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Effects of the December 2003 Freeze on Plants in DELEP's Tucson Fields

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DELEP maintains fields in the Tucson area at the University of Arizona Campus Agricultural Center (CAC) and West Campus Agricultural Center (WCAC). Plants are grown at these sites to increase seed supplies, to provide plant material for research projects and to evaluate survival and performance under local conditions. Initial plantings were made in 1989 and have continued as new species are acquired and propagated. The fields are located at two sites on the CAC and one site on the WCAC. Collectively, these fields encompass approximately 3.5 acres (1.4 ha.). As of December, 2003, there were about 200 taxa of perennial legumes present in these fields.

Freezing temperatures have accounted for more plant deaths in the Tucson fields than any other factor. The CAC fields are located along Rillito Creek and the WCAC field is immediately adjacent to the Santa Cruz River. These low-lying areas are subject to cold-air drainage at night and significant freezing temperatures occur each winter. On clear, dry, windless winter nights, the temperature in these fields can be over 10° F colder than in warmer areas of Tuc-

son. Consequently, the DELEP fields are excellent sites to evaluate cold tolerance in legume species.

Cold tolerance is difficult to quantify. Many factors can influence a plant's ability to withstand freezing temperatures including the duration and intensity of the freeze, maturity of the plant, whether the plant is actively growing or is dormant and hardened off, protection provided by adjacent plants and buildings, and genetic characteristics of individual plants. Usually, several of these factors are involved in determining a plant's response to freezing.

The autumn of 2003 had above average rainfall with the remains of three tropical storm systems from the eastern Pacific Ocean crossing the area. Temperatures had fallen into the low 20's F on several occasions in late November and early December, so most summer-growing plants had become dormant. No significant freeze damage was noted from these earlier freezes. On December 28th and 29th, 2003, the Tucson area was subjected to a cold air mass that resulted in temperatures that fell significantly below freezing at night throughout the region. The official low temperature in Tucson fell to 19° F (-7.2° C). This is the lowest temperature since December 1978 when the official reading dropped to

18° F. Temperature readings at the CAC and WCAC are taken at Arizona Meteorological Network (AZMET) recording stations. The minimum temperature reported at the CAC in the December 2003 freeze was 16° F (-8.8° C). At the WCAC, the lowest temperature recorded was 21° F (-6.1° C). The WCAC reading was recorded approximately ½ mile from DELEP's field. Based on observations of plant damage, it is likely that temperatures in the WCAC field were in the upper teens F. Due to the lack of secure locations, thermometers were not present in the field plots for this freeze event so minimum low temperatures are estimates. Temperatures on both nights were below freezing for approximately 14-16 hours.

The following report summarizes the effects of the December 2003 freeze on plants in DELEP's Tucson fields. While precise information on minimum temperatures in the fields is not available, these observations can provide a general idea of the cold tolerance of many of the plants. As with past freezes, it was interesting to observe the differences in the effects of the freeze between plants of particular species from different accessions and even within a single accession.

Notes: Damage to foliage is indicated only for those plants that typically remain evergreen through the winter in Tucson. Where more than one accession is indicated, these are usually, though not always located in separate fields.

Acacia acuminata CAC (3) / WCAC (1): None of these plants exhibited freeze damage.

Acacia adsurgens CAC (1): The foliage was killed and stems froze to 1" (2.5 cm) thick.

Acacia ampliceps CAC (2): This species freezes to the base at about 25° F (-3.8° C). A few root sprouts continue to grow despite removal of the parent plants several years ago.

Acacia aneura CAC (2) / WCAC (2): No freeze damage has been observed on this species.

Acacia angustissima var.

angustissima CAC (several plants): Most stems were frozen back to the base from 7' (2.1 m) tall. The plants exhibit vigorous recovery.

Acacia angustissima var.

suffrutescens CAC (6): As is typical in most winters, these plants froze back to the base. The plants exhibit vigorous recovery in the spring to a height of 3' (0.9 m).

Acacia aroma CAC (2) / WCAC (2) – 2 accessions: A few stems of CAC plants were frozen to 1' (30 cm) from the tips. WCAC plants exhibited no damage.

Acacia ashbyae WCAC (2): No damage was observed on these plants.

Acacia atramentaria CAC (2) / WCAC (2): None of these plants were damaged.

Acacia berlandieri CAC (5) – 2 accessions: Some stems of some plants suffered minor tip damage only.

Acacia bivenosa WCAC (1): This plant froze to the base with stems to 2" (5 cm) thick being killed. A few

stems at ground level were sufficiently protected that they escaped damage. The plant is recovering.

Acacia borleae CAC (2): A few stems froze back to 6" (15 cm) from the tips.

Acacia brachybotrya CAC (1): This plant sustained some foliage damage only.

Acacia brachystachya CAC (1) / WCAC (1) – 2 accessions: No freeze damage was observed on these plants.

Acacia brandegeana WCAC (2): These plants did not exhibit any freeze damage.

Acacia brevispica CAC (1): This plant froze back 3.5' (1 m) to the base with stems ½" thick killed. It is recovering.

Acacia cambagei WCAC (2): These plants were planted in summer 2003. They froze to the base with stems 1/8" thick killed. They are recovering.

Acacia cana CAC (1): This plant did not exhibit any freeze damage.

Acacia caven CAC (1) / WCAC (2) – 2 accessions: These plants did not suffer any apparent damage.

Acacia citrinoviridis CAC (2): One plant froze back 6' (1.8 m) to the base with stems to 1" (2.5 cm) thick killed, and is recovering. The other plant had severe foliage damage but did not sustain stem damage.

Acacia constricta CAC (7) – 2 accessions: No freeze damage has been observed on this species.

Acacia coolgardiensis WCAC (1): This plant had been planted in summer 2003 and was killed by the freeze.

Acacia coriacea CAC (2): The slender stems of this species froze back to the base. These plants regularly freeze at this site but recover vigorously and grow to 7' (2.1 m) tall the following summer.

Acacia craspedocarpa CAC (4) – 2 accessions: No freeze damage was observed on these plants.

Acacia crassifolia CAC (1): The leaves were killed and many stems froze back to 9" (23 cm) from tips.

Acacia davyi CAC (2): These plants froze back 6' (1.8 m) to the base with stems 1" (2.5 cm) thick killed. They are recovering.

Acacia deanii CAC (1): This plant did not exhibit any freeze damage.

Acacia difformis CAC (2): No freeze damage was observed on these plants.

Acacia ehrenbergiana WCAC (1): This plant froze back 2.5' (0.75 m) to the base with stems ¼" thick killed. It is recovering.

Acacia erioloba WCAC (2): No freeze damage has been observed on this species.

Acacia farnesiana CAC (5) / WCAC (2) – 2 accessions: These plants did not suffer any apparent freeze damage.

Acacia fasciculifera CAC (2) / WCAC (2): These plants froze to stems 1" (2.5 cm) thick and the foliage was killed. The plants are recovering.

Acacia fleckii WCAC (1): Minor stem die-back to 3" (7.5 cm) from the tips.

Acacia furcatispina CAC (3) – 2 accessions: A few stems died back to 6" (15 cm) from the tips.

Acacia galpinii CAC (2): Stems to ½" thick were killed. These plants are 20' (6.1 m) tall and continue to grow larger despite sustaining freeze damage each year.

Acacia gerrardii subsp. *negevensis* CAC (3) / WCAC (2): None of these plants exhibited any freeze damage.

Acacia grandicorniculata CAC (2): These plants froze back 6' (1.8 m) to the base with stems 1.5" (3.75 cm) thick killed. They are recovering.

Acacia grasbyi WCAC (1): Severe damage to foliage and some stem tips were killed.

Acacia greggii CAC (3) / WCAC (2): No freeze damage has been observed on this species.

Acacia haematoxylon CAC (2): No freeze damage was observed on these plants.

Acacia harpophylla WCAC (2): No freeze damage was observed on these plants.

Acacia harveyi CAC (1): The foliage was frozen and some stem tips were killed.

Acacia hebeclada subsp.

hebeclada CAC (3) / WCAC (2) – 2 accessions: Plants at both locations experienced die-back of some stems to 3' (0.9 m) from the tips. The CAC plants suffered less damage overall than the WCAC plants.

Acacia hemiteles WCAC (2): Both plants were killed by the freeze.

Acacia hereroensis CAC (2): Most stem froze back to 6" (15 cm) from the tips.

Acacia jennerae CAC (3) / WCAC (2): No freeze damage has been observed on this species.

Acacia karroo WCAC (2): No damage was observed on these plants.

Acacia kempeana CAC (3): No freeze damage was observed on these plants.

Acacia kirkii WCAC (2): Most stems froze back to 2' (0.6 m) from the tips.

Acacia leiocalyx WCAC (1): Froze to the base from a height of 4' (1.1 m) with stems to 1" (2.5 cm) thick killed. The plant is recovering.

Acacia mellifera subsp. *detinens* CAC (1) / WCAC (1): No freeze damage has been observed on this species.

Acacia microcarpa CAC (1): The foliage was frozen and some stem tips were killed.

Acacia millefolia CAC (9) – 2 accessions: Some stems on each plant froze back to 1' (30 cm) from the tips while other stems were unaffected.

Acacia montana CAC (1): This plant sustained minor foliage damage only.

Acacia montis-usti WCAC (2): Both plants were killed by the freeze.

Acacia nebrownii CAC (2): Froze to the base from a height of 9' (2.7 m) with stems to 3" (7.5 cm) in diameter killed. The plants are recovering vigorously.

Acacia neovernicosa CAC (3): No freeze damage has been observed on this species.

Acacia notabilis CAC (3) – 2 accessions: Some foliage damage on all 3 plants and minor stem die-back on 2 plants of one accession.

Acacia nyssophylla CAC (2): No freeze damage was observed on these plants.

Acacia obtecta CAC (1 plant): The foliage was killed but no stem damage was noted.

Acacia occidentalis CAC (1) / WCAC (2) – 2 accessions: No freeze damage has been observed on this species.

Acacia oswaldii CAC (2): Severe foliage damage occurred but the stems were undamaged.

Acacia papyrocarpa CAC (1) / WCAC (2): No freeze damage was observed on these plants.

Acacia patagiata CAC (3): Some foliage damage was evident but the stems were undamaged.

Acacia pendula CAC (1) / WCAC (2) – 2 accessions: The CAC plant suffered considerable foliage damage while the WCAC plants had no apparent damage.

Acacia permixta CAC (2): Some stems froze back to 2' (0.6 m) from the tips.

Acacia prainii WCAC (2): One plant was killed. The other froze back

2.5' (0.75 m) to near the base and is recovering.

Acacia pravissima WCAC (1): Severe foliage damage and minor die-back of some stem tips.

Acacia pruinocarpa CAC (3) / WCAC (2): The foliage of all plants was frozen. The WCAC plants suffered no stem damage while the CAC plants had surprisingly variable damage with stems killed back several feet to 3" (7.5 cm) thick on one plant while stems of another plant only froze to ¼" thick.

Acacia pyrifolia WCAC (2): These plants froze to the base from a height of 6' (0.9 m) with stems to 1" (2.5 cm) killed. They are recovering vigorously.

Acacia quornensis CAC (2): The foliage was killed and some stems froze back 3' (0.9 m) to the base while other stems had only minor tip die-back. The plants are recovering.

Acacia redolens CAC (3) – 2 accessions: The single plant of one accession exhibited no damage while the other plants suffered some foliage damage and minor stem die-back.

Acacia reficiens WCAC (1 plant): Minor die-back of some stem tips only.

Acacia rehmanniana WCAC (2): Some stems of one plant froze back to 2' (0.6 m) to ¼" thick, while the other plant froze to the base with stems to 1.5" (3.75 cm) thick killed. Both plants are recovering.

Acacia rigidula CAC (3) / WCAC (2) – 2 accessions: None of these plants exhibited freeze damage.

Acacia rivalis CAC (2) / WCAC (2): No freeze damage has been observed on this species.

Acacia salicina CAC (2) / WCAC (2) – 2 accessions: The foliage of the CAC plants was killed up to a height of 15' (4.5 m). The foliage on the upper portion of the plants was undamaged, apparently as it was above

the layer of coldest air. The WCAC plants were undamaged.

Acacia saligna CAC (1) / WCAC (1): The plant at CAC was the last of 12 originally planted in 1990 and was senescent. This individual froze and subsequently died. The plant at WCAC was 9' (2.7 m) tall and froze to the base with stems 3" (7.5 cm) in diameter killed. It is recovering.

Acacia schaffneri CAC (3) / WCAC (2): No freeze damage has been observed on this species.

Acacia schottii CAC (4): No freeze damage has been observed on this species.

Acacia sphaerocephala WCAC (2): These plants froze back 3.5' (1 m) to the base to stems ¼" thick. One is recovering and the other appears to be dead.

Acacia stenophylla CAC (1) / WCAC (2) – 2 accessions: The CAC plant suffered significant foliage damage and some stems froze back to 2' (0.6 m) from the tips. The WCAC plants were undamaged.

Acacia tetragonophylla CAC (3) – 2 accessions: All 3 plants suffered foliage damage ranging from moderate to severe. The single plant of one accession experienced considerable die-back of stems several feet from the tips, though a few stems had only minor die-back. The other 2 plants had no stem damage.

Acacia trineura WCAC (1): No freeze damage was observed on this plant.

Acacia victoriae CAC (1) / WCAC (14): None of these plants exhibited freeze damage.

Acacia villosa CAC (2): This species typically freezes to the base each winter following temperatures of about 25° F (-3.8° C). The plants grow to 9' (2.7 m) tall the following season.

Acacia viscidula CAC (3): No freeze damage was observed on these plants.

Acacia visco WCAC (2): No freeze damage has been observed on this species.

Acacia wrightii CAC (2) / WCAC (3): No freeze damage has been observed on this species.

Acacia xanthina WCAC (1): The twigs froze back to 2' (0.6 m) from the tips.

Albizia julibrissin WCAC (2): No freeze damage was observed on this species.

Albizia sinaloensis CAC (2): Froze to the base from 7' (2.1 m) tall with healthy new growth apparent.

Amorpha fruticosa CAC (5) – 2 accessions: No freeze damage has been observed on this species.

Anadenanthera colubrina WCAC (1): Stems to ½" thick were killed.

Bauhinia forficata WCAC (2): Stems to ½" thick were killed.

Bauhinia lunarioides CAC (5) – 3 accessions: No freeze damage has been observed on this species.

Bauhinia macranthera CAC (3): No freeze damage was observed on these plants.

Bauhinia natalensis CAC (3): These plants froze back 2' (0.6 m) to the base. One was killed and the others are recovering.

Bolusanthus speciosus CAC (1) / WCAC (1): The foliage was frozen and some stems died back to 1' (30 cm) from the tips while other stems were undamaged.

Brongniartia alamosana CAC (1): This plant freezes to the base most years and exhibits vigorous recovery the following summer. The plant was 7' (2.1 m) tall with stems ½" thick in December 2003.

Brongniartia minutifolia CAC (1): No freeze damage was observed on this plant.

Caesalpinia cacalaco CAC (1): This plant froze back to the base from 8' (2.4 m) height but has vigorous new growth.

Caesalpinia gilliesii CAC (8): No freeze damage was observed on these plants.

Caesalpinia mexicana CAC (12) – 2 accessions: Stems of some plants died back to 1' (30 cm) from the tips but otherwise appear undamaged while other plants had considerable stem damage with many stems killed to ½" thick.

Caesalpinia palmeri CAC (5) – 2 accessions: Some stems died back to 2' (0.6 m) from the tips while most stems remained undamaged.

Caesalpinia paraguariensis CAC (2) – 2 accessions: No freeze damage was observed on these plants.

Caesalpinia pulcherrima CAC (6): All stems of these suffrutescent plants froze to the base with rapid recovery in the spring. This species typically freezes at about 25° F (-3.8° C).

Caesalpinia sessilifolia CAC (2): Minor damage to some stems that died back to 2" (5 cm) from the tips.

Calliandra californica CAC (7): Stems of this species were frozen to near the base and exhibited rapid recovery in the spring. The stems are typically killed at 22° F (-5.5° C).

Calliandra eriophylla CAC (12) – 2 accessions: No freeze damage was observed on these plants.

Cercis canadensis var. *mexicana* WCAC (2): No freeze damage has been observed on this species.

Cercis chingii CAC (2): No freeze damage has been observed on this species.

Cercis griffithsii WCAC (1): No freeze damage has been observed on this species.

Cercis occidentalis CAC (1) / WCAC (1) – 2 accessions: No freeze

damage has been observed on this species.

Chamaecrista greggii var. *greggii* CAC (1): No freeze damage was observed on this plant.

Colutea istria CAC (3): No freeze damage has been observed on this species.

Coursetia axilaris CAC (1): No freeze damage was observed on this plant.

Coursetia glandulosa CAC (4): Most stems killed back to near the base from 8' (2.4 m) tall with vigorous recovery in the spring.

Desmodium cinerascens CAC (5): The stems were killed to the base. This species typically freezes at about 25° F (-3.8° C) and grows vigorously to 8' (2.4 m) tall the following summer.

Eysenhardtia orthocarpa CAC (6) – 3 accessions: No freeze damage was observed on these plants.

Eysenhardtia texana CAC (6): No freeze damage has been observed on this species.

Geoffroea decorticans CAC (2) / WCAC (1) – 2 accessions: No freeze damage has been observed on this species.

Gleditsia amorphoides CAC (1): No freeze damage has been observed on this species.

Gleditsia caspica CAC (2): No freeze damage has been observed on this species.

Gleditsia triacanthos CAC (1) / WCAC (2) – 2 accessions: No freeze damage has been observed on this species.

Gymnocladus dioicus CAC (1) / WCAC (2) – 2 accessions: No freeze damage has been observed on this species.

Halimodendron halodendron WCAC (1): No freeze damage has been observed on this species.

Havardia mexicana CAC (7) / WCAC (2): No freeze damage has been observed on this species.

Havardia pallens CAC (4) / WCAC (2): Some stems of CAC plants were frozen back to 1' (30 cm) from the tips. No stem damage was observed on WCAC plants.

Lebeckia sericea WCAC (1): This plant was planted in summer 2003 and was killed by the freeze.

Leucaena greggii CAC (3) / WCAC (1) – 2 accessions: No freeze damage was observed on these plants.

Leucaena leucocephala CAC (2) / WCAC (2) – 2 accessions: These plants froze to the base with stems to 22' (6.7 m) tall and 3" (7.5 cm) thick killed. This species suffers severe freeze damage below 25° F (-3.8° C) but exhibits vigorous recovery the following season.

Leucaena pulverulenta CAC (1) / WCAC (2): Stems to 2" (5 cm) in diameter were frozen.

Leucaena retusa CAC (2): No freeze damage was observed on these plants.

Lysiloma watsonii CAC (5) / WCAC (2): Somewhat variable damage with many stems killed to 1/2" in diameter.

Mimosa aculeaticarpa var. *biuncifera* CAC (3): No freeze damage has been observed on this species.

Mimosa asperata CAC (3): These plants typically freeze to the base at about 25° F (-3.8° C) and recover rapidly in the spring.

Mimosa distachya var. *laxiflora* CAC (3) – 2 accessions: 2 plants of 1 accession suffered major stem die-back, while the plant of the other accession had only minor stem die-back to 1' (30 cm) from the tips. This species exhibits rapid recovery in the summer.

Mimosa dysocarpa CAC (7): Many stems exhibited minor die-back to 1' (30 cm) from the tips.

Mimosa emoryana CAC (5): No freeze damage has been observed on this species.

Mimosa ephedroides CAC (3): No freeze damage was observed on these plants.

Mimosa farinosa CAC (4): No freeze damage has been observed on this species.

Mimosa grahamii CAC (1): No freeze damage has been observed on this species.

Mimosa malacophylla CAC (2): Most stems froze back 6' (1.8 m) to the base with vigorous recovery in the spring.

Mimosa strigillosa CAC (mass of several plants): This trailing species typically defoliates with freezing temperatures but the stems have not suffered noticeable freeze damage.

Nissolia schottii CAC (1): This vine froze to the base and recovered rapidly in the spring.

Olneya tesota CAC (1) / WCAC (2) – 2 accessions: These plants did not exhibit apparent freeze damage.

Parkinsonia africana WCAC (2): Many stems died back to 2' (0.6 m) from the tips.

Parkinsonia florida subsp. *florida* CAC (4) / WCAC (2) – 2 accessions: No freeze damage has been observed on this species.

Parkinsonia microphylla WCAC (2): No freeze damage has been observed on this species.

Parkinsonia praecox subsp. *praecox* CAC (2) / WCAC (2) – 2 accessions: The CAC plants sustained minor die-back to 6" (15 cm) from stem tips while the WCAC plants did not exhibit any damage.

Parkinsonia texana var. *macra* CAC (2) / WCAC (2): No freeze damage has been observed on these plants.

Parkinsonia texana var. *texana* CAC (2) / WCAC (2): No freeze damage has been observed on these plants.

Parkinsonia x **Desert Museum** CAC (2): No freeze damage has been observed on these plants.

Parkinsonia xsonorae CAC (5): Two plants were undamaged, while the others sustained some stem die-back up to 2' (0.6 m) from the tips.

Peltophorum africanum CAC (3) – 2 accessions: A plant of one accession froze back to the base and is recovering, while plants of the other accession had die-back on some stems to 2' (0.6 m) from the tips while other stems were undamaged.

Prosopidastrum globosum CAC (3): No freeze damage has been observed on this species.

Prosopis chilensis WCAC (1): No freeze damage has been observed on this species.

Prosopis glandulosa var.

glandulosa WCAC (2): No freeze damage has been observed on these plants.

Prosopis glandulosa var.

torreyana CAC (6) / WCAC (2) – 3 accessions: No freeze damage has been observed on these plants.

Prosopis laevigata CAC (1) / WCAC (2): No freeze damage has been observed on this species.

Prosopis nigra CAC (1): No freeze damage has been observed on this plant.

Prosopis pubescens CAC (3) / WCAC (2) – 2 accessions: No freeze damage has been observed on this species.

Prosopis reptans var. *cinerascens* CAC (numerous plants): No freeze damage has been observed on this species.

Prosopis velutina CAC (2) / WCAC (2): No freeze damage has been observed on this species.

Psorothamnus spinosus CAC (3): These plants did not exhibit freeze damage.

Retama raetam CAC (2): No freeze damage has been observed on this species.

Rhynchosia pyramidalis CAC (1): This herbaceous vine freezes to the base each winter.

Rhynchosia texana CAC (1): This herbaceous vine freezes to the base each winter.

Robinia pseudoacacia CAC (1): No freeze damage has been observed on this species.

Schotia afra var. *afra* WCAC (1): Severe foliage damage and stems to ½" thick were killed.

Schotia brachypetala WCAC (2): The foliage was killed and both plants froze to the base with stems to ½" thick killed. One plant died and the other is recovering.

Senna aphylla CAC (6) – 2 accessions: No freeze damage was observed on these plants.

Senna artemisioides subsp. *xartemisioides* CAC (3) – 2 accessions: The upper foliage was frozen and some stems died back to 6" (15 cm) from the tips.

Senna artemisioides subsp. *filifolia* CAC (3): These plants did not exhibit freeze damage.

Senna artemisioides subsp. *hamersleyensis* CAC (1) – 2 accessions: The single plant of one accession was killed. Plants of the other accession froze back 2' (0.6 m) to the base and are recovering.

Senna artemisioides subsp. *petiolaris* CAC (5): Severe foliage damage and some stems were killed back 3' (0.9 m) from the tips.

Senna artemisioides subsp. *xsturtii* CAC (2): Most of the foliage was frozen and many stems were killed back to 3' (0.9 m) from the tips.

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Senna artemisioides subsp. *zygophylla* CAC (3): No freeze damage was observed on these plants.

Senna confinis CAC (numerous plants): This suffrutescent species typically dies back to the base each winter following temperatures of about 25° F (-3.8° C).

Senna costata CAC (4) – 2 accessions: This species typically dies back to the base each winter following temperatures of about 25° F (-3.8° C). The plants grow to 6' (1.8 m) tall in the summer.

Senna covesii CAC (numerous plants): This short-lived, suffrutescent species did not appear to have been significantly damaged.

Senna hirsuta var. *glaberrima* CAC (2): This suffrutescent species typically dies back to the base each winter following temperatures of about 25° F (-3.8° C).

Senna lindheimeriana CAC (numerous plants): This suffrutescent species typically dies back to the base each winter following temperatures of about 25° F (-3.8° C).

Senna pallida CAC (8): This species typically dies back to the base each winter following temperatures of about 25° F (-3.8° C). The plants grow to 6' (1.8 m) tall in the summer.

Senna polyantha CAC (2): These plants sustained only minor die-back to 3" (7.5 cm) from the tips of some stems.

Senna roemeriana CAC (numerous plants): This short-lived, suffrutescent species did not appear to have been significantly damaged.

Senna wislizenii CAC (2): No freeze damage has been observed on this species.

Sophora arizonica CAC (1): No freeze damage has been observed on this species.

Sophora secundiflora CAC (1): No freeze damage has been observed on this species.

Tephrosia leiocarpa CAC (4): This suffrutescent species typically dies back to the base each winter following temperatures of about 25° F (-3.8° C).

Zapoteca formosa var. *schottii* CAC (5): The stems froze back to 3' (0.9 m) to the base with vigorous recovery in the spring.

Tree
Logo
Here

Opportunities for Participation

DELEP's bulletin *Aridus*, is published three times annually to stimulate interest in desert legumes, to inform our readers of DELEP's activities, and to encourage support for DELEP's programs. Manuscripts related to legumes are welcome and should be mailed to the editor for review. Subscriptions are complimentary and are available by contacting the DELEP office. *Aridus* is published by The University of Arizona on behalf of The Desert Legume Program.

Financial support for DELEP comes from contracts, grants and contributions from private industries, government agencies and individuals.

To Contribute: Send a check, payable to U of A Foundation/ DELEP, or call the DELEP Office concerning a pledge, a restricted gift, or estate planning.

The Desert Legume Program
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Dedicated volunteer work is an integral component of DELEP. Our volunteers come from many backgrounds and work on a variety of projects including wild seed collecting, seed processing, organization of special events, and office work.

To Volunteer: Or just to explore the possibilities, telephone our office (520) 318-7047) or drop us a note or email: kcoppola@ag.arizona.edu.

Staff and Volunteers in Action

Matt Johnson and volunteer Bill Kendall made several seed collection trips in southeastern Arizona this summer. Collecting pods at locations that are distant from earlier seed sources helps increase genetic diversity within the collection. Our thanks to Bill Kendall for accompanying Matt on those usually long days into diverse territory.

Matt and I have collected pods from *Acacia greggii* and *Prosopis velutina* specimens at the UA main Campus Ag Center location. These accessions will replenish the large seed numbers that were used in growing plants for revegetation during the 1990's. We had germinated hundreds of *Prosopis velutina* seedlings for varied grow out projects during the 1990's. Until now, many of those numbers had not been replenished.

During the past year we continued devoting time to the

photographic record of our fields. While many photos and slides have been taken during the past 15 years, we have not previously developed an image database. This database will be an important tool for use at DELEP and Boyce Thompson Arboretum. Margie Norem and I have photographed many species in our Tucson "West Campus" tree field, while Matt took several new images in the Yuma fields earlier this year. Some pictures from our now seven year old shrub field have been produced, with additional photos being added as those specimens mature, flower, and produce pods. These recent images are digital images and can be easily used in ARIDUS, Desert Plants Journal, and on the web.

Wayne MacGowan has provided important plant care in the shadehouses, throughout the summer. Wayne uses his impressive plant care

experience in providing weekend nursery care for us. He is one of our newest volunteers and has been an active participant at many of the past year's sessions.

Adam Ryan and I have spent additional time each week improving and repairing the drip-irrigation system at our west campus tree field. Many of those plants have become large specimens and we are continuing to relocate their drip emitters to improve their irrigation. The summer has been relatively dry, thus far, and we are irrigating our younger fields on a regular schedule. Our oldest fields are also being converted to drip irrigation.

Fall volunteer session dates will be on the following Wednesdays: September 8th, October 13th, November 10th, and December 8th. Please call me during any month to verify that the date has not changed.
KC

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