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Source: Cathryn A. Hoyt and John Karges (editors) 2014. *Proceedings of the Sixth Symposium on the Natural Resources of the Chihuahuan Desert Region* October 14–17, 2004. pp. 414–427.

Published by: The Chihuahuan Desert Research Institute, Fort Davis, TX.
Submitted in 2004

Recommended citation: West, R. 2014. Enhancing native diversity in the backyard. In: C.A. Hoyt & J. Karges (editors). *Proceedings of the Sixth Symposium on the Natural Resources of the Chihuahuan Desert Region. October 14–17*. Chihuahuan Desert Research Institute, Fort Davis, TX. pp. 414–427. <http://cdri.org/publications/proceedings-of-the-symposium-on-the-natural-resources-of-the-chihuahuan-desert-region/>

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Enhancing Native Diversity in the Backyard

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ABSTRACT—Homeowners in desert cities can have a difficult time finding information and plant sources for converting an established traditional lawn to a native plant community. Such a project requires a great deal of study, travel, and work, but it can be done. The results can be striking in terms of increasing biodiversity and in educating the gardener about ecology. One effort, started five years ago in southeastern New Mexico, is now a lush habitat utilized by a great diversity of wildlife. Plant species increased from about 5 to over 100. Bird species rose from 5 to almost 100. Invertebrate diversity is enormous.

RESUMEN—Los dueños de propiedad en ciudades desérticas tienen dificultad para encontrar información de plantas para convertir sus jardines tradicionales con plantas nativas del desierto para las comunidades. Proyectos de esa magnitud requieren bastante tiempo de estudios como viajar y trabajar. Pero sí se puede hacer. Los resultados pueden ser espectaculares en el sentido incrementando biodiversidad y educando al jardinero de estudios de ecología. Hace cinco años en el suroeste de Nuevo México comenzaron un estudio y los resultados fueron excelentes. Ahora se encuentra un refugio de animales salvajes de todas las especies. Las especies de plantas incrementaron de 5 a un poco más de 100. Las especies de aves incrementaron de 5 a un poco menos de 100. La diversidad de invertebrados es enorme.

The urban Desert Southwest is a land of seemingly endless bermuda grass lawns and mulberry trees, non-native plants that overuse water, energy, and labor but do nothing to nourish the land or its native biota. The idea of converting lawns to natural landscapes that invite wildlife has been increasingly embraced in the last decade (Stein 1993; Alcock 1997; Wasowski 2000; Grissell 2001). These small habitats might also help preserve native systems in the process (Shepherd et al. 2003). But it is not easy for a homeowner with no horticultural or landscape-design expertise to get rid of that invasive African grass and to establish a native plant community. Many cities don't have nurseries with native plants; some have ordinances against loosely-defined weeds or against the absence of a lawn. Hiring an expert can be expensive, and it detracts from direct contact with the process. Doing the project yourself is rewarding and entertaining, and the resulting increases in biodiversity are quite dramatic.

The rewards go beyond mere entertainment. The education gained at every step benefits both gardener and nature. It has been written that “we are seldom moved to protect any life we haven't first noticed and then grown to know intimately and to

love” (Buchmann and Nabhan 1996:207). A backyard native plant garden brings the gardener face to face with the system and can make you fall in love with the insects.

One such endeavor began in 1999 in Carlsbad, New Mexico. The homeowner set out to create a garden of native plants, but ended with habitat for all kinds of wildlife. The result is not a designed landscape, and not a totally natural ecosystem. It’s a lush free space where a diversity of native creatures come to live and coexist with tolerant humans.

METHODS—*Site and owner*—The site is a standard backyard of about 5,000 square feet on a city lot in Carlsbad, New Mexico. It is separated by a 4-foot wall from a mostly undisturbed desert hillside. It has shallow soils underlain by substantial caliche. The house was built in 1965 and probably landscaped at the same time with an aggressive strain of bermuda grass (*Cynodon dactylon*). Two large non-native mulberry trees (*Morus*) had huge woody roots up to 8 inches in diameter throughout the yard. Because of the shallow soils, the roots were wrapped around each other and had grown under nearby houses. Cultivar roses, German bearded irises, and shrubs from Argentina made up most of the rest of the landscape. The front yard had been originally landscaped with a so-called desert theme, with a Torrey yucca (*Yucca torreyi*), two ocotillos (*Fouquieria splendens*), some sotols (*Dasyllirion leiophyllum*), and two cacti (*Opuntia*). The rest was covered with black plastic and then white river rocks and had been maintained so that no new plants came in.

As the owner of the house, I had no experience in landscape design or horticulture. I do have a master of science degree in botany/plant ecology and have belonged to several native plant societies. I had also read many environmental writers, and I knew what I had to do. As one wrote, “We cannot in fairness rail against those who destroy the rain forest or threaten the spotted owl when we have made our own yards uninhabitable,” (Stein 1993:19). Or another, “Today, gardening and environmental responsibility must go hand in hand.” (Wasoswki 2000:4).

I did much of the planning and work myself, with help, encouragement, and wildlife identifications from my partner, Steve West, a birder and biologist.

Site preparation—Before any native plantings could be made, I had to remove the mulberries and bermuda grass, roots and all. I hired a contractor to cut the trees and grind out the stumps, then I cut and pried out the remaining large woody roots before planting.

Bermuda grass, native to southern Africa, reportedly tolerates alkali, disease, drought, frost, grazing, herbicide, heavy metal, heavy soil, insects, laterite, high pH,

low pH, nematodes, peat, poor soil, salt, sand, sewage and sludge, slope, smog, sulfur dioxide, ultraviolet, virus, waterlogging, and weeds (Duke 1983). It reproduces aggressively by seeds, roots, and runners, giving a person no option for getting rid of it in stages. Any area cleared of the grass would be rapidly reinvaded by it. While everyone agrees it is nearly impossible to eliminate bermuda grass, some believe only intensive hand-digging of all roots and constant vigilance ever after will succeed (Bowers 1993). Others think it is possible to get rid of it with careful herbicide use (Begeman 1999; Karlik 2000).

The bermuda grass removal process began in late summer of 1999 as the plants were starting to move carbohydrates into their roots for winter. I watered the grass well and did not mow for a week. Then I applied a glyphosate herbicide to the entire lawn. After several days, I did another watering to encourage the remaining live roots to sprout. Later I sprayed those new stems and leaves with herbicide, repeating the entire process three times. Then I burned off the thick dead grass and rototilled. As I dug holes for planting native plants, I removed any remaining grass roots by hand. Years later, vigilance and spot-treatments are still necessary, especially around wet areas like the bird baths and in rainy years such as 2004. Seeds and roots from neighbors are always invading. I dug out the irises and roses, and phased out most other exotics.

In the front yard, I removed as much of the black plastic as possible without causing too much disturbance to roots and invertebrates. Elsewhere, I punched many holes in it with a rake to allow seeds, roots, water, nutrients, air, and invertebrates to pass through. No sprinkler system was installed.

Native plant, seed sources— A gardener must first decide how narrowly to define native, learn what species fit the definition, and then wade through the maze of providers of seeds and plants. In many smaller towns and cities such as Carlsbad there is no native plant nursery nearby. With research and luck, I constructed a list of mail order suppliers and nurseries within driving distance of a few hours. Native plant sales occur on spring weekends at various parks and societies in the Trans-Pecos area.

Carlsbad is on the edges of the Chihuahuan Desert, Guadalupe Mountains, and Great Plains, so I had a variety of species to choose from. I wanted to enhance the plant diversity on the adjacent desert hillside, so I defined native somewhat broadly but stayed mostly with Trans-Pecos plants. Most species planted occur naturally within 100 miles of Carlsbad, some within 200 miles, and a few are sentimental favorites from the Big Bend area of southwest Texas.

Potted plants came from nurseries in New Mexico, Texas, and Arizona, a high school greenhouse project in Carlsbad, and donations by friends. Seeds were purchased from native seed providers in the same three states, as well as locally collected (legally). Numerous seeds were brought in by wildlife and wind, and a few were donated by friends.

Garden design—Native plant gardening books are filled with gorgeous pictures of well designed and executed gardens, and that is probably everyone's original goal. But when faced with a large yard stripped to bare soil, an inexperienced gardener may discard some of the finer points in favor of a criterion that says, If it's native and it'll grow here, it's welcome. This is even easier to accept when one has no landscape design experience but instead a mindset that celebrates wild native things.

Another point that favors this approach is that sometimes sticking with a plan can lead to frustration and lack of sustainability. Often there is an advantage to letting the plants decide where they want to be. An example in this yard was the Mexican evening primrose (*Oenothera speciosa*). I planted the seeds in full sun as per instructions on the packet from a northern New Mexico provider. However, the site was too hot and dry for the plants, and extra watering with the hose did little to improve things. Over the course of three years, however, the entire population managed to move itself (its seeds blowing into more favorable areas) into more shaded areas of the garden where it now thrives independent of supplemental water.

Over the long term, allowing seeds to grow wherever they germinate can result in stronger plants and natural succession. Many netleaf hackberry and littleleaf sumac seeds have germinated below a bird roosting area in the large Torrey yucca in the front yard. A small woodlot is forming there, and it is likely that the yard will look very different within 10 years. Natural succession is already in action: in August of 2004, a windstorm knocked over the mature Torrey yucca. Now more sunlight reaches the root sprouts and seedlings from that plant, as well as the small woodlot.

Maintenance—After a few years, natural reproduction takes over and the hand of humans is not much needed. The yards require almost no work. Other than the glyphosate treatments to remove bermuda grass, the yard is completely free of pesticides. After some moments of near-panic early in the process, I have learned to trust the natural balance that has developed. I don't clean up litter and debris either, because that is prime habitat for invertebrates and for lizards hunting invertebrates. It mulches the plants as well.

Abundant plant growth can be something of a problem, albeit a delightful one. But Steve and I do hand-trimming, hand-pulling, and neglect, depending on moods

or the weather. Anything more could be called interference. It's a time to explore and observe.

RESULTS—Dramatic increases in biodiversity have occurred in most classes of organisms, but they are most easily documented with plants and birds.

Native Plants—Most non-natives have been eliminated, and the current number of native species is over 100 (Appendix 1). These plants provide a great variety of structures, forms, and phenology that create diverse habitats for many kinds of wildlife. There are trees, shrubs, cacti, grasses, and forbs throughout the yard, instead of a few around the edges. New volunteer species are still appearing. Some seeds of desert perennials take years to germinate, so there are still occasional surprises when they appear long after having been planted and forgotten.

Birds—Before the project, only about five species visited the yard, primarily house sparrows (non-native), house finches, and white-winged doves. Now the bird list for the yard is approaching 100 species (Appendix 2). Most are natives, largely because there is no artificial feeding (except hummingbird feeders). Food is provided in its natural form—seeds, nectar, and insects—and only the native birds recognize and can harvest the food. Small ground-level birdbaths with drippers were also provided.

Most of these birds are not just one-time visitors. With the availability of a variety of natural foods and water, the yard is a major stopover during migration. Numerous hummingbirds take advantage of the spring, summer, and fall blooms; they much prefer flowers to the feeders. Painted buntings eat seeds of the prairie bristlegrass right off the plants. Goldfinches and house finches feed voraciously (and acrobatically) on the sunflower seeds still attached to the plants. Insect eaters like Bullock's orioles and western kingbirds feed here often. American robins, northern mockingbirds, and blue jays nest nearby and bring their fledglings to feed. Wilson's warblers spend weeks in spring and fall eating insects from netleaf hackberry trees and sunflower plants, with huge populations of aphids disappearing almost overnight. Roosting and hunting forays by raptors such as Cooper's hawk and American kestrel confirm their interest in the environs.

Other vertebrate wildlife—The diversity of other wildlife is not as well documented because of lack of time and training. Mammals that we have observed using the yard include gray fox, coyote, striped skunk, rock squirrel, deer mouse, mule deer, raccoons, and bats. Reptiles include geckoes, skinks, several snake species, and numerous lizards. Whiptail lizards thrive by digging for food in the deep leaf litter.

Invertebrates—Invertebrate life abounds in the yard. But before this project, I never paid much attention to them. I used to automatically cringe when I heard the buzz of a bee. But now I appreciate them all, and get to watch many of their interactions.

Many species of Lepidoptera (moths and butterflies) use the yard for larval food, nectar, water, and mud. Dragonflies and damselflies frequent the yard for hunting. Hymenoptera abound in the yard, with dozens of wasps, velvet ants, solitary and social bees, and ants nesting and feeding there. I have watched nest building and provisioning by wasps (mud dauber, potter, digger) and bees (mason, carpenter, leaf-cutter, cactus). Termites feed on the sawdust and remaining dead roots of bermuda grass and mulberries. The hackberry trees and other plants are loaded with scale insects, gall insects, webworms, and aphids, just as they are in the wild.

Among the others we have seen are numerous beetle species, ant lions, green lacewings, praying mantises, crane flies, grasshoppers, katydids, crickets, roaches, milkweed bugs, mesquite bugs, leaf and plant hoppers, chiggers, and clouds of tiny flying insects that provide protein for hummingbirds. Centipedes, millipedes, and sowbugs are also residents, along with earthworms and a variety of spiders, scorpions, vinegaroons, and solpugids.

DISCUSSION—What started out to be merely a native plant garden has turned into a functioning system with diversity and beauty, and a vehicle for education about nature. Creating the yard is not just an exercise in habitat or gardening. It provides fond family memories as well. I rarely look at the netleaf hackberry without remembering that Steve and I brought it home together from a nursery when we were first dating. Now that tree provides shade to the yard and a home for countless insects who in turn feed orioles, kingbirds, warblers, and hummingbirds. Hackberries in the wild look just the same as ours: covered with a variety of insects and their webs, cocoons, and galls. These trees are perfectly adapted to host many insects without mortality.

The plants and wildlife listed here represent a wide range of niches, trophic levels, and habitats. They function as a natural system that is in balance. No single group can take over and no group will be entirely destroyed, so there is no use for pesticides. In fact, the less work a gardener does to tidy up, the better. A noted entomologist and gardener has commented, “Many of us attempt, in one way or another, to believe in some notion of a perfect, orderly landscape... The more we simplify our gardens in an attempt to retain the perfect order, the more we increase our need to do something to regain the natural, biological balance that it has lost.” (Grissell 2001:320) We can’t possibly anticipate the myriad tiny interactions that go on in the yard. But left alone, they benefit everyone.

The first time I found a hornworm caterpillar in the yard, I thought of killing that voracious plant feeder. But I stopped myself. Then one day I happened to see it being attacked by two tiny black insects. A week later the caterpillar was dead, shriveled to half its size with a row of tiny white cocoons along its back. The black insects had been braconid wasps ovipositing inside the living caterpillar. By not killing the caterpillar, I provided food for another generation of these parasitoids who will help control future caterpillar populations at no cost to us. This summer a *Datura* plant was defoliated by hornworms. Later the plant leafed out again and flowered, and the caterpillars grew into beautiful sphinx moth pollinators. A tarantula donated by a neighbor didn't last long in our yard. He was soon dragged from a hiding place by a tarantula wasp and presumably used for egg-laying purposes.

Countless little dramas are there in the yard to be discovered. I have watched a paper wasp gleaning cellulose from leaves to make cells for the nest, a potter wasp making a perfect little mud pot for her egg, ants sipping honeydew from the aphids, a big black carpenter bee excavating a nest in a sotol stalk, and a leaf-cutter bee cutting a piece from a flower petal and flying off with it. There is much more to see. Someday I hope to find out which animal makes a perfect little round hole in every Mexican buckeye fruit on the tree. The cycle continues. All the tiny dramas add up to an irreplaceable education.

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APPENDIX 1—Native vascular plants in the West family Carlsbad yard in 2004. Plants with * arrived through birds or wind; all others were planted as seeds or plants. Plants with § are spreading on their own. Taxonomic authorities are Martin and Hutchins (1980) and Correll and Johnston (1970).

Family	Species	Common Name
Juglandaceae (walnut)	<i>Juglans microcarpa</i>	Little walnut
Ulmaceae (elm)	<i>Celtis reticulata</i> §*	Netleaf hackberry
Chenopodiaceae (goosefoot)	<i>Atriplex canescens</i>	Four-wing saltbush
Ranunculaceae (buttercup)	<i>Aquilegia chrysantha</i> §	Yellow columbine
	<i>Clematis drummondii</i>	Virgin's bower
Berberidaceae (barberry)	<i>Berberis trifoliolata</i> *	Algerita
	<i>Berberis haematocarpa</i> *	Red barberry
Cruciferae (mustard)	<i>Lepidium montanum</i> *§	Pepperweed
Rosaceae (rose)	<i>Fallugia paradoxa</i>	Apache plume
Leguminosae (pea)	<i>Acacia roemeriana</i>	Roemer catclaw
	<i>Acacia neovernicosa</i>	Viscid acacia
	<i>Cercis canadensis</i> §	Redbud
	<i>Dalea formosa</i> *§	Feather dalea
	<i>Desmanthus illinoense</i>	Prairie bundleflower
	<i>Eysenhardtia spinosa</i>	Spiny kidneywood
	<i>Leucaena retusa</i>	Golden leadball tree
	<i>Prosopis pubescens</i> §	Screwbean mesquite, tornillo
	<i>Prosopis glandulosa</i> *	Honey mesquite
	<i>Sophora secundiflora</i>	Mountain laurel
Zygophyllaceae (caltrop)	<i>Kallstroemia</i> sp.*	Carpetweed
	<i>Larrea tridentata</i>	Creosotebush
Euphorbiaceae (spurge)	<i>Croton pottsii</i> *	Croton
	<i>Euphorbia</i> sp.*	Poinsettia
Anacardiaceae (sumac)	<i>Rhus microphylla</i> *§	Littleleaf sumac
Sapindaceae (soapberry)	<i>Sapindus saponaria</i>	Western soapberry
	<i>Ungnadia speciosa</i>	Mexican buckeye
Rhamnaceae (buckthorn)	<i>Ceanothus greggii</i> *	Desert buckthorn
Malvaceae (mallow)	<i>Sida</i> sp.*§	Sida
	<i>Sphaeralcea angustifolia</i> *§	Narrowleaf globemallow
	<i>Sphaeralcea</i> sp.*§	Globemallow
Fouquieriaceae (ocotillo)	<i>Fouquieria splendens</i> *§	Ocotillo
Koeberliniaceae (allthorn)	<i>Koeberlinia spinosa</i>	Allthorn
Loasaceae (loasa)	<i>Mentzelia</i> sp.*§	Stickleaf

APPENDIX 1—*continued*

Family	Species	Common Name
Cactaceae (cactus)	<i>Echinocereus dasyacanthus</i>	Rainbow cactus
	<i>Echinocereus viridiflorus</i>	New Mexico rainbow cactus
	<i>Echinocereus triglochidiatus</i>	Claret cup cactus
	<i>Ferocactus wislizenii</i>	Southwest barrel cactus
	<i>Opuntia leptocaulis</i> *§	Christmas cholla
	<i>Opuntia imbricata</i> §	Cane cholla
	<i>Opuntia phaeacantha</i> §	New Mexico prickly pear
	<i>Opuntia violacea</i>	Purple prickly pear
Onagraceae (evening-primrose)	<i>Gaura parviflora</i> *	Velvet-leaf gaura
	<i>Oenothera speciosa</i> §	Mexican evening primrose
Oleaceae (olive)	<i>Forestiera neomexicana</i>	New Mexico olive
	<i>Fraxinus velutina</i>	Velvet ash, Arizona ash
Asclepiadaceae (milkweed)	<i>Asclepias subverticillata</i>	Whorled milkweed
	<i>Asclepias tuberosa</i>	Orange butterfly weed
Verbenaceae (vervain)	<i>Aloysia wrightii</i>	Oreganillo, beebrush
	<i>Lantana</i> sp.	Lantana
Lamiaceae (mint)	<i>Salvia farinacea</i>	Mealy sage
	<i>Salvia coccinea</i> §	Red salvia
	<i>Salvia greggii</i> §	Autumn salvia
Solanaceae (nightshade)	<i>Chamaesaracha</i> sp.* §	Nightshade
	<i>Datura meteloides</i> §	Jimsonweed
	<i>Solanum rostratum</i> *§	Buffalo bur
Scrophulariaceae (snapdragon)	<i>Castilleja</i> sp.	Paintbrush
	<i>Leucophyllum</i> sp.	Texas sage
	<i>Penstemon barbatus</i>	Scarlet bugler
	<i>Penstemon cardinalis</i>	Cardinal penstemon
	<i>Penstemon pseudospectabilis</i>	Desert beardtongue
Bignoniaceae (bignonia)	<i>Chilopsis linearis</i> *§	Desert willow
Cucurbitaceae (gourd)	<i>Ibervillea tenuisecta</i>	Globeberry
Campanulaceae (bluebell)	<i>Lobelia cardinalis</i> §	Cardinal flower
Asteraceae (sunflower)	<i>Artemisia ludoviciana</i> *§	Prairie sagebrush
	<i>Baileya multiradiata</i>	Desert marigold
	<i>Brickellia laciniata</i> *§	Cutleaf brickellia
	<i>Dysodia</i> sp.*§	Dogweed

APPENDIX 1—*continued*

Family	Species	Common Name	
Asteraceae (cont.)	<i>Echinacea angustifolia</i>	Purple coneflower	
	<i>Ericameria</i> sp.	Damianita	
	<i>Erigeron</i> sp.*	Fleabane daisy	
	<i>Gaillardia aristata</i> §	Blanketflower	
	<i>Gutierrezia sarothrae</i>	Broom snakeweed	
	<i>Helianthus annuus</i> §	Common sunflower	
	<i>Helianthus maximiliani</i> §	New Mexico sunflower	
	<i>Isocoma wrightii</i> *§	Rayless goldenrod	
	<i>Machaeranthera tanacetifolia</i> §	Tansy aster	
	<i>Melampodium leucanthum</i>	Blackfoot daisy	
	<i>Parthenium argentatum</i>	Guayule	
	<i>Ratibida columnifera</i> §	Prairie coneflower	
	<i>Senecio douglasii</i> *§	Groundsel	
	<i>Stephanomeria</i> sp.*§	Wire lettuce	
	<i>Verbesina encelioides</i> §	Golden crownbeard	
	<i>Viguiera stenoloba</i>	Skeletonleaf goldeneye	
	<i>Zinnia grandiflora</i>	Plains zinnia	
	Poaceae (grass)	<i>Aristida purpurea</i> *§	Purple three-awn
		<i>Bouteloua curtipendula</i> §	Sideoats grama
<i>Bouteloua gracilis</i> §		Blue grama	
<i>Bouteloua eriopoda</i> *§		Black grama	
<i>Chloris</i> sp.		Windmill grass	
<i>Leptochloa dubia</i> §		Green sprangletop	
<i>Muhlenbergia</i> sp.*§		Muhly grass	
<i>Poa fendleriana</i> *§		Mutton grass	
<i>Setaria macrostachya</i> §		Plains bristlegrass	
<i>Sorghastrum nutans</i>		Indian grass	
<i>Sporobolus cryptandrus</i>		Sand dropseed	
<i>Stipa tenuissima</i> §		Needlegrass	
Liliaceae (lily)		<i>Allium</i> sp.	Wild onion
	<i>Dasyllirion leiophyllum</i> *§	Sotol	
	<i>Hesperaloe parviflora</i>	Red yucca	
	<i>Nolina texana</i>	Bear grass	
	<i>Yucca elata</i> §	Soaptree yucca	
	<i>Yucca torreyi</i> §	Torrey yucca	
Amaryllidaceae (amaryllis)	<i>Agave neomexicana</i>	New Mexico agave	

APPENDIX 2—Bird species observed in and around the West family Carlsbad yard from 1999 to 2004. Bird with an * were present before the native habitat project began.

	Species	Nested	In Yard	Over Yard	From Yard
1	Turkey Vulture		X	X	
2	Northern Harrier				X
3	Sharp-shinned Hawk		X		
4	Cooper's Hawk		X	X	X
5	Red-tailed Hawk				X
6	Scaled Quail		X		X
7	Sandhill Crane				X
8	Upland Sandpiper				X
9	Rock Dove*		X		
10	Eurasian Collared-Dove		X		
11	White-winged Dove*	X	X	X	X
12	Mourning Dove		X		
13	Inca Dove	X	X		
14	Yellow-billed Cuckoo		X		
15	Greater Roadrunner		X		
16	Great Horned Owl			X	
17	Lesser Nighthawk			X	
18	Common Nighthawk		X		
19	Common Poor-will			X	
20	Black-chinned Hummingbird			X	
21	Broad-tailed Hummingbird		X		
22	Lucifer Hummingbird		X		
23	Rufous Hummingbird		X		
24	Ladder-backed Woodpecker			X	
25	Northern Flicker (yellow-shafted)				X
26	Northern Flicker (red-shafted)		X		X
27	Olive-sided Flycatcher		X		
28	Western Wood-Pewee		X		
29	Willow Flycatcher		X		
30	Ash-throated Flycatcher		X		
31	Say's Phoebe		X		
32	Western Kingbird*		X		
33	Bell's Vireo		X		
34	Warbling Vireo		X		
35	Blue Jay		X	X	

APPENDIX 2—*continued*

	Species	Nested	In Yard	Over Yard	From Yard
36	Western Scrub-Jay		X	X	
37	Cave Swallow			X	
38	Barn Swallow		X		
39	Verdin		X		
40	Red-breasted Nuthatch			X	X
41	Cactus Wren	X	X	X	
42	Rock Wren		X		
43	Bewick's Wren		X		
44	House Wren		X		
45	Winter Wren		X		
46	Blue-gray Gnatcatcher		X		
47	Ruby-crowned Kinglet		X		
48	Townsend's Solitaire		X		
49	Hermit Thrush		X		
50	American Robin		X	X	
51	Northern Mockingbird		X		
52	Curve-billed Thrasher		X		
53	Tennessee Warbler		X		
54	Orange-crowned Warbler		X		
55	Yellow Warbler		X		
56	Black-throated Blue Warbler			X	
57	Yellow-rumped Warbler		X		
58	Ovenbird		X		
59	Mourning Warbler		X		
60	MacGillivray's Warbler		X		
61	Wilson's Warbler		X		
62	Western Tanager		X		
63	Green-tailed Towhee		X		
64	Spotted Towhee		X		
65	Canyon Towhee		X		
66	Rufous-crowned Sparrow		X		
67	Chipping Sparrow		X		
68	Clay-colored Sparrow		X		
69	Brewer's Sparrow		X	X	
70	Lark Sparrow		X		

APPENDIX 2—*continued*

	Species	Nested	In Yard	Over Yard	From Yard
71	Black-throated Sparrow			X	
72	Savannah Sparrow		X		
73	Lincoln's Sparrow		X		
74	Harris' Sparrow		X		
75	White-crowned Sparrow		X		
76	Dark-eyed Junco (slate-colored)		X		
77	Dark-eyed Junco (Oregon)		X		
78	Dark-eyed Junco (pink-sided)		X		
79	Dark-eyed Junco (gray-headed)		X		
80	Pyrrhuloxia		X		
81	Black-headed Grosbeak		X		X
82	Blue Grosbeak		X		
83	Indigo Bunting		X		
84	Painted Bunting		X		
85	Dickcissel		X		
86	Red-winged Blackbird		X	X	
87	Brewer's Blackbird			X	
88	Common Grackle				X
89	Great-tailed Grackle		X		
90	Brown-headed Cowbird		X		
91	Orchard Oriole		X		
92	Hooded Oriole		X		
93	Bullock's Oriole		X		X
94	Scott's Oriole		X		
95	House Finch*	X	X		
96	Lesser Goldfinch (dark-backed)		X		
97	American Goldfinch		X		
98	House Sparrow	X	X		