appendix B: Database table descriptions with field names and descriptions.

### tblCOELine

This table stores data related to each transect: location, condition, description. Links to tblCOEGPS and tblPhoto to store UTM's for each rebar and data on photos taken at each transect. Links to tblCOETreeQuad for tree data and tblCOEVegQuad for vegetation cover data. Also links to tblPlot in NMNH Ecology database.

Name	Type	Size	Description
COELineRecID	Long Integer	4	Unique field to serve as primary key for tblCOELine.
PlotID	Long Integer	4	Plot id associated with each transect. Displaying Plot ID, but storing PlotRecID from tblPlot.
H&Oname	Text	50	Hink and Ohmart name for the line.
HAName	Text	50	Hawks Aloft name for the line.
LineOrigin	Text	50	Is this an original Hink and Ohmart line, was it moved by Hawks Aloft or is it a new Hawks Aloft line?
Desc	Memo	Open	General description of the transect.
Alterations	Text	50	Select whether the area the transect falls within has had; no alterations, alterations performed by man, alterations by fire, or alterations by both man and fire.
AlterationComment	Memo	Open	Comments relevant to the type of alterations or disturbance to the site.

### tblCOEGPS

This table stores UTM's (Nad27, Zone 13) for each rebar on each transect.

Name	Type	Size	Description
COEGPSRecID	Long Integer	4	Unique field to serve as the primary key for tblCOEGPS.
COELineRecID	Long Integer	4	Primary key from tblCOELine.
Location	Text	50	Location of the rebar in feet along the transect.
Easting	Long Integer	4	Easting of the gps location of the rebar on the transect (Nad 27, Zone 13).
Northing	Long Integer	4	Northing of the gps location of the rebar on the transect (Nad 27, Zone 13).
Notes	Memo	Open	Any notes relevant to the gps location of the rebar.

### tblCOETreeQuad

This table stores data relevant to each quad surveyed for trees: location, date, surveyor, method used. Links to tblCOETreeCount and tblCOETree>18, which store the stem counts and cover estimates for each species, and the diameter root crown of trees over 18" respectively.

Name	Type	Size	Description
COETreeRecID	Long Integer	4	Unique field to serve as the primary key for tblCOETreeQuad
COELineRecID	Long Integer	4	Primary key from tblCOELine.
Date	Date	8	Date of survey.
Side	Text	50	Side of the transect on which the trees were counted.
Quad	Text	50	Location of quad along transect.
Surveyor	Long Integer	4	Displaying the full name of each surveyor, but storing the primary key from tblSurveyors, SurveyorID.
Notes	Memo	Open	Any comments or notes relevant to the tree count quads.
Method	Text	50	Count Methods were changed early in the survey, prior to transect NE03; select "Prior to NE03" if the transect was read before the change at NE03; select "After NE03" if after.
Accuracy	True/False	1	Mark yes or check if the accuracy of this count is reliable. Do not check if there are issues related to the count.
AccuracyComments	Memo	Open	Notes relevant to the issues with the accuracy of the count.

### tblCOETreeCount

This table links to tblTreeQuad; stores the stem count and cover (described as number of 4x4 squares) of each species surveyed within each tree quad. COETreeCountRecID, Long Integer, 4, Unique field to serve as the primary key for tblCOETreeCount.

Name	Type	Size	Description
COETreeRecID	Long Integer	4	Primary key from tblCOETreeQuad.
ACRO1	Long Integer	4	Displaying the acronym of the species counted, but storing the SpFlorRecID tblSpeciesFLoristic.
UnidCode	Text	50	Code assigned to collected, unidentified species.
Height	Text	50	Select whether the shrubs/trees counted were in the 2-10ft. height category or the >10ft. height category.
Morph	Text	50	Morphology of the trees/shrubs counted.
4x4	Long Integer	4	Number of 4x4 squares occupied by the canopy of the species surveyed.
<2"	Long Integer	4	Number of stems greater than 2" in diameter.

2-6"	Long Integer	4	Number of stems between 2" and 6" in diameter.
6-12"	Long Integer	4	Number of stems between 6" and 12" in diameter.
12-18"	Long Integer	4	Number of stems between 12" and 18" in diameter.
>18"	Long Integer	4	Number of stems greater than 18" in diameter.
Notes	Memo	Open	Any notes relevant to each species counted.

### **tblCOETree>18**

This table is linked to tblCOETreeQuad and stores diameter root crown for each tree over 18" in diameter.

Name	Type	Size	Description
COETree>18RecID	Long Integer	4	Unique field to serve as the primary key for tblCOETree>18.
COETreeRecID	Long Integer	4	Primary key from tblCOETreeQuad.
ACRO1	Long Integer	4	Displaying the acronym for each species surveyed, but storing SpFlorRecID from tblSpeciesFLoristic.
Height	Text	50	Select whether the shrubs/tree measured was in the 2-10ft. height category or the >10ft. height category.
Morph	Text	50	Morphology of the trees/shrub measured.
Tree#	Long Integer	4	Arbitrary number to separate individuals of the same species and tree quad with measurements greater than 18".
DRC	Double	8	Diameter root crown of individual trees greater than 18"; measurement taken in inches.
Notes	Memo	Open	Any comments relevant to the individual tree measured.

### **tblCOEVegQuad**

This table stores data relevant to each vegetation quad sampled: date, surveyor, method used. Links to tblCOEVegCover, which stores cover estimates for each species.

Name	Type	Size	Description
COEVegQuadRecID	Long Integer	4	Unique field to serve as the primary key for tblCOEVegQuad.
COELineRecID	Long Integer	4	Primary key from tblCOELine.
Date	Date	8	Date of the survey.
Rebar	Text	50	Rebar at which the vegetation quad was located
Side	Text	50	Side of the transect on which the vegetation quad was located.
Surveyor	Long Integer	4	Surveyor that took the data at vegetation quad.
Method	Text	50	Vegetation Cover methods were changed early in the survey; select "Original H&O" if the transect was read before the changes, or select "Modified Heritage" if after.
Notes	Memo	Open	Notes pertaining to the specific quad.
NorthSDCount	Long Integer	4	Dot counts from the spherical densiometer to the north .
EastSDCount	Long Integer	4	Dot counts from the spherical densiometer to the east
WestSDCount	Long Integer	4	Dot counts from the spherical densiometer to the west
SouthSDCount	Long Integer	4	Dot counts from the spherical densiometer to the south
SDCountComments	Memo	Open	Comments relevant to the spherical densiometer dot counts.
NorthSD%	Long Integer	4	Percentage calculated from the spherical densiometer dot counts.
EastSD%	Long Integer	4	Percentage calculated from the spherical densiometer dot counts.
SouthSD%	Long Integer	4	Percentage calculated from the spherical densiometer dot counts.
WestSD%	Long Integer	4	Percentage calculated from the spherical densiometer dot counts.

### **tblCOEVegCover**

This table stores cover estimates for each species surveyed within each vegetation quad. Links to tblCOEVegQuad and tblSpeciesFloristic.

Name	Type	Size	Description
COEVegCoverRecID	Long Integer	4	Unique field to serve as the primary key for tblCOEVegCover.
COEVegQuadRecID	Long Integer	4	Primary key from tblCOEVegQuad.
ACRO	Long Integer	4	Displaying the acronym for each species surveyed, but storing SpFlorRecID from tblSpeciesFLoristic.
UnidCode	Text	50	Unidentified code number from field data
AvgHt	Double	8	Average height for the species in feet.
%Cover0-2ft	Double	8	Percent cover under 2ft tall.
%Cover2-15ft	Double	8	Percent cover from 2-15ft tall.
North%Cover>15	Double	8	Percent cover of species over 15ft tall within the north.
East%Cover>15	Double	8	Percent cover of species over 15ft tall within the east.
South%Cover>15	Double	8	Percent cover of species over 15ft tall within the south.
West%Cover>15	Double	8	Percent cover of species over 15ft tall within the west.
NorthSDCount	Long Integer	4	Dot counts from the spherical densiometer to the north
EastSDCount	Long Integer	4	Dot counts from the spherical densiometer to the east
WestSDCount	Long Integer	4	Dot counts from the spherical densiometer to the west
SouthSDCount	Long Integer	4	Dot counts from the spherical densiometer to the south
SDCountType	Text	50	Select whether this spherical densiometer count was for the entire quad - "Total count", or if it was for the species in this record - "Count for this species".
Notes	Memo	Open	Any comments relevant to the individual species within this quad.

## **tblSpeciesFLoristic**

This table contains information for each of species found, and is a basic table from the NMNH Ecology database.

Name	Type	Size	Description
SpFlorRecID	Long Integer	4	Primary key for the species floristic table.
ACRO1	Text	8	NHNM 7 letter code
LifeForm	Double	8	1=tree 2=shrub 3=grass 4=forb 5=lichen/algae/fungi 6=other
NMSpName	Text	60	NHNM Accepted full name, genus and species, variety or subspecies, and, if plant is a tree, growth form.
NMComName	Text	35	Common name as assigned by NHNM botanist
NM_K_Symbol	Text	50	Kartez symbol for current New Mexico name.
Family	Text	50	
Genus	Text	50	
Species	Text	50	
Subspecies	Text	50	
Variety	Text	50	
GrowthForm	Text	50	text field describing the stages of tree growth: seedling, yng regen, adv regen, mature.
NMWeedClass	Text	2	NM Weed status class - A, B or C from state weed status link to tblNMWeedClass
FedWeedStatus	True/False	1	Is this plant federal listed as a noxious weed? See tblFedWeeds
OtherStateWeedStat	True/False	1	Does this plant have noxious weed status in a state other than NM? see tblOtherStateWeeds
MasterAcronym	Text	8	NHNM grouping acronyms
Origin	Text	15	Native or Introduced

## **tblPlot**

This table contains all the basic data for a plot, and is the base table for records in the NMNH Ecology database.

Name	Type	Size	Description
PlotRecID	Long Integer	4	Unique number to identify each record and serve as the primary key.
PlotID	Text	7	Plots are named with a standard of last two digits of year, team leader's or projects initials, and 3 digits in numerical order as plots are established, e.g. 03AB001, 03AB002, etc.
Type	Text	3	RP Releve Plot, QP Quick Plot, VP Video Plot, MP Map Point
ParentProject	Long Integer	4	Storing Record ID from Project table and showing project code.
Subproject	Long Integer	4	Storing Record ID from subproject table and showing subproject code.
SURVEY_DATE	Date	8	Date the survey took place.
SURVEYSITE	Text	255	Sites delineated for the purpose of the field work only, usually assigned by project manager.
DIRECTIONS	Memo	Open	Directions that can be useful in finding the plot again.
Vegetation Desc/Site Features	Memo	Open	Description of the vegetation and any significant site features.
Adjacent Communities	Memo	Open	Any communities surrounding the occurrence surveyed.
Animals	Memo	Open	Any evidence or sighting of animals.
Disturbance Evidence	Memo	Open	Any evidence of disturbance. e.g. tire tracks, cropping/grazing, garbage, fire scars, etc.
Botanist	Long Integer	4	The surveyor that served as the botanist for the plot.
CommentFieldQC	True/False	1	Were the comment fields qcd for appropriate language?
ComFieldQCInitials	Text	3	Initials of the person responsible for qcng the comment fields.
CommFieldQCDate	Date	8	Date the comment fields were qcd.
DataQC	True/False	1	Were the following fields qcd: Plot type, Project/Subproject, Date, Surveyor, Botanist, UTM's, Community Acronyms, Ground Cover, Life Form Cover.
DataQCInitials	Text	3	Initials of the person responsible for qcng the above data fields.
DataQCDate	Date	8	Date the data fields were qcd.
OrigPlotID	Text	25	If the plot came from a source outside of NHNM or an alternate ID was created for data entry, enter the original plot id here.

## **tblPhoto**

This table stores data concerning the photos taken at a plot or for a project. Stores information such as focal length, exposure number, and the location the print/slide is archived.

Name	Type	Size	Description
PhotoRecID	Long Integer	4	Unique number to identify each record and serve as the primary key.
Source	Text	50	Was the photo from a plot; not from a plot, but from Heritage; or from an outside source?
PhotoPlotRecID	Long Integer	4	Plot ID for the plot at which the photo taken.
Project	Long Integer	4	Storing Record ID from Project table and showing project code.
Subproject	Long Integer	4	Storing Record ID from subproject table and showing subproject code.

Location	Text	42	General location at which the photos were taken. e.g., Bandelier National Monument, Holloman AFB, etc.
Date	Date	8	Date the photo was taken.
PhotoLogRollNo	Text	50	The name used to identify the roll of film on the photo log.
Keywords	Memo	Open	Keywords to help identify the subject matter of the photo. e.g. Short grass prairie, mixed conifer forest, Blue spruce fringe forest, Texas Horned Lizard, etc.
AddFilePath	Text	50	Additional directory info for digital photos beyond general subproject photo location.
ExpNo/FileName	Text	50	The number of the individual exposure taken or, in the case of digital photos, the file name for the individual photo.
Photographer	Text	50	Name of the person who shot the photo.
Azm	Long Integer	4	Azimuth or direction the photo was taken.
FocalLength	Long Integer	4	Focal length of the photo.
Desc1	Text	42	Description of the subject matter of the photo. e.g., across slope from plot center.
Desc2	Text	42	If description is longer than 42 characters (label program limitation), put overflow here.
Sensitive	True/False	1	Does this photo contain a sensitive element or community?
Comments	Memo	Open	Any comments relevant to this individual exposure.
Film/Dig	Text	50	Was photo originally shot on film or digital camera?

### **tblPlotEcomonitoring**

This table connects tblPlot to tblPlotFloristic. It allows data from more than one visit to a plot location to be recorded.

Name	Type	Size	Description
EcomonRecID	Long Integer	4	Unique number to identify each record and serve as primary key.
Plot ID	Text	7	Plot ID from tblPlot
Monitoring Date	Date	8	Date Plot was visited/revisited.
MonitoringComments	Memo	Open	Comments relevant to this visit to the plot.
PlotFlorQC	True/False	1	Was plot floristic qcd?
PlotFIQCInitials	Text	3	Initials of the person responsible for qcinq plot floristic.
PlotFIQCDate	Date	8	Date floristic was qcd.

### **tblPlotFloristic**

Stores data and id for each plant recorded at the plot, e.g. abundance value, collection info, and notes taken at plot.

Name	Type	Size	Description
PlotFlorRecID	Long Integer	4	Primary key for plot floristic.
PFEcomonRecID	Long Integer	4	Record id from ecomonitoring table.
Monitoring Date	Date	8	Date of the survey.
PFSpFlorRecID	Long Integer	4	Storing the record id from species floristic, but looking up ACROI.
UNID Code	Text	50	Unidentified code number from field data
Abundance	Double	8	Should contain *only* Percentage cover values - either directly from the field or converted scalars - unconverted scalar values belong in the field AbunScalar
AbunType	Text	50	Explains missing values and gives info on how abundance was measured in the field (see look up tblPlotFlorAbunType for information on codes)
KDKscalar	Text	5	Unconverted Modified Domin-Krajina scalar abundance values read up from tblModDomKrajinaScalar
Height in Meters	Double	8	Average height measured in meters.
Number of Vouchers	Text	5	How many specimens were collected? If plant was not collected, but is a unid from another plot, enter NO.
Specimen Number	Text	10	Specimen number from the data sheet. (F1, G4, T2, etc.)
UNMCatalogNumber	Text	10	Numbering system used by UNM herbarium.
Field label	Text	50	What was written on the label in the field.
Quality	Text	2	Quality of the vouchered specimen.
Det by	Text	50	Who was responsible for identifying the vouchered specimen?
Distribution	Text	50	What herbaria received the specimen?
Comments	Text	250	Any comments relevant to this particular plant, including references to other plots where the plant was collected.
Phenology	Text	50	Flowering, fruiting or dead annual



### **tblSurveyors**

This table contains information on the surveyors at Natural Heritage New Mexico.

Name	Type	Size	Description
SurveyorID	Long Integer	4	Primary key for Surveyor table
Last_name	Text	50	Surveyors last name
First_name	Text	50	Surveyors first name plus middle initials if relevant
Full_name	Text	50	Surveyors full name first, initials, last
Initials	Text	50	Surveyors initials
Plot_Initials	Text	50	Surveyors initials as used in PlotIDs
Surveyor_type	Text	50	How was this person connected to NMNHP?

### **tblParentProject**

This table contains information describing each Parent Project.

Name	Type	Size	Description
ProjUpRecID	Long Integer	4	Primary key for the ProjectUpper table.
ProjectCode	Text	50	Code used to identify the project.
Project_name	Text	50	Full project name.

### **tblSubproject**

This table contains information describing each Subproject.

Name	Type	Size	Description
ProjLowRecID	Long Integer	4	Primary key for the ProjectLower table.
ProjUpRecID	Long Integer	4	Primary key from the ProjectUpper table.
Parent_Project	Text	50	The main project that this subproject falls under.
SubprojectCode	Text	50	Project code for the subproject.
Subproject_name	Text	50	Full name of the project.
Description	Memo	0	Description of what the subproject entails.
Start Date	Date	8	Date work started.
End Date	Date	8	Date subproject was completed.
Supervisor	Long Integer	4	Person responsible for organizing the subproject.
PI	Long Integer	4	Person responsible for overseeing the parent project.
Photos	True/False	1	Are there photos associated with this subproject?
DigPhoto_Loc	Text	250	Directory path to master photo directory for subproject.