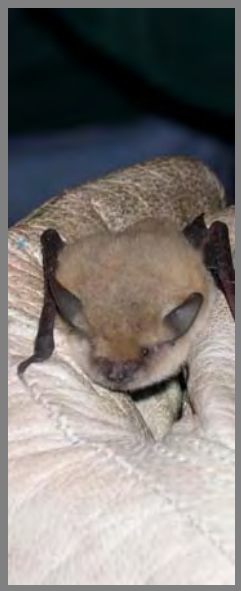
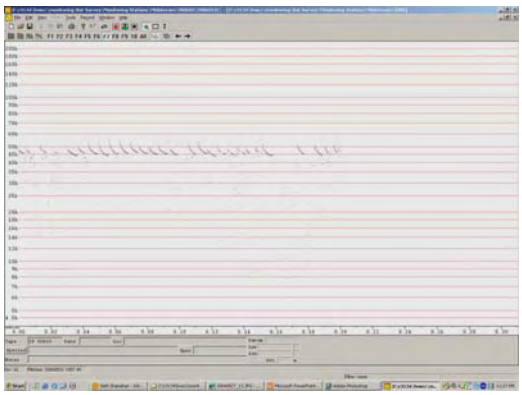
## Las Vegas Wash Coordination Committee



# Las Vegas Wash
# Bat Survey, 2004-2005





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Las Vegas Wash
Coordination
Committee

# Las Vegas Wash Bat Survey, 2004-2005

**SOUTHERN NEVADA WATER AUTHORITY**
**Las Vegas Wash Project Coordination Team**

Prepared For:
Las Vegas Wash Coordination Committee

Prepared by:

Michael J. O'Farrell, Ph.D.[1] and Seth A. Shanahan[2]

[1]O'Farrell Biological Consulting
7320 Heggie Avenue
Las Vegas, Nevada 89113

[2]Southern Nevada Water Authority
Las Vegas Wash Project Coordination Team
1900 E. Flamingo Road
Las Vegas, Nevada 89119

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# Las Vegas Wash Bat Survey, 2004-2005

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## 1.0 SUMMARY

Three continuous acoustic monitoring stations were established in the Las Vegas Wash (Wash) approximately 1.6 km apart in January 2004. Sites were intentionally selected to sample the range of microhabitats available. The Downstream Station is located in a broad open portion of channel that includes patches of common reed (*Phragmites australis*), quail bush (*Atriplex lentiformis var. lentiformis*), and tamarisk (*Tamarix ramosissima*). The Midstream Station is located in a backwater marsh habitat bordered by a dense stand of common reed and a patchy distribution of open water, unvegetated sandbars, and dense tamarisk. The Upstream Station is located along a narrow, incised portion of the Wash 4 m below the historical floodplain and is bordered by dense tamarisk and common reed.

A total of 17 species were documented for 2004 and 2005; eight are listed as Federal Species of Special Concern, four are State-listed Sensitive, and four are State-listed Protected. Fifty percent of all bat activity was recorded at the Upstream Station. The greatest species richness was found at the Downstream Station with 16 species and the least was found at the Midstream Station with 13 species. Four species (*Myotis yumanensis, My. californicus, Pipistrellus hesperus,* and *Tadarida brasiliensis*) comprised ≥ 90% of the activity at the Downstream Station both years and the Midstream Station in 2004 and *My. californicus* was replaced by *Lasiurus cinereus* in 2005. Three of the species (*My. californicus, M. yumanensis,* and *T. brasiliensis*) were core species at the Upstream Station but required *Lasiurus xanthinus,* and *Eptesicus fuscus* in 2004 and *L. xanthinus* and *P. hesperus* in 2005 to account for ≥ 90% of activity. Based on the amount of time spent at each monitoring station, habitat selection was determined for six species: *P hesperus* spent 49 and 54% of the time (2004 and 2005, respectively) at the Downstream Station; *Antrozous pallidus* (57 and 69%, 2004 and 2005, respectively) and *Corynorhinus townsendii* (62%) selected the Midstream Station; and, *T brasiliensis* (65 and 55%, 2004 and 2005, respectively), *L. xanthinus* (66 and 96%, 2004 and 2005, respectively), and *E. fuscus* (92 and 90%, 2004 and 2005, respectively) predominated at the Upstream Station. Some species showed crepuscular activity with the peak within the first hour after sunset, minor activity through the night, and a small but distinct peak within the hour prior to sunrise. Others showed a somewhat later peak and then prolonged moderate to high activity through most of the night. A few species demonstrated a later peak around 4-5 hours after sunset and then declining activity through the remainder of the night.

Of the 17 species documented along the Wash in 2004-2005, four were uncommon statewide (*Macrotus californicus, L. xanthinus, Nyctinomops macrotis,* and *Eumops perotis*) and five had never been found in Las Vegas Valley before (*Myotis ciliolabrum, M. thysanodes, M. yumanensis, Lasiurus blossevillii,* and *Idionycteris phyllotis*). The sensitive *C. townsendii* was found consistently within the Wash from spring through fall indicating the potential of a nearby maternity roost. Most species comprise a breeding community. Two of the migratory species (*L. cinereus* and *L. blossevillii*) were found in small numbers through the summer. These individuals probably composed of males and non-reproductive females. Although some species may roost long distances from the Wash, it is clearly used as an important foraging area. Four of the species are known to be particularly quiet and difficult to detect acoustically (*A. pallidus, C. townsendii, M. thysanodes,* and *Macrotus californicus*) indicating a more widespread use and quantity of activity within the Wash.

The present study provides an initial database of unprecedented detail of bat presence, activity, and habitat use within the Wash. The data demonstrate clearly that activity was variable from night to night and year to year. These variations are probably due to changes in weather patterns and other unknown abiotic and biotic factors. Only a long-term database will address these factors.

## 2.0 INTRODUCTION

Prior to 1954, all records of bat occurrence were based on shooting, finding dead animals, or locating a roost site (Hall, 1946). In 1954, mist nets were introduced to North American bat work (Dalquest, 1954), resulting in the ability to conduct focused surveys. Little was known about bat occurrence and distribution in southern Nevada until mist net studies were initiated by me in 1964. These studies were confined to small water holes that could be effectively netted. Thus the sites studied were confined to the fringes of the Las Vegas Valley and beyond.

Although mist nets provide an enhanced ability to study localized bat faunas, there is considerable bias inherent in their use (Kunz and Kurta, 1988). Technological advances over the past decade have produced acoustic equipment capable of recording and displaying the time-frequency structure of echolocation calls which then allows identification of the vocalizing species (O'Farrell, 1997; O'Farrell et al., 1999). Acoustic surveys have limitations, particularly for quiet species (O'Farrell and Gannon, 1999). However, significantly more species can be documented by acoustic means than standard capture methods (Kalko et al., 1996; O'Farrell and Gannon, 1999; Ochoa et al., 2000).

The purpose of the present study is to provide a baseline of knowledge on temporal changes in inventory and differential habitat use within the Wash. Because the baseline is being accrued during the initial phase of an extensive riparian restoration program in the Wash, the effects of the program can be documented on resident and transient bat populations. This is a final report of the initial phase of baseline collection from January 2004 through December 2005.

## 3.0 MATERIALS AND METHODS

Three acoustic monitoring stations were established at select sites within the Wash that reflect the range of habitat configurations present (Figure 1). The Downstream Station was located in a broad open portion of channel (25 m wide) with tamarisk, patches of common reed, and quail bush nearby. The unit sampled a volume over this open area. The Midstream Station was located in a backwater marsh habitat created behind one of the erosion control structures. The station sampled a volume above a dense stand of common reed and cattails (*Typha domingensis*) although a portion of the sampling volume includes a patchy distribution of open water, unvegetated sandbars, and dense tamarisk. The Upstream Station was located along a narrow portion of the Wash where the active channel has incised the historical floodplain by 4 m. The station sampled a 10 m wide portion of the stream, which was bordered on the north by dense tamarisk and the south by a moderately vegetated sandbar of tamarisk and common reed. All stations were deployed and activated on January 7, 2004. However, technical problems with the Midstream station prevented data collection until February 5, 2004.

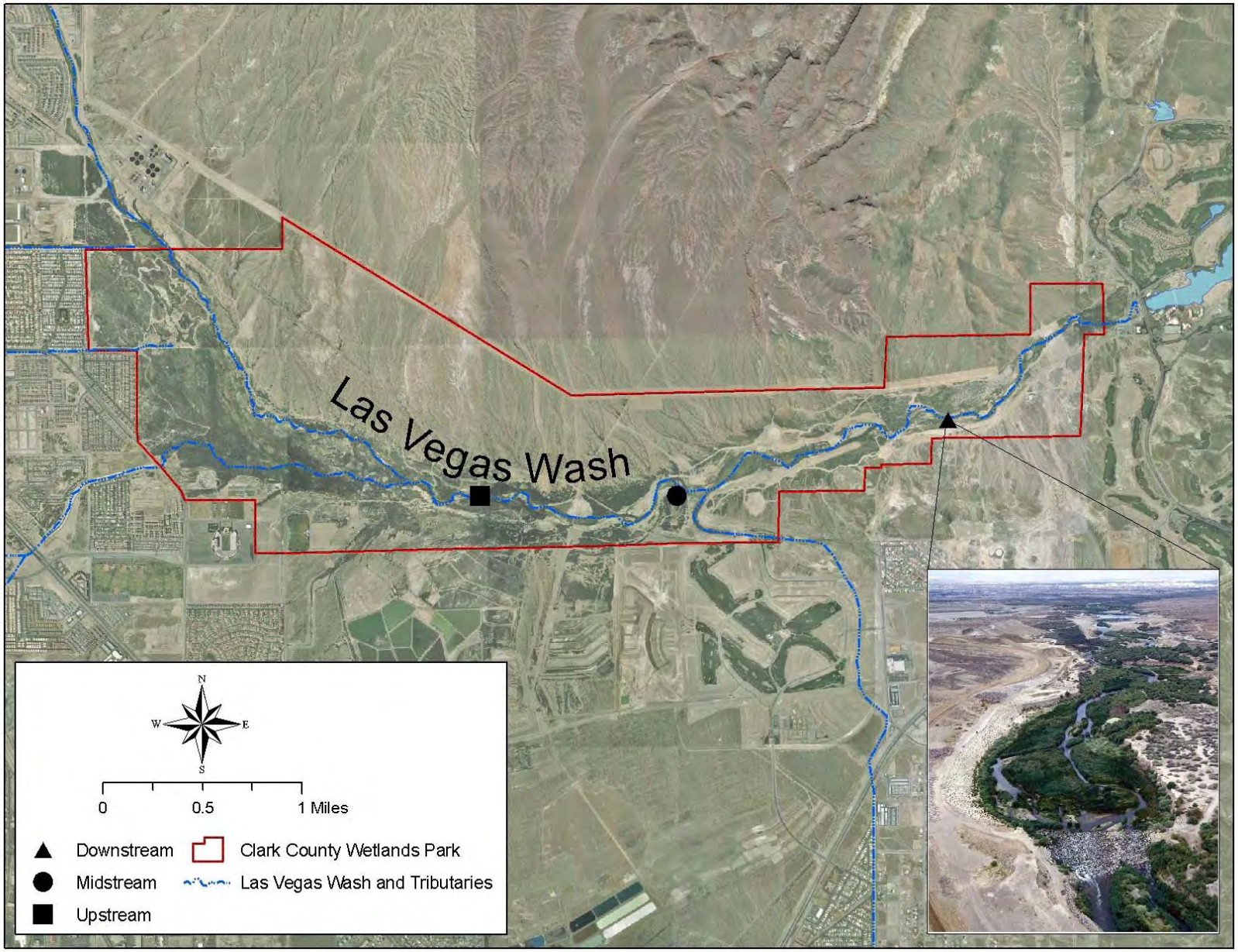


**Figure 1: Locations of the three monitoring stations in Las Vegas Wash, Clark County, Nevada.**

Likewise, during the first few months of data collection there were periodic gaps in data collection due to minor technical problems or extraneous noise, primarily from insects. Techniques were developed to orient the reflector to minimize general noise and judicious pruning of vegetation directly within the envelope of detection likewise minimized deleterious insect noise.

Each station contained an Anabat II bat detector with the microphone (i.e., transducer) encased in a protective shroud utilizing a reflector plate to collect bat vocalizations and mounted on a post approximately 3 m above ground level. The remaining equipment consisted of a Compact Flash Zero Crossings Analysis Interface Module (CF ZCAIM), a 5-watt solar panel, two rechargeable batteries, and a solar charge controller encased in a weatherproof NEMA case. The detector and CF ZCAIM were obtained from Titley Electronics, Ballina, New South Wales, Australia. In addition, a Hobo Pro Series temperature and humidity data logger (Onset Computer Corporation, Bourne, Massachusetts) were housed in a solar radiation shield and mounted on the microphone post.

Identification of species followed the methods of O'Farrell et al., 1999, based on frequency characteristics, call shape, and comparison with a comprehensive library of vocal signatures developed by O'Farrell and colleagues. Thus, species richness (# species verified as present) was obtained for each location. A key feature of the Anabat system is that each file saved to the computer is named with a time date code (e.g., B8012024.16#, where B = 2001, 8 = August, 01 = day of the month, 2024.16 = 8:24:16 PM). Thus, activity data was derived for each monitoring station. Relative abundance, or the magnitude of each species contribution to spatial use, was obtained using an Index of Activity (IA) modified from Miller (2001). The method is based upon the presence/absence of a species occurrence within 1-minute time increments. Thus, IA was the sum of increments with a species presence divided by the unit effort (IA = # minutes/nights of recording*100).

Statistical analyses were performed using SPSS (version 14.0). Standardized occurrence data (IA) were used to compare abundance/use of each species by habitat between years, which prompted use of a multiple analysis of variance (MANOVA) followed by Tukey-Kramer multiple comparisons (Zar, 1996). Statistical significance was determined using a $P < 0.05$ value for all tests.

## 4.0 RESULTS

A total of 17 species of bats have been recorded to date within the Wash (Table 1). Eight of the species are listed as Federal Species of Special Concern, four of them are State-listed Sensitive and four are State-listed Protected. Species richness varied among the sites and from year to year but no site demonstrated the entire inventory of species found within the Wash (Table 2). The trend was for species to be absent during 2005 although one species (*Lasionycteris noctivagans*) was added to the inventory at the Downstream Station. *Myotis thysanodes* was only found at the Downstream and Upstream stations and was absent at both in 2005. *Macrotus californicus* was only found at the Downstream Station and was absent in 2005.

The sampling effort generated differences among the three sites as well as from year to year at a specific site (Table 2; Appendix A-1). All measures of sampling effort (number of files, number of calls, and number of minutes) showed similar trends with a sharp drop in activity from 2004 to

| *Family Name* | **Species Name** | **Common Name** |
|---|---|---|
| Phyllostomidae | *Macrotus californicus* | California Leaf-nosed Bat **,++ |
| | | |
| Vespertilionidae | *Myotis californicus* | California Myotis |
| Vespertilionidae | *Myotis ciliolabrum* | Western Small-footed Myotis ++ |
| Vespertilionidae | *Myotis thysanodes* | Fringed Myotis ‡,++ |
| Vespertilionidae | *Myotis yumanensis* | Yuma Myotis ++ |
| Vespertilionidae | *Lasionycteris noctivagans* | Silver-haired Bat |
| Vespertilionidae | *Lasiurus blossevillii* | Western Red Bat ** |
| Vespertilionidae | *Lasiurus cinereus* | Hoary Bat |
| Vespertilionidae | *Lasiurus xanthinus* | Western Yellow Bat |
| Vespertilionidae | *Pipistrellus hesperus* | Western Pipistrelle |
| Vespertilionidae | *Eptesicus fuscus* | Big Brown Bat |
| Vespertilionidae | *Corynorhinus townsendii townsendii* | Pacific Western Big-eared Bat **,++ |
| Vespertilionidae | *Idionycteris phyllotis* | Allen's Big-eared Bat ‡,++ |
| Vespertilionidae | *Antrozous pallidus* | Pallid Bat ‡ |
| | | |
| Molossidae | *Tadarida brasiliensis* | Brazilian Free-tailed Bat ‡ |
| Molossidae | *Nyctinomops macrotis* | Big Free-tailed Bat ++ |
| Molossidae | *Eumops perotis californicus* | Greater Western Mastiff Bat **,++ |

**Table 1: Checklist of bats documented acoustically in Las Vegas Wash, 2004-2005 (Bradley et al., 2005).**

** State-listed Sensitive

‡ State-listed Protected

++ Federal Species of Special Concern (formerly Category 2 for Federal Listing)

2005: a 25% decrease at the Downstream Station, a 57% decrease at the Midstream Station, and a 43% decrease at the Upstream Station.

The Downstream Station demonstrated the greatest species richness (16 species for both years combined), lacking only *Idionycteris phyllotis* (Tables 3 and 4; Appendices A-2 and A-3). Four to five species were active through the winter although seven species were recorded in February 2005. The winter was the least active in number of minutes present. Mid-to late summer through early fall had the greatest activity in both years. Spring was the second most active season in both years. In 2004, *Tadarida brasiliensis*, *Pipistrellus hesperus*, and *Myotis yumanensis* were the primary species with *My. californicus*, *Lasiurus xanthinus*, *L. cinereus*, and *Eptesicus fuscus* as secondary in contribution to activity levels. In 2005, *T. brasiliensis* was the primary species and *M. yumanensis*, *P. hesperus*, and *My. californicus* were secondary in contribution to activity levels. The primary migratory species (*Lasiurus* spp.) were minor components in 2005 although *Lasionycteris noctivagans* only occurred in mid-fall 2005. Consistent, low activity of *Corynorhinus townsendii* from March through October 2004 is noteworthy as is the reduction in 2005 to July through October. This was the only site with

| | | Downstream | Midstream | Upstream |
|---|---|---|---|---|
| Species Richness | | | | |
| | 2004 | 15 | 13 | 14 |
| | 2005 | 14 | 13 | 13 |
| Number of Minutes | | | | |
| | 2004 | 101,614 | 66,127 | 168,428 |
| | 2005 | 76,134 | 28,594 | 95,305 |
| Total | | 177,748 | 94,721 | 263,734 |

**Table 2: Summary of Species Richness (number of species) and Index of Activity (number of minutes of activity/nights of recording*100) at the three monitoring stations in Las Vegas Wash, 2004-2005.**

*Macrotus californicus*.

The Midstream Station demonstrated the smallest species richness (13 species for both years combined), lacking *Ma. californicus, M. thysanodes, L. noctivagans,* and *N. macrotis* (Tables 5 and 6; Appendices A-4 and A-5). Three to four species were active through the winter although January and March 2004 and December 2005 were lost due to equipment problems. The winter was the least active in number of minutes present although a large presence of *T. brasiliensis* occurred in February 2004. Mid- to late summer through early fall had the greatest activity in both years. Spring was the second most active season in both years. In 2004, *My. californicus, Pipistrellus hesperus,* and *M. yumanensis* were the primary species with *T. brasiliensis, Lasiurus xanthinus,* and *A. pallidus* as secondary in contribution to activity levels. In 2005, *L. cinereus* and *M. yumanensis* were the primary species with *T. brasiliensis, P. hesperus,* and *A. pallidus* were secondary in contribution to activity levels. The primary migratory species (*Lasiurus* spp.) were minor components in 2005 except for the significant presence of *L. cinereus* in 2005 and the increase in *L. blossevillii* by a factor of 10. Consistent, moderate activity of *C. townsendii* from May through October 2004 was three times greater than found at the other stations; the reduction in activity stretching from March through September 2005 remained three times greater than the other stations. This was the only site that demonstrated presence of *I. phyllotis*.

The Upstream Station was intermediate in species richness (14 species for both years combined), lacking *Ma. californicus, I. phyllotis,* and *L. noctivagans* (Tables 7 and 8; Appendices A-6 and A-7). Four to six species were active through the winter although seven species were recorded in February 2004. The winter was the least active in number of minutes present. Summer through mid-fall had the greatest activity in both years with the peak occurring in late summer. Spring was the second most active season in both years. In both years, *T. brasiliensis* was the overwhelming primary species with *My. californicus, M. yumanensis, L. xanthinus, E. fuscus,* and *P. hesperus* as secondary in contribution to activity levels. The primary migratory species (*Lasiurus* spp.) were reduced in activity in 2005 although *L. xanthinus* was secondary in importance for both years. Consistent, low activity of *C. townsendii* was restricted to summer months.

Either four or five species accounted for ≥ 90% of the minutes of activity at all sites in both years (Tables 3-8; Appendices A-2 to A-7). At the Downstream Station, *P. hesperus, T. brasiliensis, M.*

| Species | Jan[a] | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Antrozous pallidus* | 12 | 0 | 16 | 27 | 23 | 37 | 61 | 61 | 43 | 19 | 3 | 0 | **303** |
| *Corynorhinus townsendii* | 0 | 0 | 19 | 10 | 3 | 17 | 10 | 10 | 23 | 3 | 0 | 0 | **95** |
| *Eptesicus fuscus* | 0 | 3 | 65 | 250 | 103 | 147 | 13 | 87 | 250 | 0 | 0 | 0 | **918** |
| *Eumops perotis* | 0 | 0 | 0 | 0 | 0 | 17 | 3 | 0 | 23 | 0 | 0 | 0 | **43** |
| *Lasiurus blossevillii* | 0 | 0 | 113 | 3 | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | **123** |
| *Lasiurus cinereus* | 0 | 0 | 55 | 597 | 113 | 0 | 6 | 245 | 30 | 13 | 10 | 0 | **1069** |
| *Lasiurus xanthinus* | 0 | 0 | 242 | 103 | 135 | 167 | 187 | 2519 | 3700 | 606 | 263 | 39 | **7962** |
| *Macrotus californicus* | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | **3** |
| *Myotis californicus* | 12 | 172 | 832 | 587 | 1381 | 2040 | 1561 | 2597 | 3340 | 1210 | 47 | 6 | **13785** |
| *Myotis ciliolabrum* | 0 | 0 | 0 | 0 | 6 | 0 | 3 | 3 | 3 | 0 | 0 | 0 | **16** |
| *Myotis thysanodes* | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | **3** |
| *Myotis yumanensis* | 32 | 17 | 552 | 223 | 258 | 797 | 2903 | 7868 | 7857 | 1487 | 73 | 10 | **22077** |
| *Nyctinomops macrotis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | **13** |
| *Pipistrellus hesperus* | 20 | 103 | 2397 | 637 | 1513 | 2847 | 5942 | 7068 | 6470 | 1184 | 123 | 29 | **28332** |
| *Tadarida brasiliensis* | 220 | 707 | 3648 | 4767 | 2810 | 2543 | 1826 | 4503 | 4153 | 819 | 730 | 145 | **26872** |
| **Total** | **296** | **1003** | **7939** | **7203** | **6348** | **8610** | **12523** | **24961** | **25893** | **5358** | **1250** | **229** | **101614** |

**Table 3: Activity Index (number of minutes of activity/nights of recording*100) by month and species at the Downstream Site, Las Vegas Wash, 2004. The number of minutes of activity is given in Appendix A-2.**

[a] No records for January 1-6

| Species | Jan | Feb | Mar | Apr | May | Jun | Jul[a] | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Antrozous pallidus* | 0 | 0 | 6 | 13 | 23 | 23 | 60 | 48 | 40 | 0 | 0 | 0 | **214** |
| *Corynorhinus townsendii* | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 3 | 3 | 10 | 0 | 0 | **20** |
| *Eptesicus fuscus* | 0 | 32 | 55 | 27 | 10 | 13 | 24 | 32 | 90 | 55 | 7 | 0 | **344** |
| *Eumops perotis* | 0 | 0 | 3 | 0 | 0 | 3 | 36 | 6 | 10 | 10 | 0 | 0 | **69** |
| *Lasionycteris noctivagans* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | **3** |
| *Lasiurus blossevillii* | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 7 | 3 | 0 | 0 | **13** |
| *Lasiurus cinereus* | 0 | 4 | 13 | 77 | 77 | 3 | 0 | 26 | 93 | 3 | 0 | 0 | **296** |
| *Lasiurus xanthinus* | 0 | 0 | 16 | 10 | 26 | 87 | 56 | 45 | 87 | 42 | 10 | 3 | **382** |
| *Myotis californicus* | 6 | 14 | 248 | 383 | 558 | 990 | 1456 | 703 | 1827 | 1474 | 73 | 16 | **7750** |
| *Myotis ciliolabrum* | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | **10** |
| *Myotis yumanensis* | 3 | 39 | 148 | 207 | 819 | 1440 | 2728 | 3926 | 6587 | 2229 | 673 | 84 | **18884** |
| *Nyctinomops macrotis* | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 6 | 20 | 0 | 0 | 0 | **33** |
| *Pipistrellus hesperus* | 29 | 50 | 226 | 420 | 1200 | 1780 | 4224 | 3916 | 2943 | 726 | 507 | 29 | **16050** |
| *Tadarida brasiliensis* | 368 | 832 | 2526 | 7147 | 4294 | 2973 | 2500 | 4210 | 3420 | 2503 | 893 | 400 | **32065** |
| **Total** | **406** | **975** | **3242** | **8290** | **7006** | **7317** | **11088** | **12923** | **15133** | **7058** | **2163** | **532** | **76134** |

**Table 4: Activity Index (number of minutes of activity/nights of recording*100) by month and species at the Downstream Site, Las Vegas Wash, 2005. The number of minutes of activity is given in Appendix A-3.**

[a] No records for July 11-14 and 30-31

| Species | Jan | Feb[a] | Mar | Apr[b] | May | Jun | Jul | Aug | Sep | Oct | Nov[c] | Dec[d] | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Antrozous pallidus* | - | 31 | - | 77 | 410 | 400 | 481 | 687 | 193 | 13 | 0 | 0 | **2292** |
| *Corynorhinus townsendii* | - | 0 | - | 0 | 16 | 27 | 106 | 52 | 7 | 39 | 0 | 0 | **246** |
| *Eptesicus fuscus* | - | 0 | - | 8 | 129 | 113 | 103 | 294 | 127 | 6 | 0 | 0 | **780** |
| *Eumops perotis* | - | 0 | - | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | **3** |
| *Idionycteris phyllotis* | - | 0 | - | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | **3** |
| *Lasiurus blossevillii* | - | 0 | - | 0 | 6 | 3 | 0 | 3 | 7 | 3 | 0 | 0 | **23** |
| *Lasiurus cinereus* | - | 0 | - | 0 | 0 | 3 | 0 | 0 | 10 | 0 | 0 | 0 | **13** |
| *Lasiurus xanthinus* | - | 0 | - | 65 | 174 | 163 | 384 | 761 | 1547 | 119 | 119 | 10 | **3343** |
| *Myotis californicus* | - | 13 | - | 319 | 781 | 1670 | 4503 | 6071 | 5963 | 2216 | 24 | 3 | **21563** |
| *Myotis ciliolabrum* | - | 0 | - | 0 | 3 | 13 | 3 | 19 | 13 | 3 | 0 | 0 | **56** |
| *Myotis yumanensis* | - | 0 | - | 15 | 235 | 637 | 1548 | 4477 | 7553 | 1542 | 71 | 7 | **16087** |
| *Pipistrellus hesperus* | - | 19 | - | 100 | 510 | 1290 | 5197 | 4400 | 3677 | 874 | 29 | 3 | **16098** |
| *Tadarida brasiliensis* | - | 1150 | - | 515 | 623 | 337 | 461 | 716 | 1210 | 442 | 152 | 13 | **5620** |
| **Total** | **-** | **1213** | **-** | **1100** | **2887** | **4657** | **12787** | **17481** | **20313** | **5258** | **395** | **37** | **66127** |

**Table 5: Activity Index (number of minutes of activity/nights of recording*100) by month and species at the Midstream Site, Las Vegas Wash, 2004. The number of minutes of activity is given in Appendix A-4.**

**a** No records for February 1-4 and 21-29

**b** No records for April 1-4

**c** No records for November 22-30

**d** No records for December 1

| Species | Jan[a] | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov[b] | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Antrozous pallidus* | 0 | 0 | 0 | 23 | 252 | 683 | 232 | 103 | 50 | 0 | 0 | - | **1344** |
| *Corynorhinus townsendii* | 0 | 0 | 3 | 0 | 3 | 30 | 10 | 16 | 10 | 0 | 0 | - | **72** |
| *Eptesicus fuscus* | 0 | 0 | 13 | 0 | 6 | 47 | 58 | 48 | 33 | 0 | 0 | - | **206** |
| *Eumops perotis* | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 6 | 0 | 0 | 0 | - | **10** |
| *Idionycteris phyllotis* | 0 | 0 | 0 | 10 | 13 | 0 | 3 | 3 | 0 | 0 | 0 | - | **29** |
| *Lasiurus blossevillii* | 0 | 0 | 16 | 3 | 23 | 33 | 103 | 61 | 0 | 0 | 0 | - | **240** |
| *Lasiurus cinereus* | 4 | 11 | 71 | 67 | 413 | 1493 | 2906 | 926 | 2403 | 1558 | 0 | - | **9852** |
| *Lasiurus xanthinus* | 0 | 0 | 0 | 0 | 10 | 0 | 6 | 0 | 0 | 0 | 0 | - | **16** |
| *Myotis californicus* | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 3 | 3 | 3 | 0 | - | **19** |
| *Myotis ciliolabrum* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | - | **6** |
| *Myotis yumanensis* | 0 | 4 | 32 | 77 | 271 | 523 | 1739 | 1823 | 3000 | 768 | 11 | - | **8247** |
| *Pipistrellus hesperus* | 21 | 4 | 26 | 77 | 365 | 660 | 1510 | 723 | 670 | 145 | 0 | - | **4199** |
| *Tadarida brasiliensis* | 96 | 96 | 532 | 780 | 448 | 580 | 458 | 316 | 170 | 242 | 633 | - | **4353** |
| **Total** | **121** | **114** | **694** | **1037** | **1813** | **4050** | **7029** | **4029** | **6340** | **2723** | **644** | **-** | **28594** |

**Table 6: Activity Index (number of minutes of activity/nights of recording*100) by month and species at the Midstream Site, Las Vegas Wash, 2005. The number of minutes of activity is given in Appendix A-5.**

**a** No records for January 8-10

**b** No records for November 5-16 and 22-30

| Species | Jan[a] | Feb | Mar[b] | Apr[c] | May[d] | Jun[e] | Jul[f] | Aug | Sep[g] | Oct[h] | Nov | Dec[i] | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Antrozous pallidus* | 0 | 17 | 28 | 36 | 73 | 358 | 396 | 365 | 87 | 79 | 13 | 3 | **1455** |
| *Corynorhinus townsendii* | 0 | 0 | 0 | 7 | 0 | 8 | 54 | 6 | 0 | 0 | 0 | 0 | **75** |
| *Eptesicus fuscus* | 0 | 45 | 244 | 1143 | 445 | 2185 | 9979 | 4145 | 209 | 4 | 13 | 3 | **18415** |
| *Eumops perotis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | **4** |
| *Lasiurus blossevillii* | 0 | 0 | 0 | 0 | 0 | 8 | 4 | 13 | 4 | 29 | 0 | 0 | **58** |
| *Lasiurus cinereus* | 0 | 3 | 56 | 521 | 27 | 0 | 121 | 97 | 74 | 0 | 0 | 0 | **900** |
| *Lasiurus xanthinus* | 0 | 79 | 1164 | 279 | 882 | 1446 | 3332 | 8506 | 4883 | 1025 | 237 | 7 | **21840** |
| *Myotis californicus* | 4 | 31 | 348 | 657 | 664 | 2431 | 5568 | 6039 | 6070 | 2217 | 13 | 0 | **24041** |
| *Myotis ciliolabrum* | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 6 | 4 | 17 | 0 | 0 | **56** |
| *Myotis thysanodes* | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **7** |
| *Myotis yumanensis* | 4 | 7 | 104 | 143 | 227 | 354 | 2579 | 9358 | 11757 | 3021 | 60 | 10 | **27623** |
| *Nyctinomops macrotis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | **3** |
| *Pipistrellus hesperus* | 8 | 0 | 116 | 93 | 136 | 388 | 3804 | 4542 | 3774 | 288 | 17 | 7 | **13172** |
| *Tadarida brasiliensis* | 292 | 359 | 4484 | 3464 | 2327 | 3181 | 14164 | 19519 | 8504 | 3871 | 417 | 197 | **60779** |
| **Total** | **308** | **541** | **6544** | **6350** | **4782** | **10358** | **40029** | **52600** | **35365** | **10554** | **770** | **228** | **168428** |

**Table 7: Activity Index (number of minutes of activity/nights of recording*100) by month and species at the Upstream Site, Las Vegas Wash, 2004. The number of minutes of activity is given in Appendix A-6.**

[a] No records for January 1-6
[b] No records for March 26-31
[c] No records for April 1-8 and 23-30
[d] No records for May 1-20
[e] No records for June 27-30
[f] No records for July 1 and 14-15
[g] No records for September 24-30
[h] No records for October 1-7
[i] No records for December 30-31

| Species | Jan[a] | Feb | Mar | Apr | May[b] | Jun[c] | Jul[d] | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Antrozous pallidus* | - | 0 | - | 7 | 28 | 158 | 111 | 35 | 33 | 3 | 0 | 0 | **375** |
| *Corynorhinus townsendii* | - | 0 | - | 0 | 0 | 4 | 17 | 3 | 0 | 0 | 0 | 0 | **24** |
| *Eptesicus fuscus* | - | 0 | - | 30 | 97 | 2008 | 1667 | 219 | 817 | 110 | 10 | 29 | **4986** |
| *Eumops perotis* | - | 0 | - | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | **3** |
| *Lasiurus blossevillii* | - | 0 | - | 3 | 0 | 0 | 0 | 0 | 27 | 55 | 0 | 0 | **85** |
| *Lasiurus cinereus* | - | 0 | - | 43 | 55 | 4 | 0 | 23 | 127 | 6 | 0 | 0 | **258** |
| *Lasiurus xanthinus* | - | 5 | - | 23 | 493 | 1485 | 878 | 2945 | 2920 | 1035 | 7 | 0 | **9791** |
| *Myotis californicus* | - | 10 | - | 107 | 345 | 892 | 1856 | 629 | 1947 | 1832 | 3 | 3 | **7623** |
| *Myotis ciliolabrum* | - | 0 | - | 0 | 0 | 0 | 56 | 0 | 7 | 0 | 0 | 0 | **62** |
| *Myotis yumanensis* | - | 5 | - | 77 | 766 | 2477 | 4411 | 3697 | 5550 | 1842 | 87 | 6 | **18917** |
| *Nyctinomops macrotis* | - | 0 | - | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | **7** |
| *Pipistrellus hesperus* | - | 5 | - | 90 | 355 | 1023 | 3561 | 2371 | 1633 | 390 | 33 | 6 | **9469** |
| *Tadarida brasiliensis* | - | 90 | - | 4763 | 4328 | 6958 | 7922 | 6248 | 4083 | 7255 | 607 | 1452 | **43706** |
| **Total** | **-** | **114** | **-** | **5143** | **6466** | **15008** | **20478** | **16174** | **17150** | **12529** | **747** | **1497** | **95305** |

**Table 8: Activity Index (number of minutes of activity/nights of recording*100) by month and species at the Upstream Site, Las Vegas Wash, 2005. The number of minutes of activity is given in Appendix 7.**

**a** No records for February 1-3 and 25-28

**b** No records for May 30-31

**c** No records for 27-30

**d** No records for July 1-5, 9-14 and 30-31

*yumanensis*, and *My.californicus* comprised 90 and 98% for 2004 and 2005, respectively. The same species assemblage accounted for 90% of the activity at the Midstream Station in 2004 but in 2005, *My. californicus* was a minor component and was replaced by *L. cinereus* thus accounting for 97% of the activity in 2005. At the Upstream Station, *T. brasiliensis, M. yumanensis, L. xanthinus* and *My.californicus* comprised the core species but required *E. fuscus* in 2004 to account for 91% and *P. hesperus* in 2005 to account for 94% of the activity.

An examination of bat occurrence and abundance among the three habitat types and between years showed significant differences (MANOVA for habitat $F = 2.479$, d.f. = 34, $P < 0.0001$; and year $F = 2.389$, d.f. = 17, $P < 0.05$). A comparison of mean differences between sites revealed three species selected Upstream more than either Midstream or Downstream habitats: *E. fuscus* ($P < 0.05$); *L. xanthinus* ($P < 0.05$ and $P < 0.01$, respectively); and, *T. brasiliensis* ($P < 0.05$ and $P < 0.001$, respectively). One species selected Downstream more than either Midstream or Upstream: E. perotis ($P < 0.05$). Two species selected Midstream more than Downstream or both Upstream and Downstream: *A. pallidus* ($P < 0.01$); and, *N. macrotis* ($P < 0.01$), respectively). Remaining species showed no preference among the three habitats however, several species were represented by insufficient sample size to adequately assess selection (*I. phyllotis, L. noctivagans*, and *Ma. californicus*).

The patterns and magnitude of activity through the night is variable among species as well as among sampling locations. *Pipistrellus hesperus* was crepuscular in activity patterns with a major peak of activity within the first 1-1.5 hr after sunset, low and declining activity through the night, and a small distinct peak within the hour before sunrise (Figures 2-4). *Myotis californicus* and *M. yumanensis* demonstrated a similar initial crepuscular peak but a more prolonged period of moderate to high activity through much of the night. The clear patterns shown for summer of both years (Figures 2-4) was similar in other seasons; the general trend was for spring number of minutes to be very low, whereas fall number of minutes to be near or slightly lower than summer values. The reduction in number of minutes of use from 2004 and 2005 was constant among these species and sites.

*Antrozous pallidus* and *L. xanthinus* generally showed a crepuscular pattern of activity although for *L. xanthinus* a more prolonged period of activity was found at the Upstream Station (Figures 5-7). However, *A. pallidus* demonstrated relatively constant activity through the night in summer 2004 (Figure 10). *Eptesicus fuscus* tended to show a peak of activity at 2.5-3 hrs after sunset with declining activity through the remainder of the night. *Tadarida brasiliensis* demonstrated moderate to high activity through much of the night with relatively consistent peak in activity after midnight. The clear patterns shown for summer of both years (Figures 2-4) was similar in other seasons; the general trend was for spring number of minutes to be very low, whereas fall number of minutes to be lower than summer values except for *T. brasiliensis* and *L. xanthinus* for fall 2004 at the Midstream Station. The reduction in number of minutes of use from 2004 and 2005 was constant among these species and sites.

*Lasiurus cinereus* and *L. blossevillii* showed erratic bouts of activity throughout the night for most seasons and most sites (Figures 8-10). Both species showed an early peak of activity between 2-4 hrs after sunset with declining activity through the remainder of the night in spring 2004 at the Downstream Station. The Midstream Station was the only site with sufficient

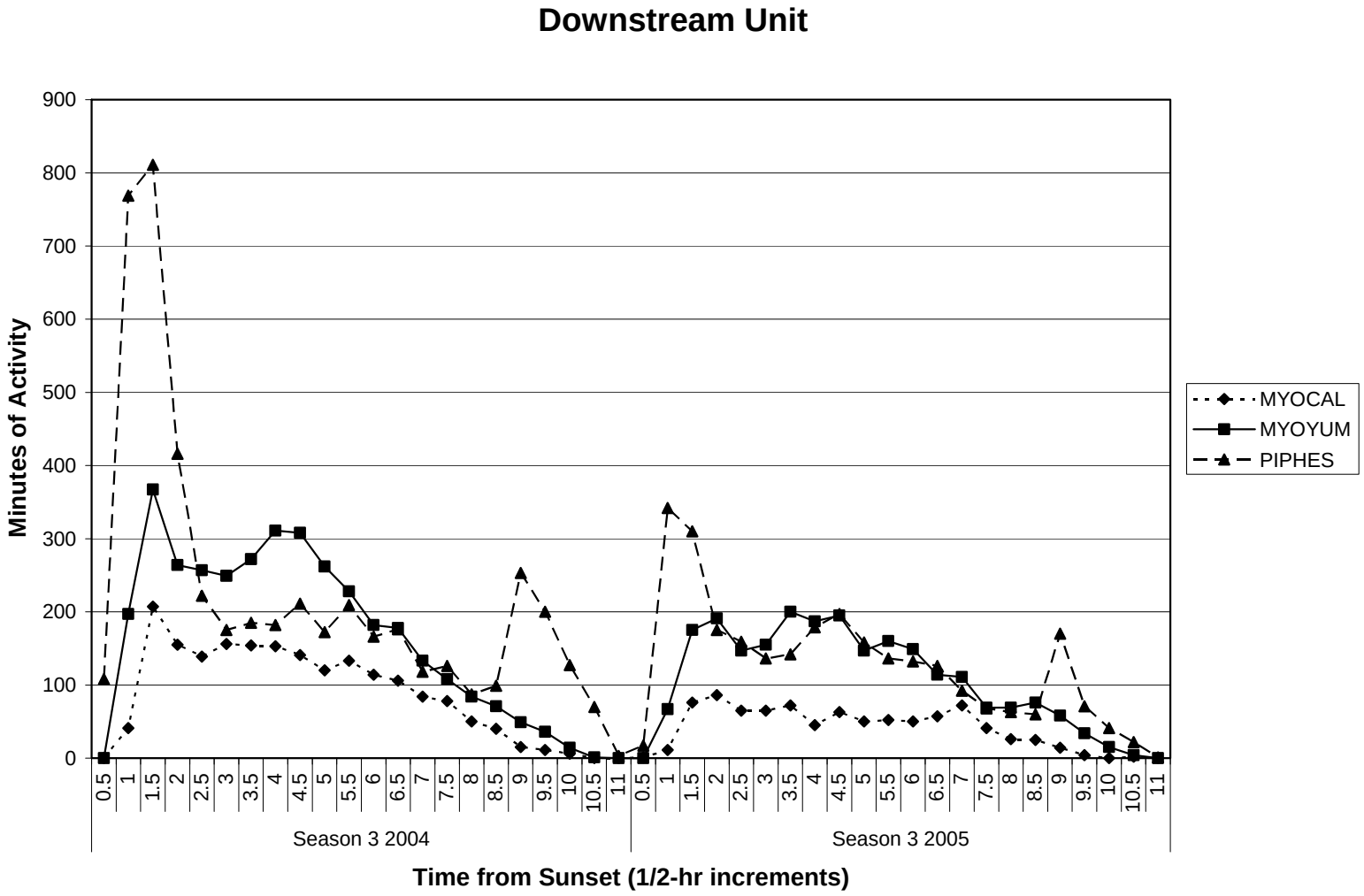


**Figure 2: Nightly activity by season for *Myotis californicus, M. yumanensis,* and *Pipistrellus hesperus* at the Downstream Unit. Season 3 = Summer.**

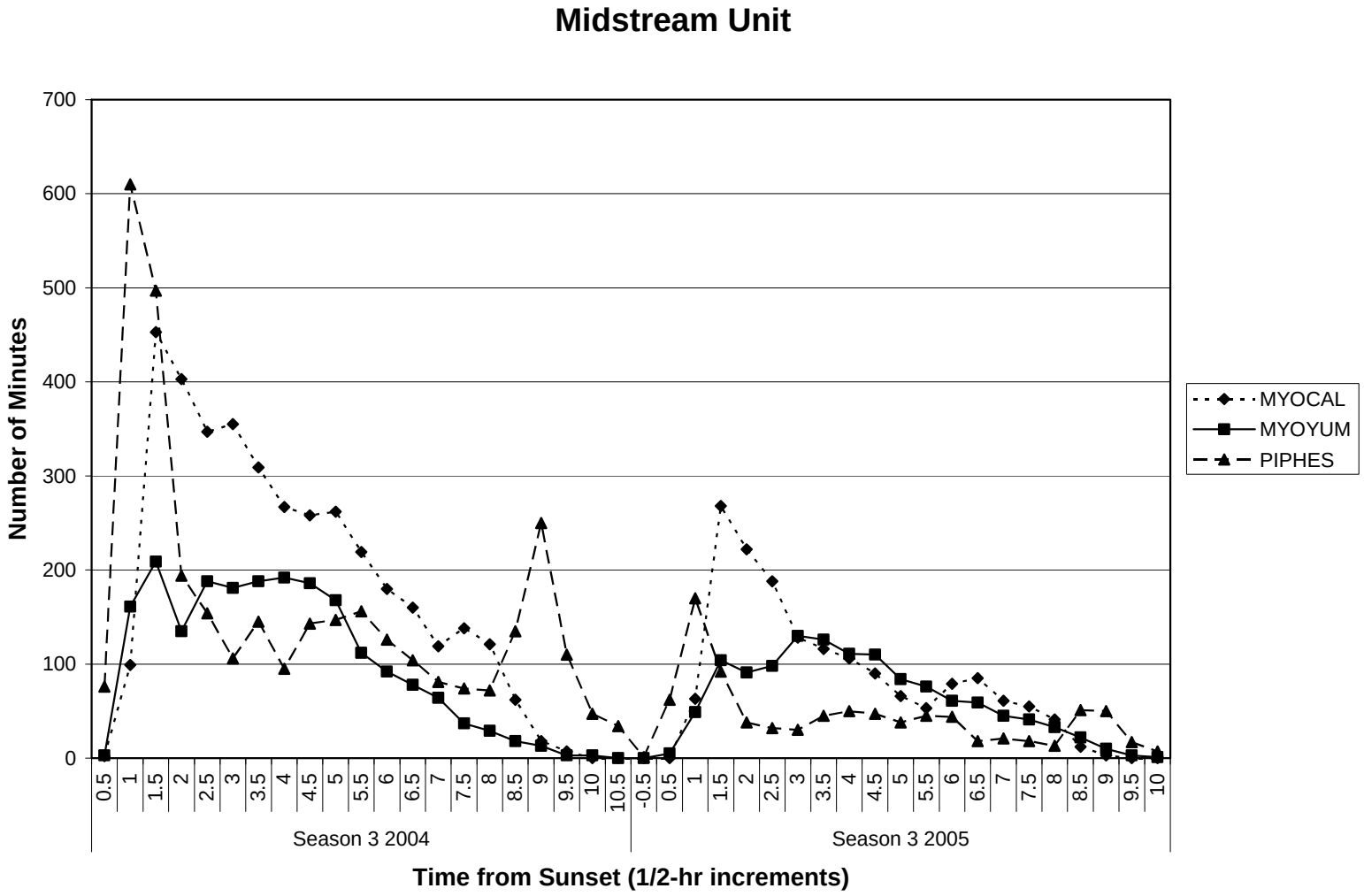


**Figure 3: Nightly activity by season for *Myotis californicus, M. yumanensis,* and *Pipistrellus hesperus* at the Midstream Unit. Season 3 = Summer.**

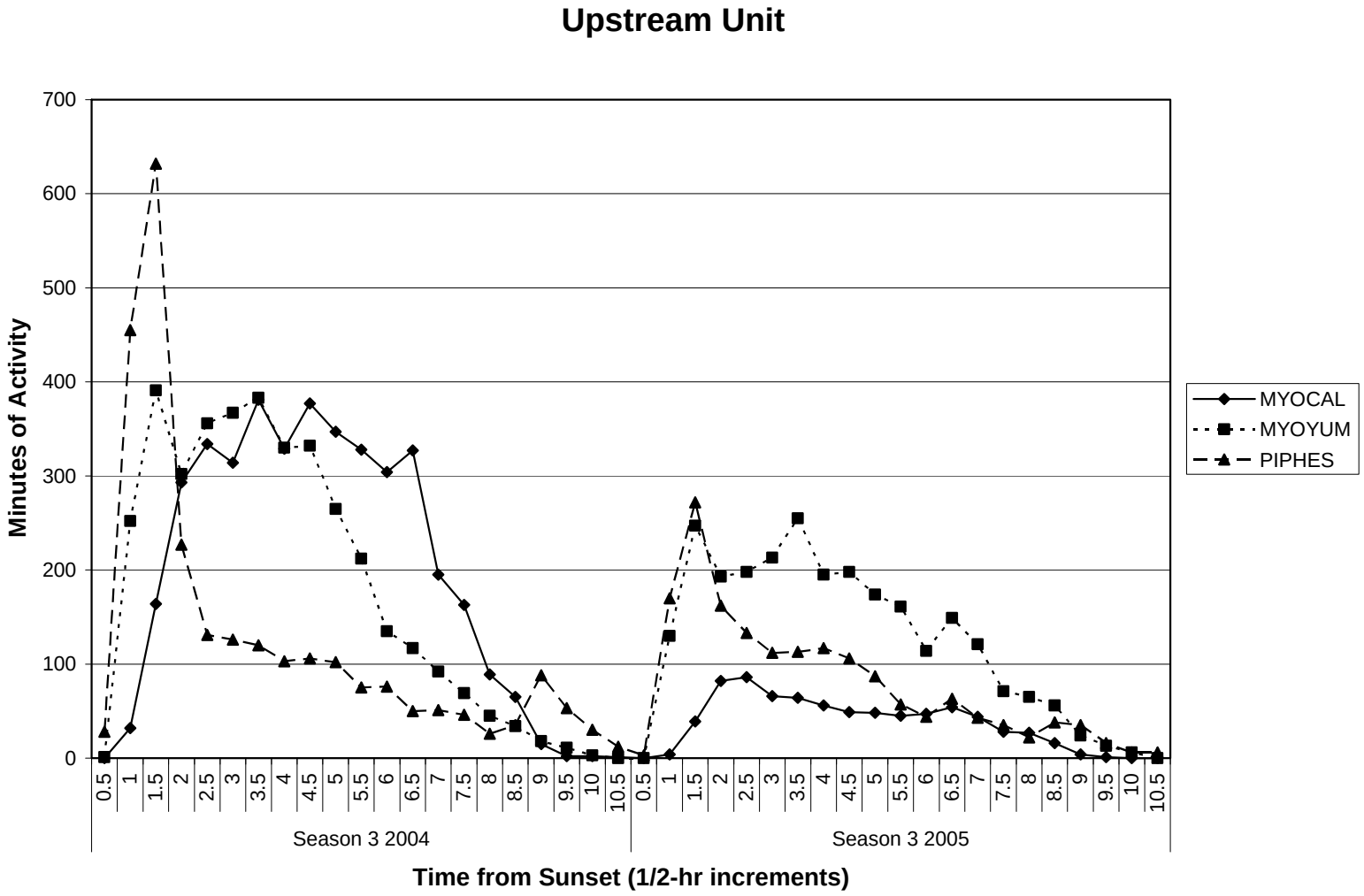


**Figure 4: Nightly activity by season for *Myotis californicus, M. yumanensis,* and *Pipistrellus hesperus* at the Upstream Unit. Season 3 = Summer.**

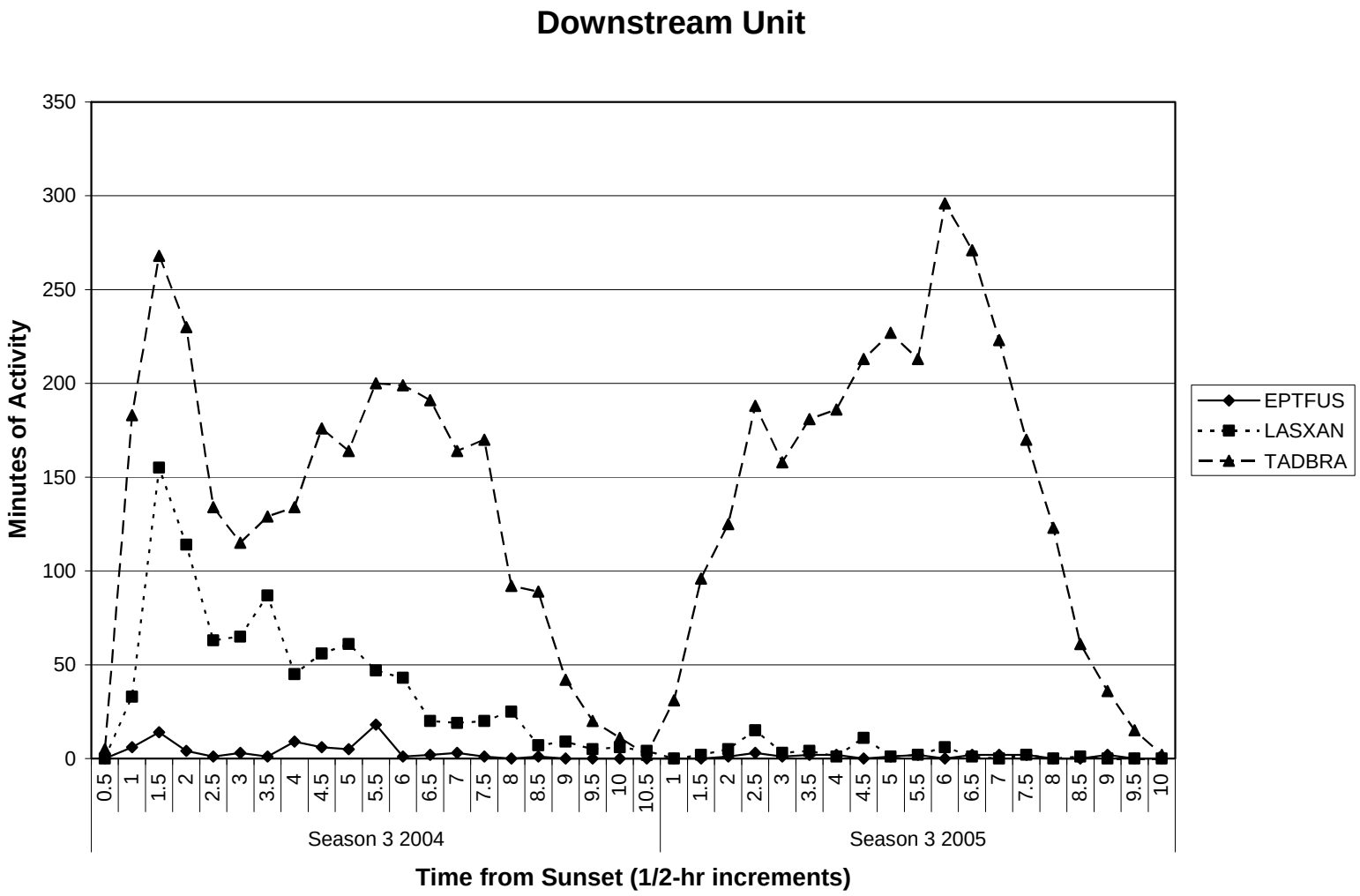


**Figure 5: Nightly activity by season for *Eptesicus fuscus, Lasiurus xanthinus,* and *Tadarida brasiliensis* at the Downstream Unit. Season 3 = Summer.**

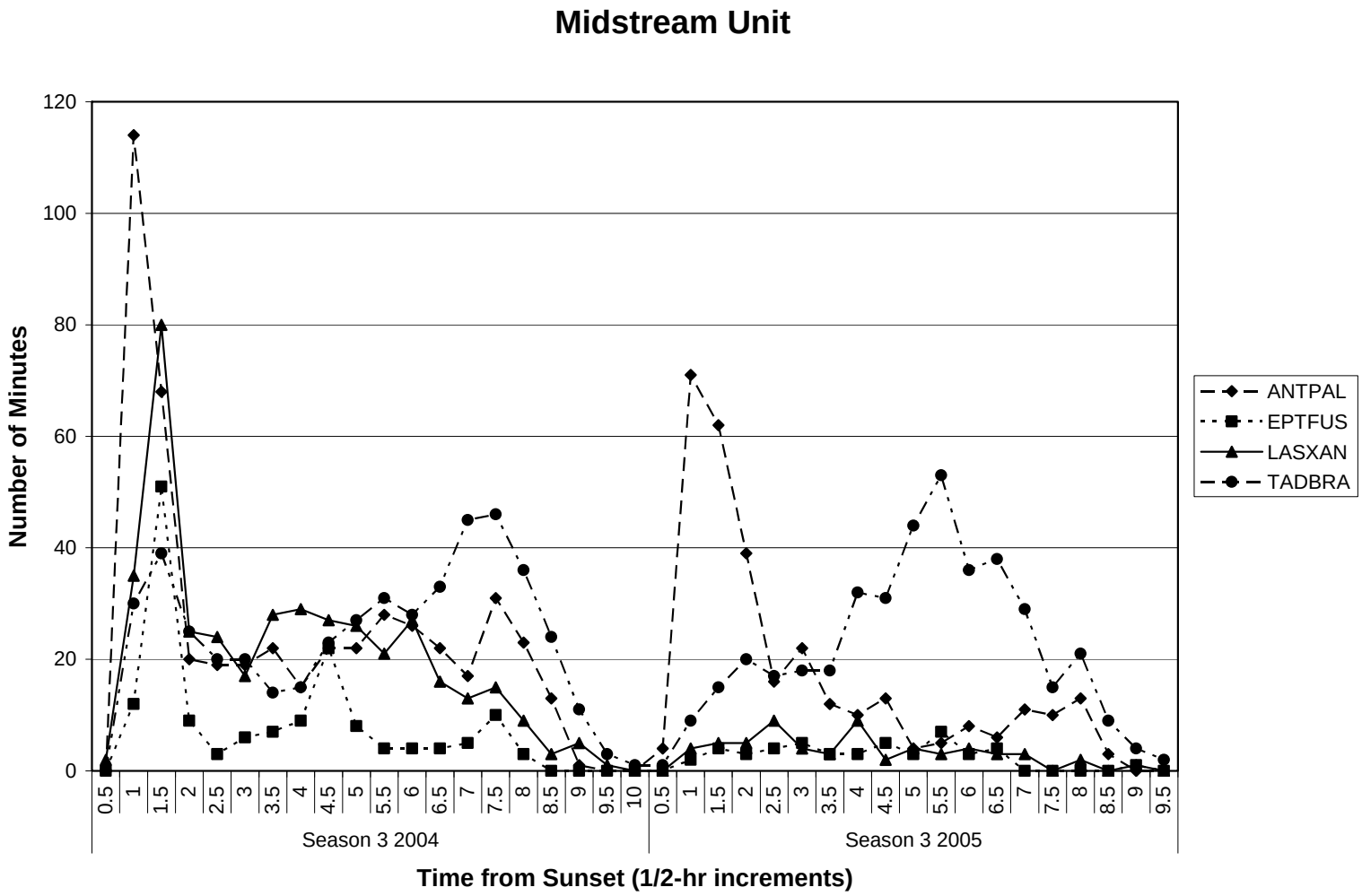


**Figure 6: Nightly activity by season for *Antrozous pallidus, Eptesicus fuscus, Lasiurus xanthinus,* and *Tadarida brasiliensis* at the Midstream Unit. Season 3 = Summer.**

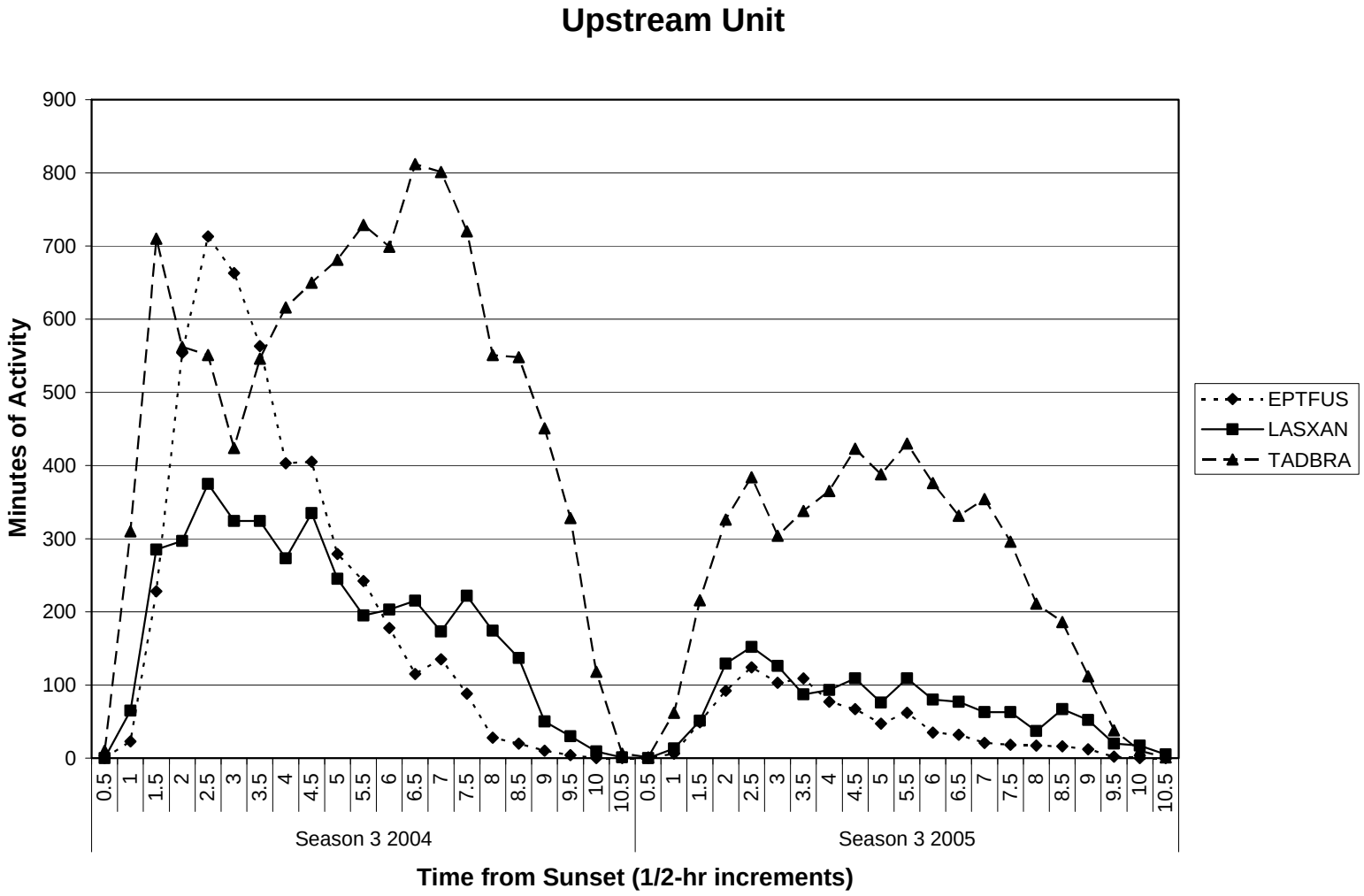


**Figure 7: Nightly activity by season for *Eptesicus fuscus, Lasiurus xanthinus,* and *Tadarida brasiliensis* at the Upstream Unit. Season 3 = Summer.**

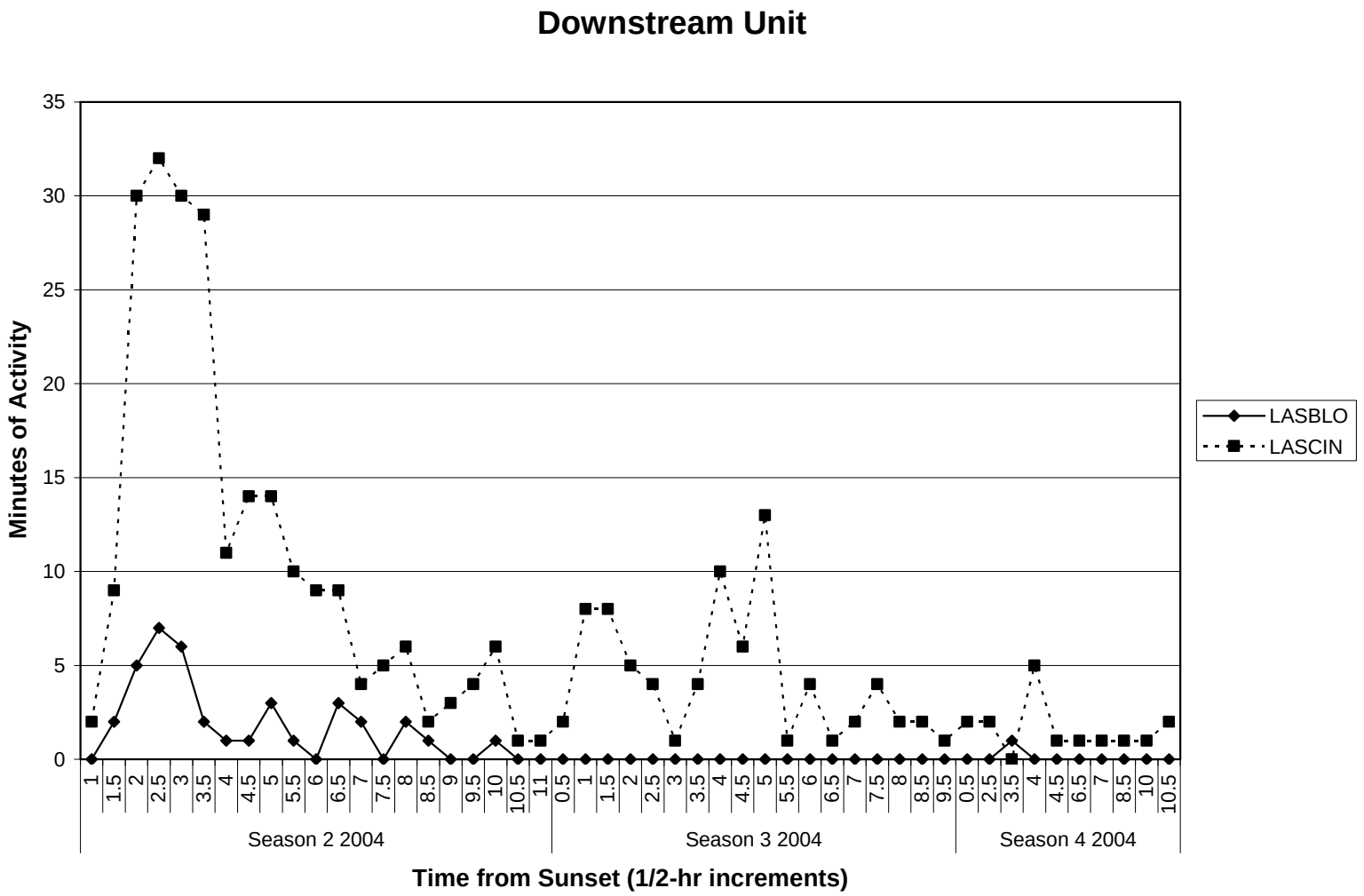


**Figure 8: Nightly activity by season for *Lasiurus blossevillii* and *L. cinereus* at the Downstream Unit. Season 2 = Spring; Season 3 = Summer; Season 4 = Fall.**

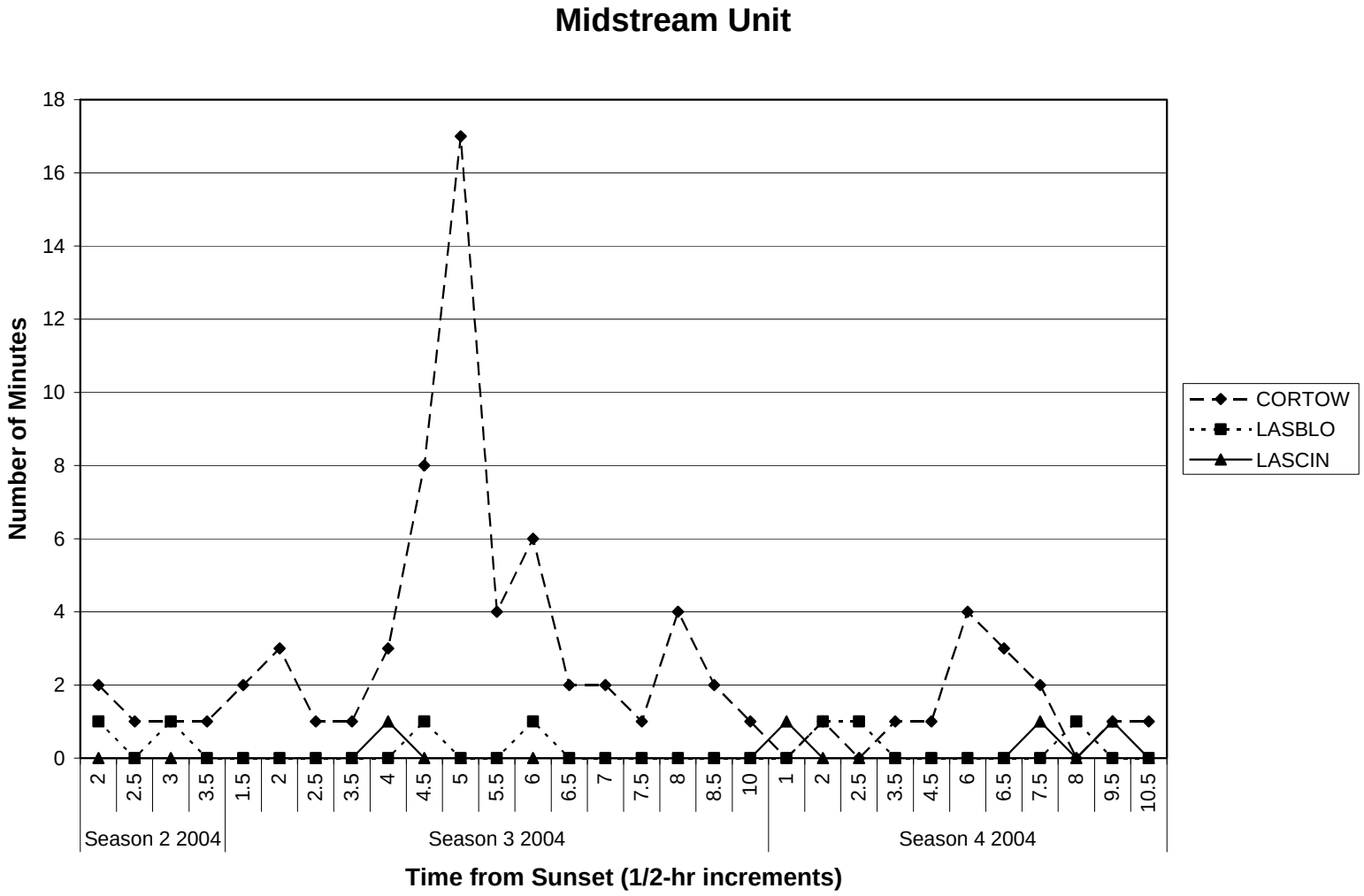


**Figure 9: Nightly activity by season for *Corynorhinus townsendii, Lasiurus blossevillii* and *L. cinereus* at the Downstream Unit. Season 2 = Spring; Season 3 = Summer; Season 4 = Fall.**

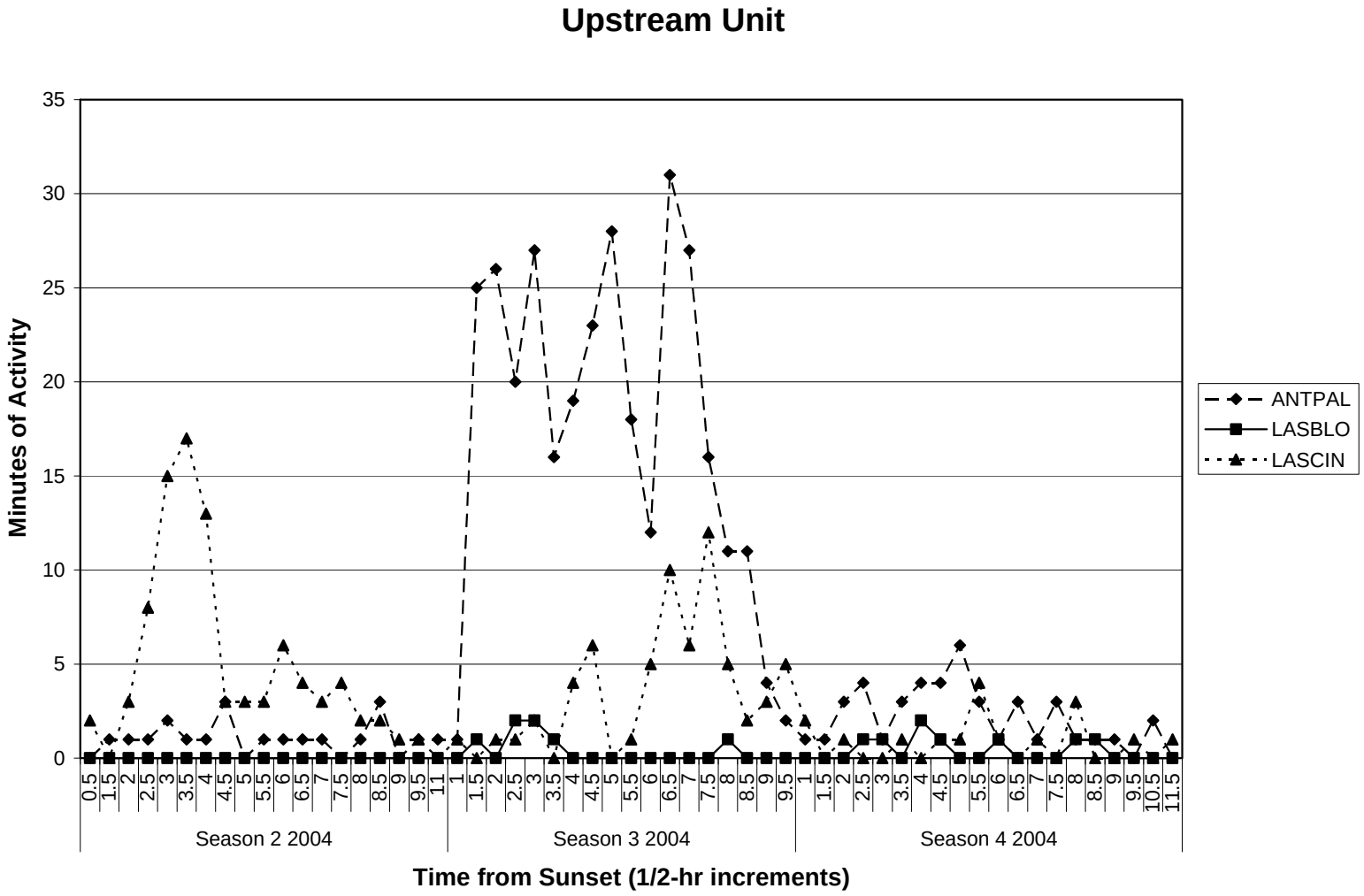


**Figure 10: Nightly activity by season for *Antrozous pallidus, Lasiurus blossevillii* and *L. cinereus* at the Upstream Unit. Season 2 = Spring; Season 3 = Summer; Season 4 = Fall**.

activity to examine temporal use by *C. townsendii* (Figure 9). The peak in activity was at 5 and 6 hours after sunset, summer and fall respectively. Where numbers permitted, the patterns in 2005 tended to show a reduction in number of minutes in all seasons except for an increase in number of minutes for *L. blossevillii* at the Upstream Station in fall 2005.

## 5.0 DISCUSSION

There were four species of uncommon (for the state of Nevada) bats documented within the Wash; three of these have designated sensitive status (Bradley et al., 2005; Table 1): *Macrotus californicus, Lasiurus xanthinus, Nyctinomops macrotis*, and *Eumops perotis*. *Macrotus californicus* was known from an historic roost in Frenchman's mine at the southern end of Frenchman's Mountain near the Wash but that was permanently closed by 1960 (O'Farrell, 1970). *Lasiurus xanthinus* is a bat recently new to the State and was only found as a transient in the Wash in May 2002 (O'Farrell et al., 2004). *Nyctinomops macrotis* was known in Nevada from a single animal found in Henderson (Bradley et al., 1965). Recent acoustic surveys have documented autumn occurrence in the Upper Moapa Valley (Williams, 2001) and Kyle and Lee canyons (O'Farrell, 2002; 2006). *Eumops perotis* was known in Nevada from a single animal found in southeast Las Vegas (Bradley and O'Farrell, 1967). Recent acoustic surveys have documented summer occurrences in Kyle Canyon (O'Farrell, 2003). The occurrence of *Ma. californicus* in the present study indicates at least a summer roost in the general vicinity of the Wash. Solitary presence at the Downstream Station further suggests a roost in the Rainbow Gardens area immediately to the north. The population of *L. xanthinus* within the Wash appears to have evolved from transient migratory use to that of year round use similar to that established in the Upper Moapa Valley (O'Farrell et al., 2004). The large molossids (*N. macrotis* and *E. perotis*) tend to fly at high altitudes and forage frequently in association with large reservoirs. They tend to roost in fissures on high cliff faces, which would suggest that these species are commuting from outside the Wash proper. Nearby Lake Las Vegas and the large open volume above the Wash would provide ample foraging space.

Five species have never been recorded in Las Vegas Valley; all have been accorded sensitive status (Bradley et al., 2005; Table 1): *Myotis ciliolabrum, M. thysanodes, M. yumanensis, Lasiurus blossevillii,* and *Idionycteris phyllotis*. *Myotis ciliolabrum* is a relatively common species of mid- to high elevations but appears to periodically use the Wash, probably as a transient. *Myotis thysanodes* was known only from a single location in Nevada near the historic town of St. Thomas which was inundated with the formation of Lake Mead (Hall, 1946). More recently, it has been documented in the Upper Moapa Valley (Williams, 2001). All further observations have been associated with mid- to high elevations within the Spring Mountain Range (O'Farrell, 2002a and b; 2006). Sparse occurrence in the Wash suggests only transient use. *Myotis yumanensis* is common along the Colorado River and associated lakes. It forages low over water. Occurrence within the valley is probably associated with the recent formation of Lake Las Vegas and construction of several weirs within the Wash. *Lasiurus blossevillii* was known in Nevada from one animal each at Overton and Fallon (Hall, 1946). Since then, several individuals have been captured near Fallon in 1958 (J. R. Alcorn collection, Nevada State Museum of Natural History). Recently, observations verified a year round presence in the Upper Moapa Valley (Williams, 2001; O'Farrell et al., 2003) and seasonal occurrence in the Spring Mountain Range (O'Farrell, 2002a and b; 2006). Prolonged use of the species in the Wash

suggests that the Wash is being used as a stepping stone during seasonal migration but harbors small numbers of individual through the summer. These individuals are probably males and/or non-reproductive females. *Idionycteris phyllotis* has a patchy distribution in Nevada since it was initially discovered in Red Rock Canyon (O'Farrell and Bradley, 1969). A single capture occurred near Gold Butte (Bradley et al., 2005). The majority of locations center in the southern Spring Mountain Range at Red Rock Canyon, Lovell Canyon, and Mt. Potosi (O'Farrell, 2002b) and more recently in lower Kyle Canyon (O'Farrell, 2006). This species was found only at the Midstream Station but occurred through the spring and summer months. The purpose of such usage is not clear at this time.

The consistent presence of *C. townsendii* with the Wash was somewhat surprising. It is known to occur around the fringe of the valley and is primarily associated with abandoned mines and old buildings (Bradley et al., 2005). There may be roosts in abandoned mines found in the Rainbow Gardens area immediately to the north of the Wash. No known probable roosts occur within the Wash proper. The species may travel long distances to reach foraging grounds so there may be no close roosts. Regardless, it is clear that the Wash is used as a consistent foraging area.

Based upon the data collected in 2004 and 2005, general seasonal and behavioral characteristics can be formulated for the inventory generated in the present study (Table 1). Six species are year round residents of the Wash: *Myotis californicus, M. yumanensis, L. xanthinus, P. hesperus, A. pallidus*, and *T. brasiliensis*. Eight species were found in the spring, summer, and fall: *M. ciliolabrum, L. blossevillii, L. cinereus, E. fuscus, C. townsendii, I. phyllotis, N. macrotis*, and *E. perotis*. Two species were detected only during the summer (*Macrotus californicus* and *M. thysanodes*) and a single species occurred only during the fall (*L. noctivagans*). All year round species are known to breed in the area. Most of the species found either during the summer, including those detected in spring and summer also breed in the area. Possible exceptions are known migratory species (*Lasiurus* spp.) with known breeding grounds elsewhere. Individuals of these species collected in the Upper Moapa Valley during the summer were found to be males or non-reproductive females (Williams, 2001). *Lasionycteris noctivagans* apparently use the Wash solely as a stepping stone during migration. The remaining species found in small numbers presumably breed within the local geographic region but pass only periodically through the wash, probably as a minor feeding ground.

Occurrence of migrating species in southern Nevada has been poorly known (Bradley et al., 2005), particularly prior to 2001 because data were solely from capture methods. *Lasiurus cinereus* was known from a handful of specimens either as individuals found dead (Bradley et al., 1965) or isolated captures, generally in May. Intense acoustic work since 2000 has documented a prolonged spring period of movement from February through early June and shorter period in the fall from late August through October (Williams, 2001; O'Farrell, 2002a and b; O'Farrell, 2006; O'Farrell et al., 2003). In the present study, the IA increased from 13 in 2004 to 9852 (Tables 5 and 6) which was mirrored by an IA of 11,963 documented simultaneously in lower Kyle Canyon in 2005 (O'Farrell, 2006). Unfortunately, the latter study did not start until November 2004. Unlike a declining trend in activity for other species (see below), the large increase for *L. cinereus* in 2005 appeared to be an unusual phenomenon in southern Nevada.

A similar, but far less dramatic, increase in activity was found for *L. blossevillii*. However, the quantity of data generated for this species from recent acoustic studies has been significant. Prior to 2001, this species was known from southern Nevada from a single specimen found in a mesquite near Overton in the 1940's (Hall, 1946). Acoustic studies documented prolonged presence in the Upper Moapa Valley (Williams, 2001; O'Farrell et al., 2003). A few isolated occurrences have been documented in the Spring Mountain Range (O'Farrell, 2002a and b). The level of activity in 2005 was similar at the Midstream Station (IA = 240; Table 6) and lower Kyle Canyon (IA = 284; O'Farrell, 2006).

Large-eared bats tend to forage in closed, cluttered microhabitats and tend to have simple short duration calls of low intensity and therefore difficult to detect acoustically (O'Farrell and Gannon, 1999). The documentation of presence of large-eared quiet species (*A. pallidus, C. townsendii, M. thysanodes,* and *Macrotus californicus*) demonstrates significant presence of these species. The large quantity of minutes of activity recorded for *C. townsendii* was unexpected because it is a very quiet bat and only can be detected at distances of less than 10 m. *Macrotus* is a whispering bat and usually cannot be recorded at distances more than 1 or 2 m. It is reasonable to assume that there is more widespread use and quantity of activity for these species within the Wash.

MANOVA analysis determined significant differences in abundance and use among the three habitats and between years. Multiple comparisons showed that Midstream was selected more than Downstream by *A. pallidus* and more than both the other habitats by *N. macrotis*. Midstream habitat differed from the other two habitats by representing a large open section of wash that was dominated by sedges and reeds with a mosaic of stream channels and other small open water. Midstream also had the largest amount of activity of *C. townsendii* but sample size was small and statistical significance was not reached ($P < 0.08$). *N. macrotis* is a high altitude, fast flying species and may prefer the large expanse of sedges and reeds for presence of adequate insects in an open setting. Downstream was selected by *E. perotis* more that either of the other two habitats. This may be a reflection of the close proximity of Downstream to Lake Las Vegas; *E. perotis* appears to prefer foraging near large reservoirs. Three species selected Upstream more than the other two habitats: *E. fuscus, L. xanthinus*, and *T. brasiliensis*, which differed from the other habitats by representing a narrow, deeply incised segment of wash bordered by dense, robust tamarisk woodland. *E. fuscus* and *L. xanthinus* are known to roost and forage in various woodland habitats. However, *T. brasiliensis* is a high altitude species that apparently is finding greater quantities of insects above the narrow, heavily wooded channel. This is borne out by activity patterns (Figure 5-7). Activity away from Upstream tended to be unimodal or bimodal, but at Upstream activity remained high throughout the majority of the night. Remaining species did not show a preference for any of the habitat types and were relatively evenly distributed throughout the Wash.

The significant difference between years is visually apparent with the sharp decline in the quantity of activity from 2004 to 2005 (Tables 3-8). The only exceptions were *N. macrotis* and *T. brasiliensis* at the Downstream Station and *L. cinereus* at the Midstream Station. The proximal cause for the disparity between years is not clear. Records from the National Weather Service at McCarran International Airport indicate that the winter of 2004-2005 was the fourth

wettest on record. The associated storm fronts accounted for greatly reduced bat activity in winter and early spring, but does not account for the magnitude of activity decline documented for 2005. In contrast, winter of 2005-2006 was unusually warm and dry promoting prolonged and greater bat activity. It was predicted that activity would increase in summer of 2005 because of the high levels of winter-spring rains and the expected increase in vegetation growth and associated insect availability. This obviously did not happen. It is equally obvious that two years do not provide a sufficient database to understand annual variations in occurrence and levels of activity, as well as potential changes in habitat preference due to prey availability in the different habitat types.

It is clear from the present study that continuous acoustic sampling has allowed an unprecedented look at bat presence, activity, and habitat use within the Wash. The operation of the monitoring stations for two years provides ample evidence of seasonal variation in occurrence and magnitude of spatial use. However, causes of these annual fluctuations and resulting magnitude of such changes remain unknown. Further, operation of other monitoring stations throughout the region will allow meaningful comparison of the simultaneous dynamics with the bat community. Not only will a greater understanding of community dynamics be determined, but also critical changes at the individual population level can be identified. Thus, deleterious events potentially can be determined and remediated in a timely manner. With respect to the Wash, a long-term database will provide an understanding of the basic dynamics of the bat community and enable the assessment of future progress in riparian restoration. The current study is part of the first step in achieving the recommendation of the Nevada Bat Conservation Plan to create a network of acoustic monitoring stations throughout the state in order to follow regional patterns in bat community dynamics (Bradley et al., 2005). Implementation of such a plan will provide invaluable knowledge in order to conserve a valuable natural resource.

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## Appendix A

Raw data of sampling effort and number of minutes of activity at the three acoustic monitoring stations in Las Vegas Wash, Clark County, Nevada during the present study (2004-2005).

Appendix A-1. Summary of sampling effort (Number of Files, Number of Calls, and Number of Minutes recorded) at the three monitoring stations in Las Vegas Wash, 2004-2005.

| | Downstream | Midstream | Upstream |
|---|---|---|---|
| Number of Files | | | |
| 2004 | 39,847 | 27,917 | 73,516 |
| 2005 | 26,930 | 10,482 | 34,238 |
| Total | 66,777 | 38,399 | 107,754 |
| Number of Calls | | | |
| 2004 | 479,636 | 317,413 | 1,459,709 |
| 2005 | 255,189 | 49,303 | 343,543 |
| Total | 734,825 | 366,716 | 1,803,252 |
| Number of Minutes | | | |
| 2004 | 31,033 | 19,973 | 44,458 |
| 2005 | 22,578 | 8,601 | 25,761 |
| Total | 53,611 | 28,574 | 70,219 |

Appendix A-2. A summary of the number of minutes of acoustic activity recorded by month and species at the Downstream Site, Las Vegas Wash, 2004.

| Species | Jan[a] | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Antrozous pallidus* | 3 | 0 | 5 | 8 | 7 | 11 | 19 | 19 | 13 | 6 | 1 | 0 | 92 |
| *Corynorhinus townsendii* | 0 | 0 | 6 | 3 | 1 | 5 | 3 | 3 | 7 | 1 | 0 | 0 | 29 |
| *Eptesicus fuscus* | 0 | 1 | 20 | 75 | 32 | 44 | 4 | 27 | 75 | 0 | 0 | 0 | 278 |
| *Eumops perotis* | 0 | 0 | 0 | 0 | 0 | 5 | 1 | 0 | 7 | 0 | 0 | 0 | 13 |
| *Lasiurus blossevillii* | 0 | 0 | 35 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 38 |
| *Lasiurus cinereus* | 0 | 0 | 17 | 179 | 35 | 0 | 2 | 76 | 9 | 4 | 3 | 0 | 325 |
| *Lasiurus xanthinus* | 0 | 0 | 75 | 31 | 42 | 50 | 58 | 781 | 1110 | 188 | 79 | 12 | 2426 |
| *Macrotus californicus* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Myotis californicus* | 3 | 50 | 258 | 176 | 428 | 612 | 484 | 805 | 1002 | 375 | 14 | 2 | 4209 |
| *Myotis ciliolabrum* | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 5 |
| *Myotis thysanodes* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Myotis yumanensis* | 8 | 5 | 171 | 67 | 80 | 239 | 900 | 2439 | 2357 | 461 | 22 | 3 | 6752 |
| *Nyctinomops macrotis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 4 |
| *Pipistrellus hesperus* | 5 | 30 | 743 | 191 | 469 | 854 | 1842 | 2191 | 1941 | 367 | 37 | 9 | 8679 |
| *Tadarida brasiliensis* | 55 | 205 | 1131 | 1430 | 871 | 763 | 566 | 1396 | 1246 | 254 | 219 | 45 | 8181 |
| Total | 74 | 291 | 2461 | 2161 | 1968 | 2583 | 3882 | 7738 | 7768 | 1661 | 375 | 71 | 31033 |

**a** No records for January 1-6

Appendix A-3. A summary of the number of minutes of acoustic activity recorded by month and species at the Downstream Site, Las Vegas Wash, 2005.

| Species | Jan | Feb | Mar | Apr | May | Jun | Jul[a] | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Antrozous pallidus* | 0 | 0 | 2 | 4 | 7 | 7 | 15 | 15 | 12 | 0 | 0 | 0 | 62 |
| *Corynorhinus townsendii* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 3 | 0 | 0 | 6 |
| *Eptesicus fuscus* | 0 | 9 | 17 | 8 | 3 | 4 | 6 | 10 | 27 | 17 | 2 | 0 | 103 |
| *Eumops perotis* | 0 | 0 | 1 | 0 | 0 | 1 | 9 | 2 | 3 | 3 | 0 | 0 | 19 |
| *Lasionycteris noctivagans* | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 4 |
| *Lasiurus blossevillii* | 0 | 1 | 4 | 23 | 24 | 1 | 0 | 8 | 28 | 1 | 0 | 0 | 90 |
| *Lasiurus cinereus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| *Lasiurus xanthinus* | 0 | 0 | 5 | 3 | 8 | 26 | 14 | 14 | 26 | 13 | 3 | 1 | 113 |
| *Myotis californicus* | 2 | 4 | 77 | 115 | 173 | 297 | 364 | 218 | 548 | 457 | 22 | 5 | 2282 |
| *Myotis ciliolabrum* | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 3 |
| *Myotis yumanensis* | 1 | 11 | 46 | 62 | 254 | 432 | 682 | 1217 | 1976 | 691 | 202 | 26 | 5600 |
| *Nyctinomops macrotis* | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 6 | 0 | 0 | 0 | 10 |
| *Pipistrellus hesperus* | 9 | 14 | 70 | 126 | 372 | 534 | 1056 | 1214 | 883 | 225 | 152 | 9 | 4664 |
| *Tadarida brasiliensis* | 114 | 233 | 783 | 2144 | 1331 | 892 | 625 | 1305 | 1026 | 776 | 268 | 124 | 9621 |
| Total | 126 | 273 | 1005 | 2487 | 2172 | 2195 | 2772 | 4006 | 4540 | 2188 | 649 | 165 | 22578 |

**a** No records for July 11-14 and 30-31

Appendix A-4. A summary of the number of minutes of acoustic activity recorded by month and species at the Midstream Site, Las Vegas Wash, 2004.

| Species | Jan | Feb[a] | Mar | Apr[b] | May | Jun | Jul | Aug | Sep | Oct | Nov[c] | Dec[d] | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Antrozous pallidus* | - | 5 | - | 20 | 127 | 120 | 149 | 213 | 58 | 4 | 0 | 0 | 696 |
| *Corynorhinus townsendii* | - | 0 | - | 0 | 5 | 8 | 33 | 16 | 2 | 12 | 0 | 0 | 76 |
| *Eptesicus fuscus* | - | 0 | - | 2 | 40 | 34 | 32 | 91 | 38 | 2 | 0 | 0 | 239 |
| *Eumops perotis* | - | 0 | - | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| *Idionycteris phyllotis* | - | 0 | - | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| *Lasiurus blossevillii* | - | 0 | - | 0 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 0 | 7 |
| *Lasiurus cinereus* | - | 0 | - | 0 | 0 | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 4 |
| *Lasiurus xanthinus* | - | 0 | - | 17 | 54 | 49 | 119 | 236 | 464 | 37 | 25 | 3 | 1004 |
| *Myotis californicus* | - | 2 | - | 83 | 242 | 501 | 1396 | 1882 | 1789 | 687 | 5 | 1 | 6588 |
| *Myotis ciliolabrum* | - | 0 | - | 0 | 1 | 4 | 1 | 6 | 4 | 1 | 0 | 0 | 17 |
| *Myotis yumanensis* | - | 0 | - | 4 | 73 | 191 | 480 | 1388 | 2266 | 478 | 15 | 2 | 4897 |
| *Pipistrellus hesperus* | - | 3 | - | 26 | 158 | 387 | 1611 | 1364 | 1103 | 271 | 6 | 1 | 4930 |
| *Tadarida brasiliensis* | - | 184 | - | 134 | 193 | 101 | 143 | 222 | 363 | 137 | 32 | 4 | 1513 |
| Total | - | 194 | - | 286 | 895 | 1397 | 3964 | 5419 | 6094 | 1630 | 83 | 11 | 19973 |

**a** No records for February 1-4 and 21-29

**b** No records for April 1-4

**c** No records for November 22-30

**d** No records for December 1

Appendix A-5. A summary of the number of minutes of acoustic activity recorded by month and species at the Midstream Site, Las Vegas Wash, 2005.

| Species | Jan[a] | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov[b] | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Antrozous pallidus* | 0 | 0 | 0 | 7 | 78 | 205 | 72 | 32 | 15 | 0 | 0 | - | 409 |
| *Corynorhinus townsendii* | 0 | 0 | 1 | 0 | 1 | 9 | 3 | 5 | 3 | 0 | 0 | - | 22 |
| *Eptesicus fuscus* | 0 | 0 | 4 | | 2 | 14 | 18 | 15 | 10 | 0 | 0 | - | 63 |
| *Eumops perotis* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | - | 3 |
| *Idionycteris phyllotis* | 0 | 0 | 0 | 3 | 4 | | 1 | 1 | 0 | 0 | 0 | - | 9 |
| *Lasiurus blossevillii* | 0 | 0 | 5 | 1 | 7 | 10 | 32 | 19 | 0 | 0 | 0 | - | 74 |
| *Lasiurus cinereus* | 1 | 3 | 22 | 20 | 128 | 448 | 901 | 287 | 721 | 483 | 0 | - | 3014 |
| *Lasiurus xanthinus* | 0 | 0 | 0 | 0 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | - | 5 |
| *Myotis californicus* | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 1 | 1 | 0 | - | 6 |
| *Myotis ciliolabrum* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | - | 2 |
| *Myotis yumanensis* | 0 | 1 | 10 | 23 | 84 | 157 | 539 | 565 | 900 | 238 | 1 | - | 2518 |
| *Pipistrellus hesperus* | 6 | 1 | 8 | 23 | 113 | 198 | 468 | 224 | 201 | 45 | 0 | - | 1287 |
| *Tadarida brasiliensis* | 27 | 27 | 165 | 234 | 139 | 174 | 142 | 98 | 51 | 75 | 57 | - | 1189 |
| Total | 34 | 32 | 215 | 311 | 562 | 1215 | 2179 | 1249 | 1902 | 844 | 58 | - | 8601 |

**a** No records for January 8-10

**b** No records for November 5-16 and 22-30

Appendix A-6. A summary of the number of minutes of acoustic activity recorded by month and species at the Upstream Site, Las Vegas Wash, 2004.

| Species | Jan[a] | Feb | Mar[b] | Apr[c] | May[d] | Jun[e] | Jul[f] | Aug | Sep[g] | Oct[h] | Nov | Dec[i] | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Antrozous pallidus* | 0 | 5 | 7 | 5 | 8 | 93 | 111 | 113 | 20 | 19 | 4 | 1 | 386 |
| *Corynorhinus townsendii* | 0 | 0 | 0 | 1 | 0 | 2 | 15 | 2 | 0 | 0 | 0 | 0 | 20 |
| *Eptesicus fuscus* | 0 | 13 | 61 | 160 | 49 | 568 | 2794 | 1285 | 48 | 1 | 4 | 1 | 4984 |
| *Eumops perotis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| *Lasiurus blossevillii* | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 4 | 1 | 7 | 0 | 0 | 15 |
| *Lasiurus cinereus* | 0 | 1 | 14 | 73 | 3 | 0 | 34 | 30 | 17 | 0 | 0 | 0 | 172 |
| *Lasiurus xanthinus* | 0 | 23 | 291 | 39 | 97 | 376 | 933 | 2637 | 1123 | 246 | 71 | 2 | 5838 |
| *Myotis californicus* | 1 | 9 | 87 | 92 | 73 | 632 | 1559 | 1872 | 1396 | 532 | 4 | 0 | 6257 |
| *Myotis ciliolabrum* | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 2 | 1 | 4 | 0 | 0 | 15 |
| *Myotis thysanodes* | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Myotis yumanensis* | 1 | 2 | 26 | 20 | 25 | 92 | 722 | 2901 | 2704 | 725 | 18 | 3 | 7239 |
| *Nyctinomops macrotis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| *Pipistrellus hesperus* | 2 | | 29 | 13 | 15 | 101 | 1065 | 1408 | 868 | 69 | 5 | 2 | 3577 |
| *Tadarida brasiliensis* | 73 | 104 | 1121 | 485 | 256 | 827 | 3966 | 6051 | 1956 | 929 | 125 | 57 | 15950 |
| Total | 77 | 157 | 1636 | 889 | 526 | 2693 | 11208 | 16306 | 8134 | 2533 | 231 | 66 | 44456 |

[a] No records for January 1-6
[b] No records for March 26-31
[c] No records for April 1-8 and 23-30
[d] No records for May 1-20
[e] No records for June 27-30
[f] No records for July 1 and 14-15
[g] No records for September 24-30
[h] No records for October 1-7
[i] No records for December 30-31

Appendix A-7. A summary of the number of minutes of acoustic activity recorded by month and species at the Upstream Site, Las Vegas Wash, 2005.

| Species | Jan | Feb[a] | Mar | Apr | May[b] | Jun[c] | Jul[d] | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Antrozous pallidus* | - | 0 | - | 2 | 8 | 41 | 20 | 11 | 10 | 1 | 0 | 0 | 93 |
| *Corynorhinus townsendii* | - | 0 | - | 0 | 0 | 1 | 3 | 1 | 0 | 0 | 0 | 0 | 5 |
| *Eptesicus fuscus* | - | 0 | - | 9 | 28 | 522 | 300 | 68 | 245 | 34 | 3 | 9 | 1218 |
| *Eumops perotis* | - | 0 | - | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| *Lasiurus blossevillii* | - | 0 | - | 1 | 0 | 0 | 0 | 0 | 8 | 17 | 0 | 0 | 26 |
| *Lasiurus cinereus* | - | 0 | - | 13 | 16 | 1 | 0 | 7 | 38 | 2 | 0 | 0 | 77 |
| *Lasiurus xanthinus* | - | 1 | - | 7 | 143 | 386 | 158 | 913 | 876 | 321 | 2 | 0 | 2807 |
| *Myotis californicus* | - | 2 | - | 32 | 100 | 232 | 334 | 195 | 584 | 568 | 1 | 1 | 2049 |
| *Myotis ciliolabrum* | - | 0 | - | 0 | 0 | 0 | 10 | 0 | 2 | 0 | 0 | 0 | 12 |
| *Myotis thysanodes* | - | 1 | - | 23 | 222 | 644 | 794 | 1146 | 1665 | 571 | 26 | 2 | 5094 |
| *Myotis yumanensis* | - | 0 | - | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| *Nyctinomops macrotis* | - | 1 | - | 27 | 103 | 266 | 641 | 735 | 490 | 121 | 10 | 2 | 2396 |
| *Pipistrellus hesperus* | - | 19 | - | 1429 | 1255 | 1809 | 1426 | 1937 | 1225 | 2249 | 182 | 450 | 11981 |
| *Tadarida brasiliensis* | - | 0 | - | 2 | 8 | 41 | 20 | 11 | 10 | 1 | 0 | 0 | 93 |
| Total | - | 24 | - | 1543 | 1875 | 3902 | 3686 | 5014 | 5145 | 3884 | 224 | 464 | 25761 |

**a** No records for February 1-3 and 25-28

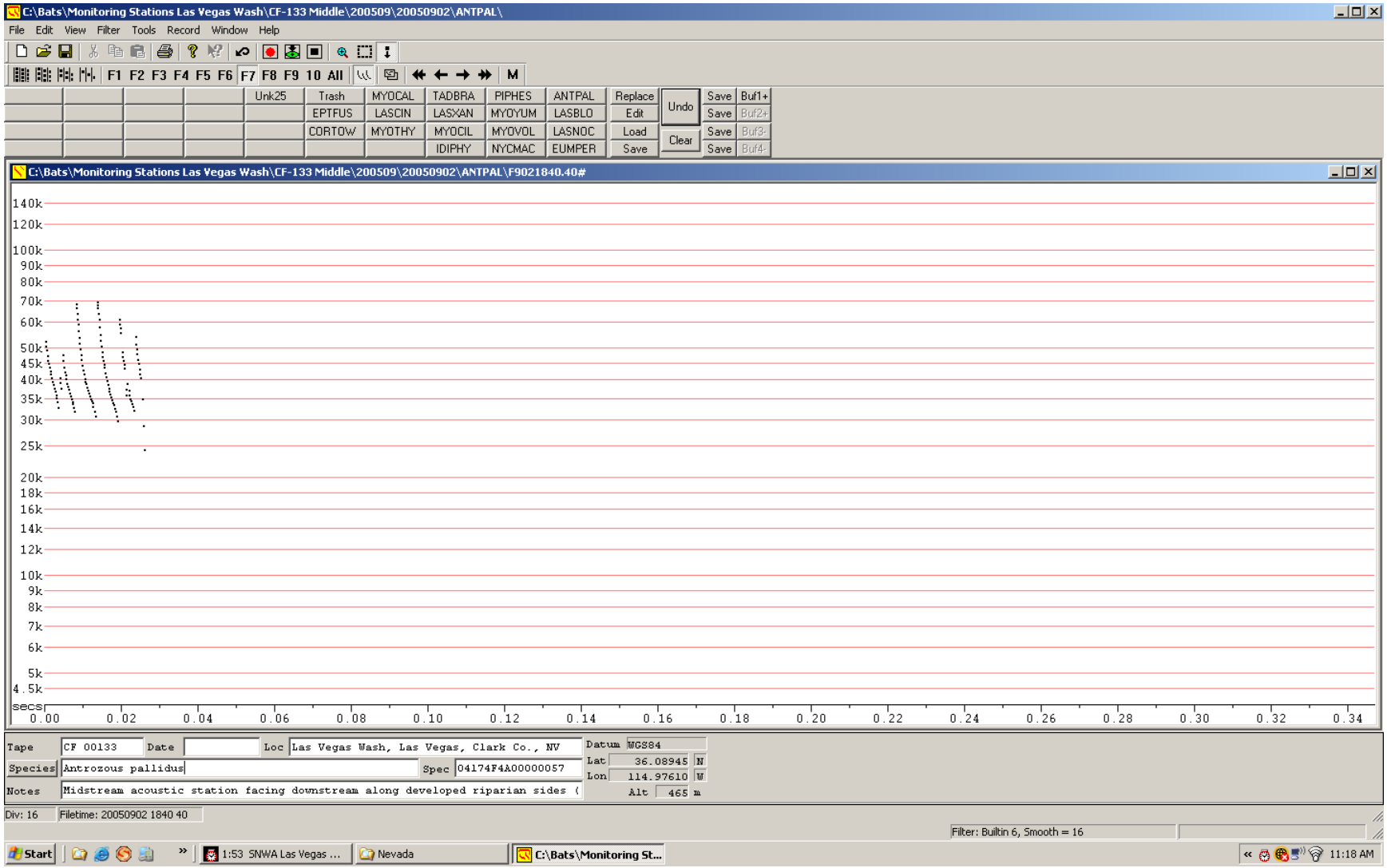
**b** No records for May 30-31

**c** No records for June 27-30

**d** No records for July 1-5, 9-14 and 30-31

## Appendix B

Representative vocal signatures of each species of bat detected within Las Vegas Wash, Clark County, Nevada during the present study (2004-2005).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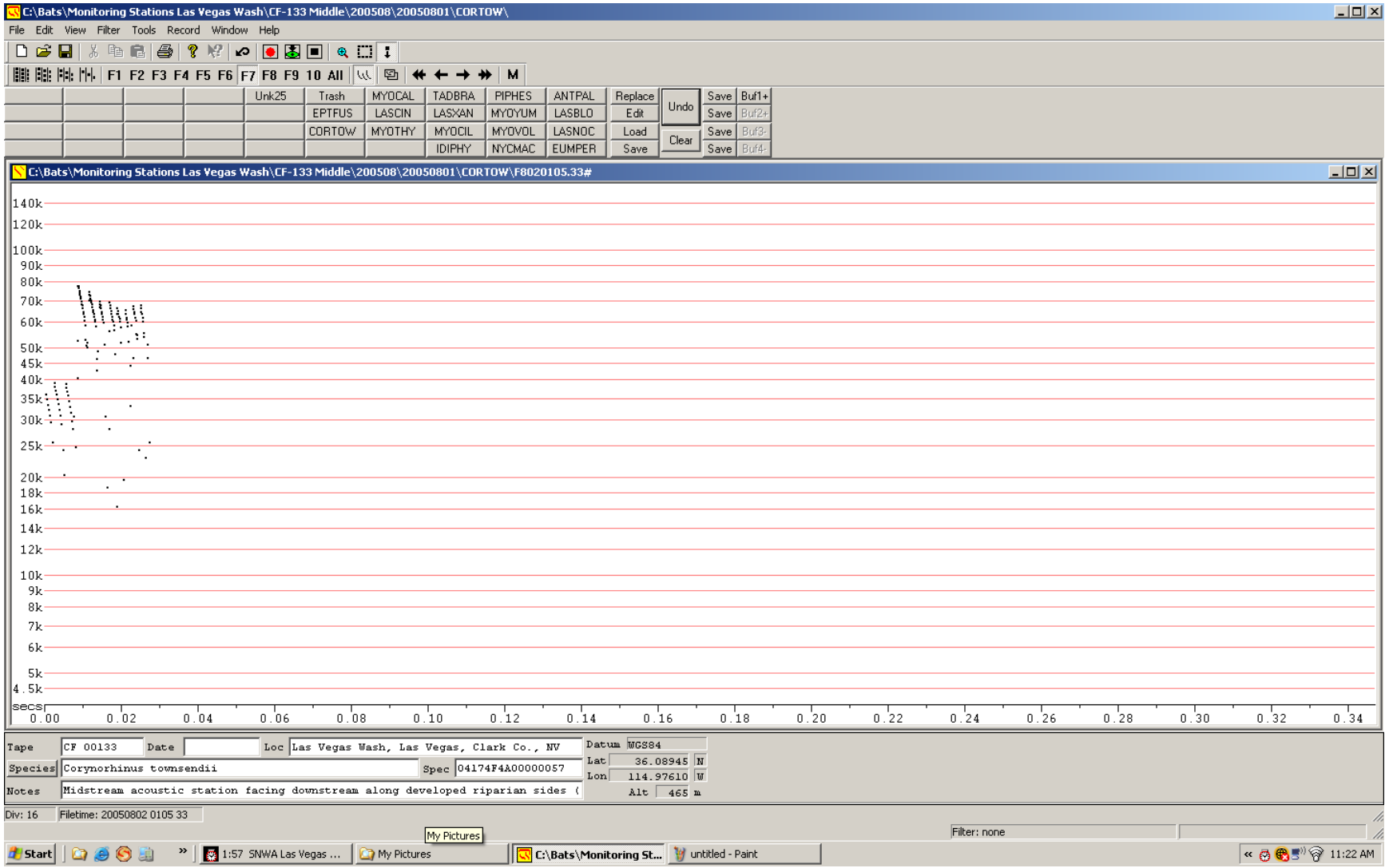
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load
IDIPHY NYCMAC EUMPER Save
Undo
Clear
Save Buf1+
Save Buf2+
Save Buf3-
Save Buf4-
C:\Bats\Monitoring Stations Las Vegas Wash\CF-133 Middle\200509\20050902\ANTPAL\F9021840.40#
140k
120k
100k
90k
80k
70k
60k
50k
45k
40k
35k
30k
25k
20k
18k
16k
14k
12k
10k
9k
8k
7k
6k
5k
4.5k
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00133 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV
Species Antrozous pallidus Spec 04174F4A00000057
Notes Midstream acoustic station facing downstream along developed riparian sides (
Datum WGS84
Lat 36.08945 N
Lon 114.97610 W
Alt 465 m
Div: 16 Filetime: 20050902 1840 40
Filter: Builtin 6, Smooth = 16
Start
1:53 SNWA Las Vegas ...
Nevada
C:\Bats\Monitoring St...
11:18 AM


C:\Bats\Monitoring Stations Las Vegas Wash\CF-133 Middle\200508\20050801\CORTOW\
File Edit View Filter Tools Record Window Help
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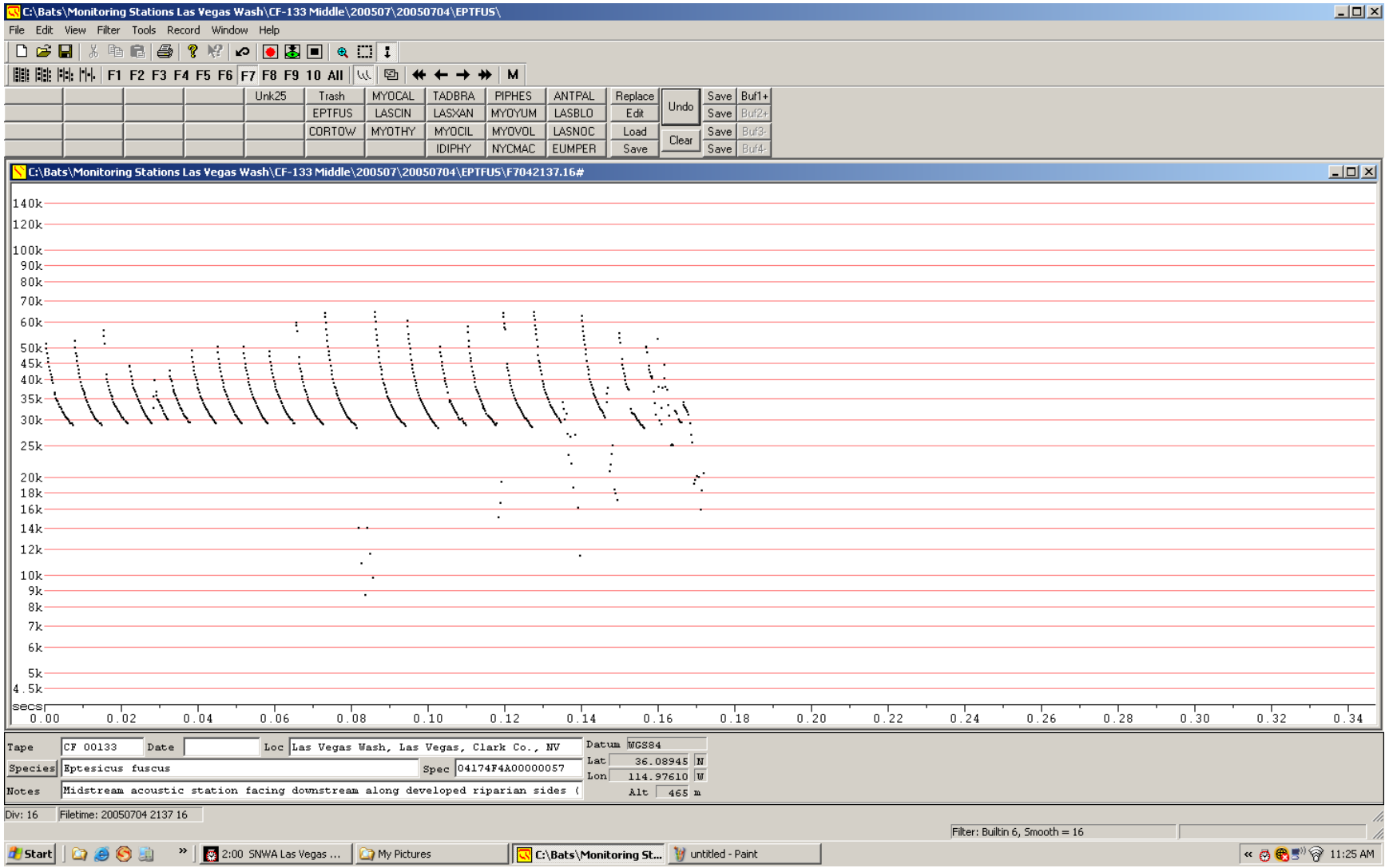
Unk25 Trash MYOCAL TADBRA PIPHES ANTPAL Replace Undo Save Buf1+
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit Save Buf2+
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load Clear Save Buf3-
IDIPHY NYCMAC EUMPER Save Save Buf4-
C:\Bats\Monitoring Stations Las Vegas Wash\CF-133 Middle\200508\20050801\CORTOW\F8020105.33#
140k
120k
100k
90k
80k
70k
60k
50k
45k
40k
35k
30k
25k
20k
18k
16k
14k
12k
10k
9k
8k
7k
6k
5k
4.5k
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00133 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV Datum WGS84
Species Corynorhinus townsendii Spec 04174F4A00000057 Lat 36.08945 N
Notes Midstream acoustic station facing downstream along developed riparian sides ( Lon 114.97610 W
Alt 465 m
Div: 16 Filetime: 20050802 0105 33
Filter: none
Start
1:57 SNWA Las Vegas ...
My Pictures
C:\Bats\Monitoring St...
untitled - Paint
11:22 AM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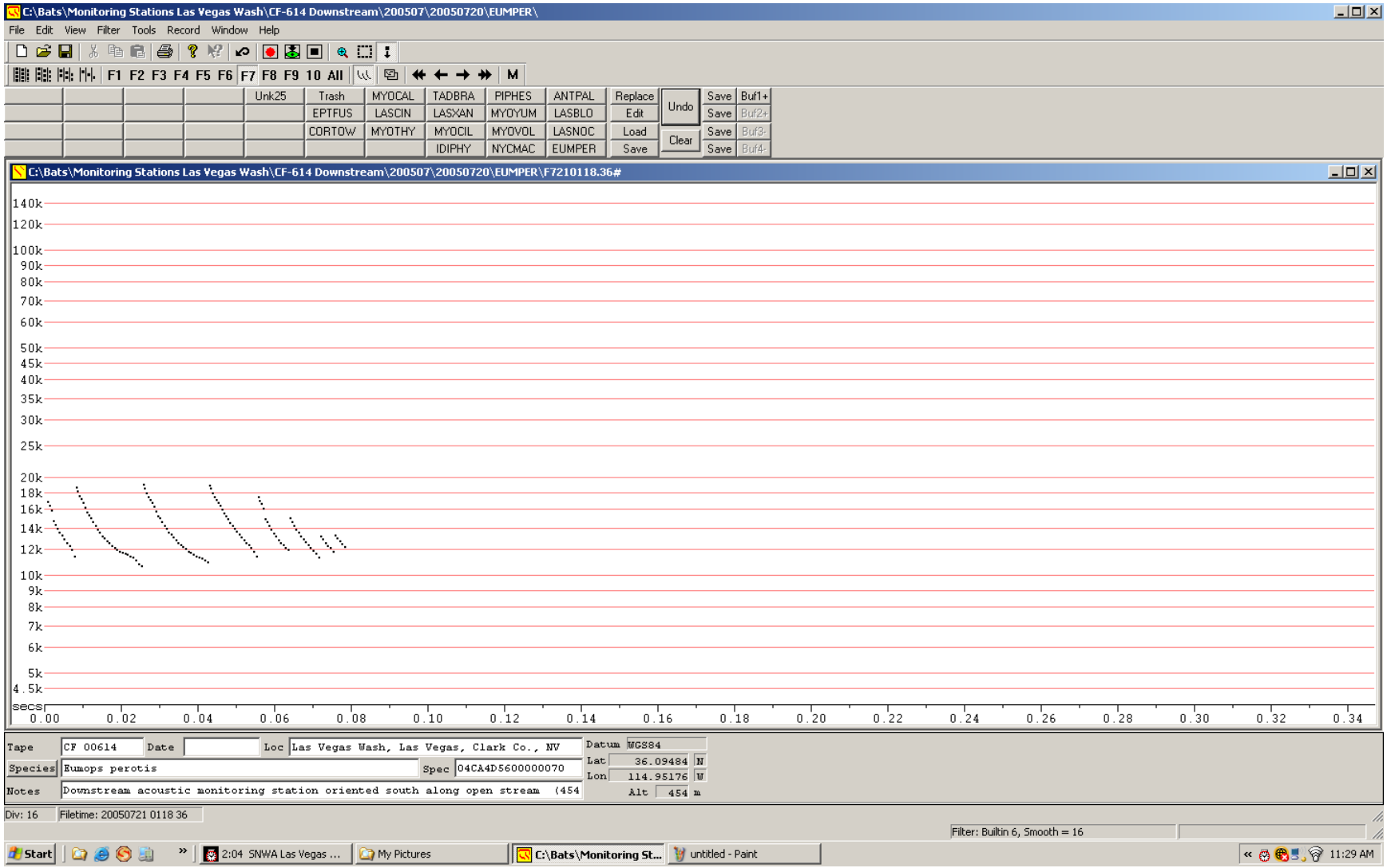
File Edit View Filter Tools Record Window Help
F1 F2 F3 F4 F5 F6 F7 F8 F9 10 All M
Unk25 Trash MYOCAL TADBRA PIPHES ANTPAL Replace Undo Save Buf1+
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit Save Buf2+
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load Clear Save Buf3-
IDIPHY NYCMAC EUMPER Save Save Buf4-
C:\Bats\Monitoring Stations Las Vegas Wash\CF-133 Middle\200507\20050704\EPTFUS\F7042137.16#
140k 120k 100k 90k 80k 70k 60k 50k 45k 40k 35k 30k 25k 20k 18k 16k 14k 12k 10k 9k 8k 7k 6k 5k 4.5k
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00133 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV Datum WGS84
Species Eptesicus fuscus Spec 04174F4A00000057 Lat 36.08945 N
Notes Midstream acoustic station facing downstream along developed riparian sides ( Lon 114.97610 W
Alt 465 m
Div: 16 Filetime: 20050704 2137 16
Filter: Builtin 6, Smooth = 16
Start 2:00 SNWA Las Vegas ... My Pictures C:\Bats\Monitoring St... untitled - Paint 11:25 AM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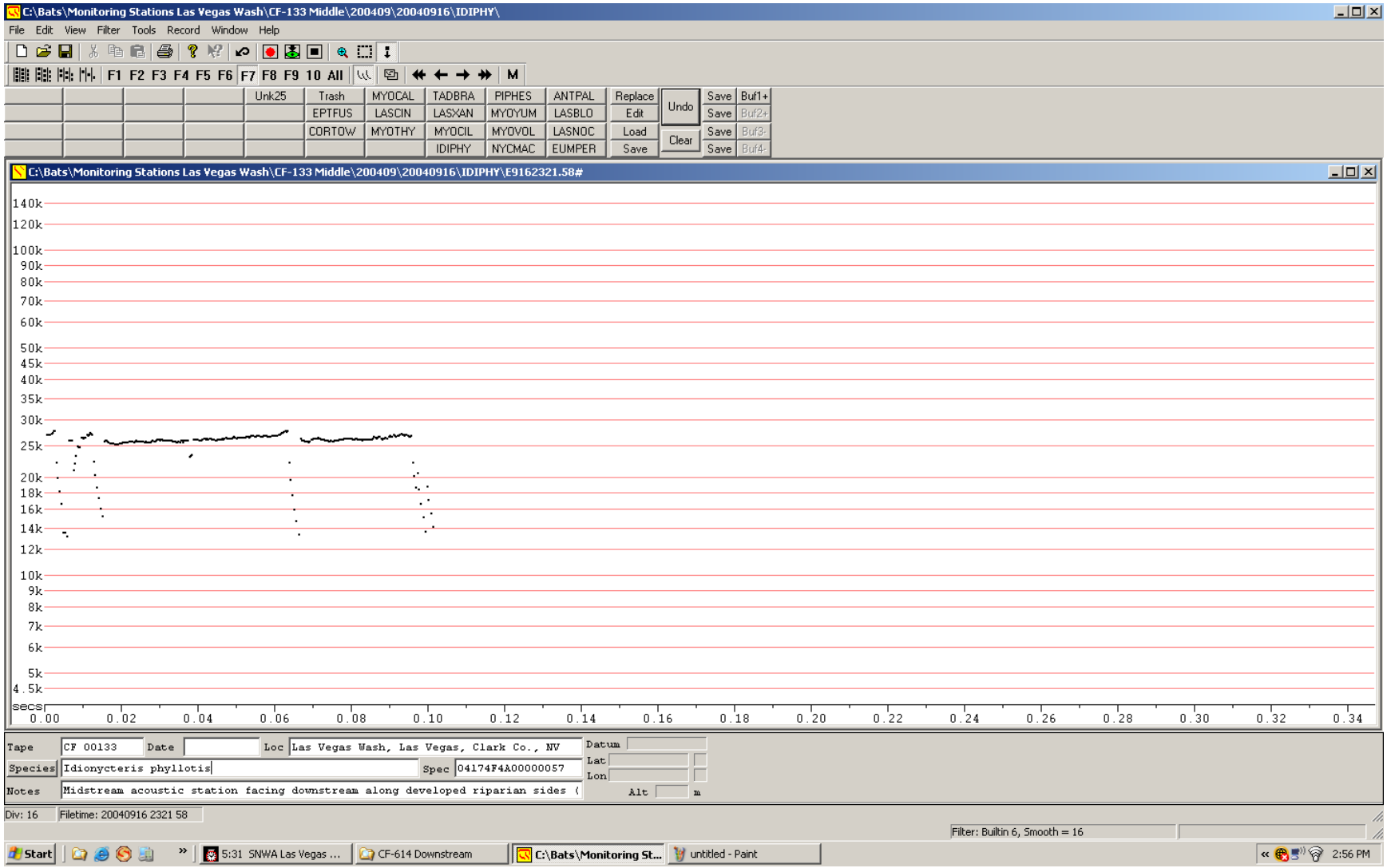
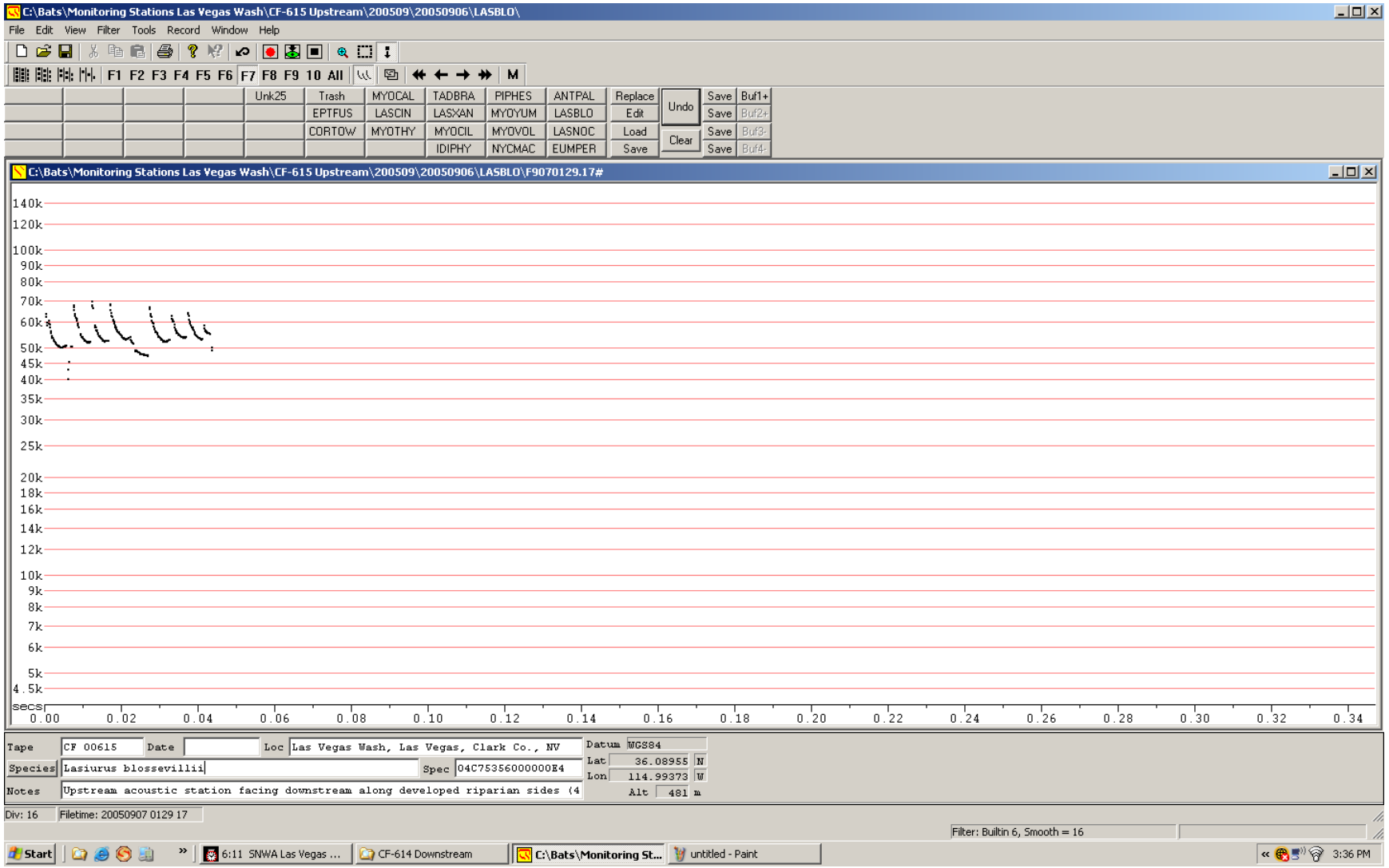
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load
IDIPHY NYCMAC EUMPER Save
Undo
Clear
Save Buf1+
Save Buf2+
Save Buf3-
Save Buf4-
C:\Bats\Monitoring Stations Las Vegas Wash\CF-614 Downstream\200507\20050720\EUMPER\F7210118.36#
140k
120k
100k
90k
80k
70k
60k
50k
45k
40k
35k
30k
25k
20k
18k
16k
14k
12k
10k
9k
8k
7k
6k
5k
4.5k
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00614
Date
Loc Las Vegas Wash, Las Vegas, Clark Co., NV
Datum WGS84
Species Eumops perotis
Spec 04CA4D5600000070
Lat 36.09484 N
Lon 114.95176 W
Notes Downstream acoustic monitoring station oriented south along open stream (454
Alt 454 m
Div: 16
Filetime: 20050721 0118 36
Filter: Builtin 6, Smooth = 16
Start
2:04 SNWA Las Vegas ...
My Pictures
C:\Bats\Monitoring St...
untitled - Paint
11:29 AM


C:\Bats\Monitoring Stations Las Vegas Wash\CF-133 Middle\200409\20040916\IDIPHY\
File Edit View Filter Tools Record Window Help
F1 F2 F3 F4 F5 F6 F7 F8 F9 10 All M
Unk25 Trash MYOCAL TADBRA PIPHES ANTPAL Replace
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load
IDIPHY NYCMAC EUMPER Save
Undo Clear
Save Buf1+
Save Buf2+
Save Buf3-
Save Buf4-
C:\Bats\Monitoring Stations Las Vegas Wash\CF-133 Middle\200409\20040916\IDIPHY\E9162321.58#
140k 120k 100k 90k 80k 70k 60k 50k 45k 40k 35k 30k 25k 20k 18k 16k 14k 12k 10k 9k 8k 7k 6k 5k 4.5k
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00133 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV Datum
Species Idionycteris phyllotis Spec 04174F4A00000057 Lat Lon
Notes Midstream acoustic station facing downstream along developed riparian sides ( Alt m
Div: 16 Filetime: 20040916 2321 58
Filter: Builtin 6, Smooth = 16
Start 5:31 SNWA Las Vegas ... CF-614 Downstream C:\Bats\Monitoring St... untitled - Paint 2:56 PM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File Edit View Filter Tools Record Window Help
F1 F2 F3 F4 F5 F6 F7 F8 F9 10 All M
Unk25 Trash MYOCAL TADBRA PIPHES ANTPAL Replace
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load
IDIPHY NYCMAC EUMPER Save
Undo Clear
Save Buf1+
Save Buf2+
Save Buf3-
Save Buf4-
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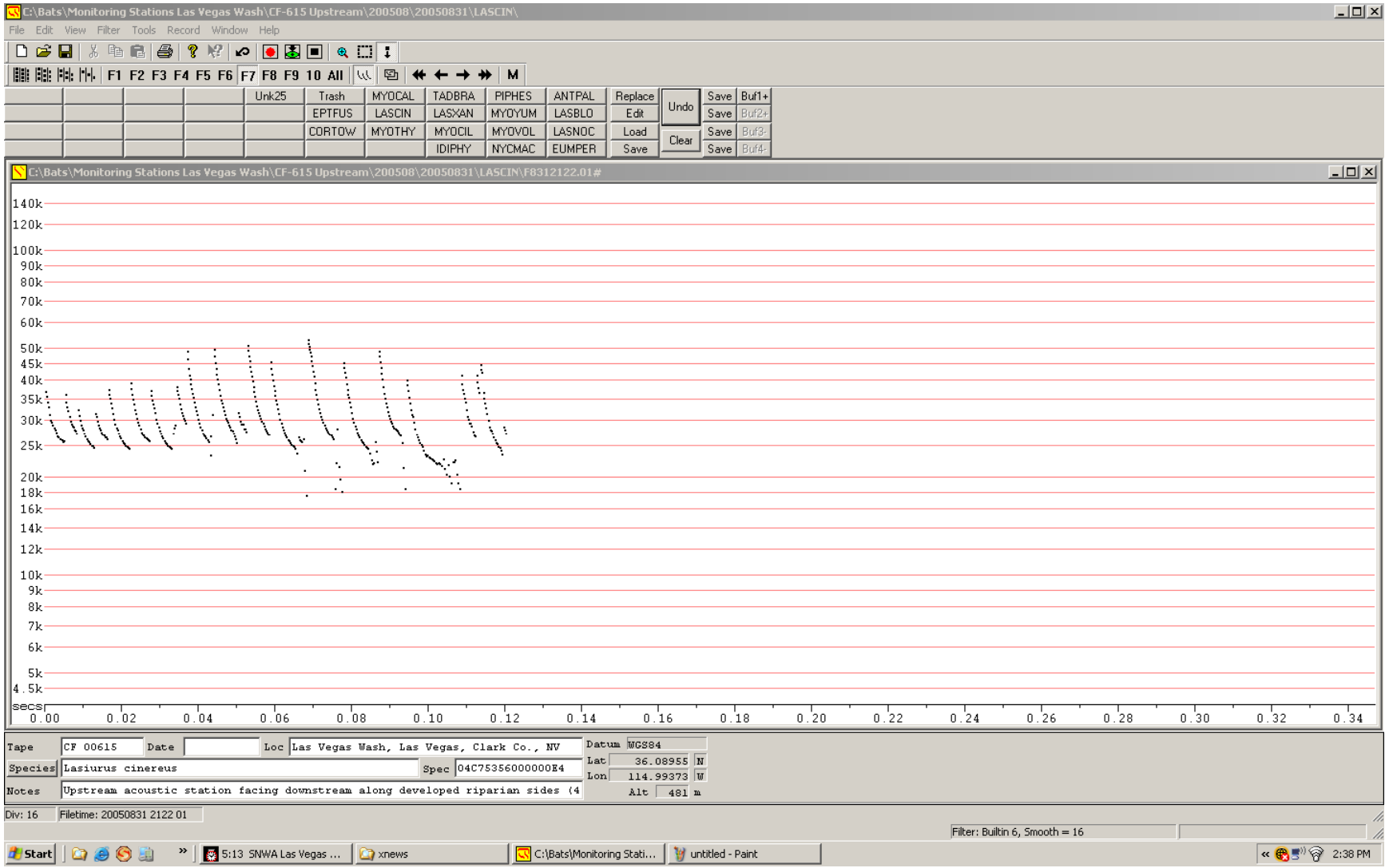
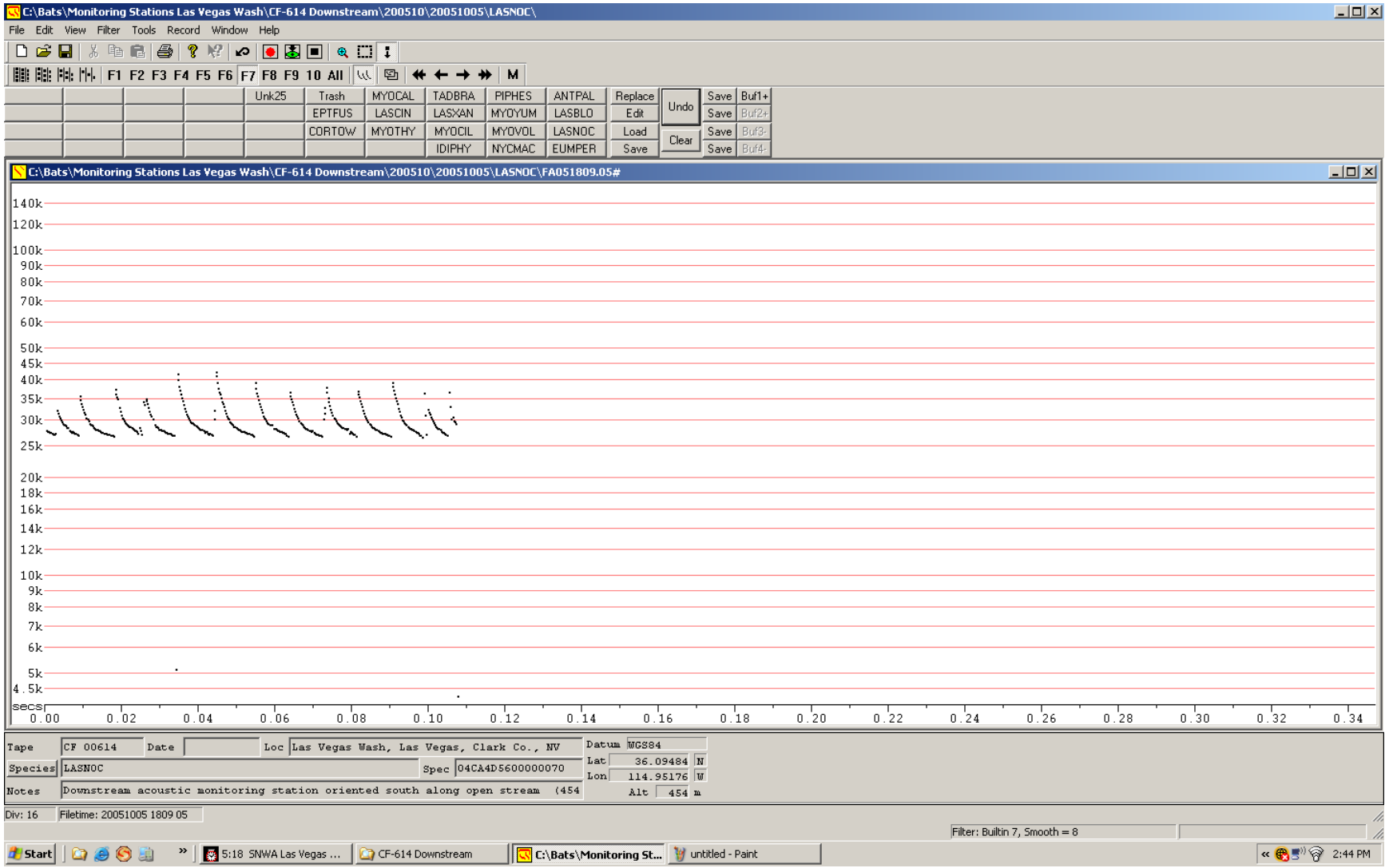
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00615 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV
Species Lasiurus blossevillii Spec 04C75356000000E4
Notes Upstream acoustic station facing downstream along developed riparian sides (4
Datum WGS84
Lat 36.08955 N
Lon 114.99373 W
Alt 481 m
Div: 16 Filetime: 20050907 0129 17
Filter: Builtin 6, Smooth = 16
Start
6:11 SNWA Las Vegas ...
CF-614 Downstream
C:\Bats\Monitoring St...
untitled - Paint
3:36 PM


C:\Bats\Monitoring Stations Las Vegas Wash\CF-615 Upstream\200508\20050831\LASCIN\
File Edit View Filter Tools Record Window Help
F1 F2 F3 F4 F5 F6 F7 F8 F9 10 All M
Unk25 Trash MYOCAL TADBRA PIPHES ANTPAL Replace
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load
IDIPHY NYCMAC EUMPER Save
Undo Clear
Save Buf1+
Save Buf2+
Save Buf3-
Save Buf4-
C:\Bats\Monitoring Stations Las Vegas Wash\CF-615 Upstream\200508\20050831\LASCIN\F8312122.01#
140k
120k
100k
90k
80k
70k
60k
50k
45k
40k
35k
30k
25k
20k
18k
16k
14k
12k
10k
9k
8k
7k
6k
5k
4.5k
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00615 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV
Species Lasiurus cinereus Spec 04C75356000000E4
Notes Upstream acoustic station facing downstream along developed riparian sides (4
Datum WGS84
Lat 36.08955 N
Lon 114.99373 W
Alt 481 m
Div: 16 Filetime: 20050831 2122 01
Filter: Builtin 6, Smooth = 16
Start
5:13 SNWA Las Vegas ...
xnews
C:\Bats\Monitoring Stati...
untitled - Paint
2:38 PM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File Edit View Filter Tools Record Window Help
F1 F2 F3 F4 F5 F6 F7 F8 F9 10 All M
Unk25 Trash MYOCAL TADBRA PIPHES ANTPAL Replace
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load
IDIPHY NYCMAC EUMPER Save
Undo Clear
Save Buf1+
Save Buf2+
Save Buf3-
Save Buf4-
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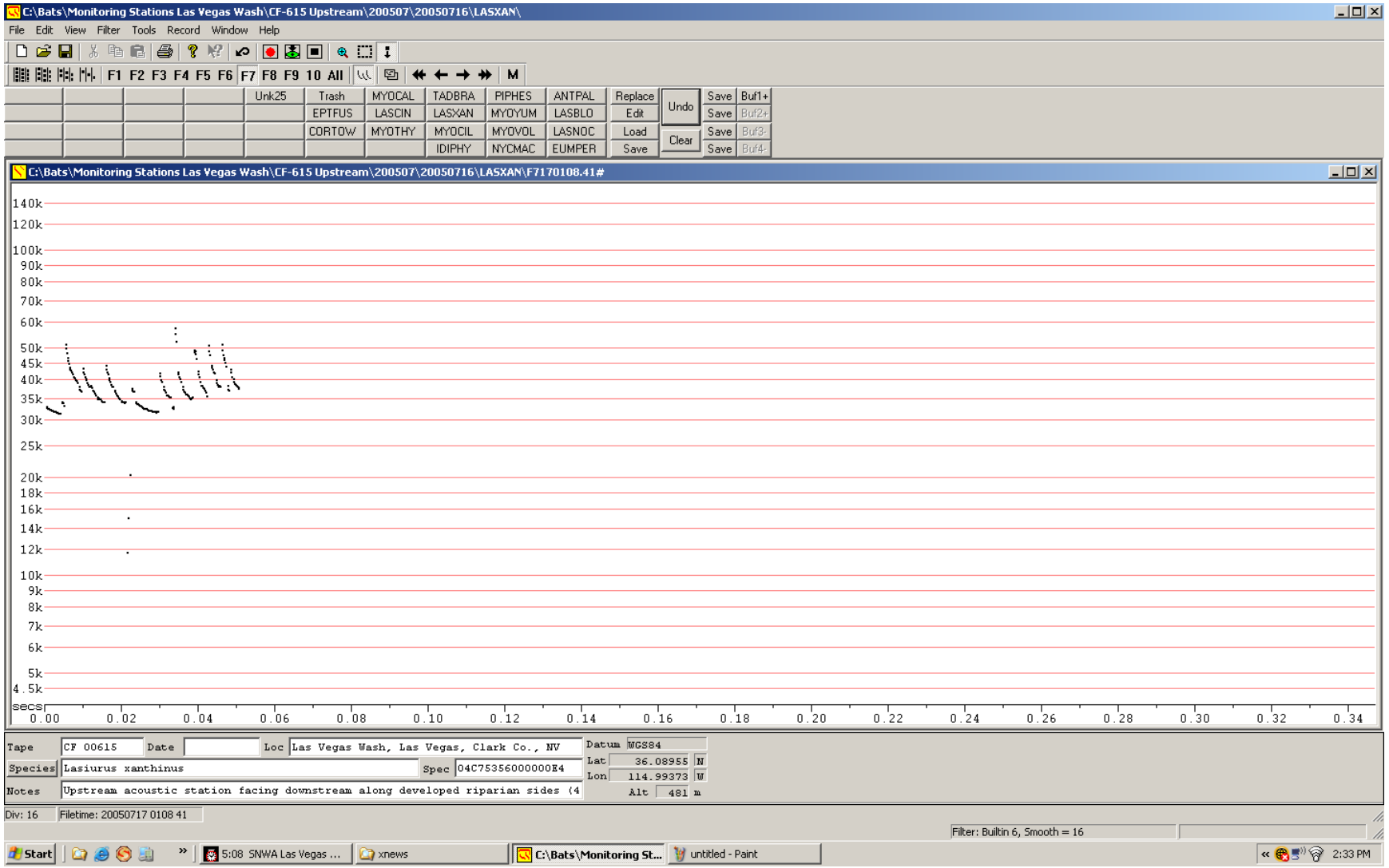
140k 120k 100k 90k 80k 70k 60k 50k 45k 40k 35k 30k 25k 20k 18k 16k 14k 12k 10k 9k 8k 7k 6k 5k 4.5k
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00614 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV
Species LASNOC Spec 04CA4D5600000070
Notes Downstream acoustic monitoring station oriented south along open stream (454
Datum WGS84
Lat 36.09484 N
Lon 114.95176 W
Alt 454 m
Div: 16 Filetime: 20051005 1809 05
Filter: Builtin 7, Smooth = 8
Start
5:18 SNWA Las Vegas ...
CF-614 Downstream
C:\Bats\Monitoring St...
untitled - Paint
2:44 PM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File Edit View Filter Tools Record Window Help
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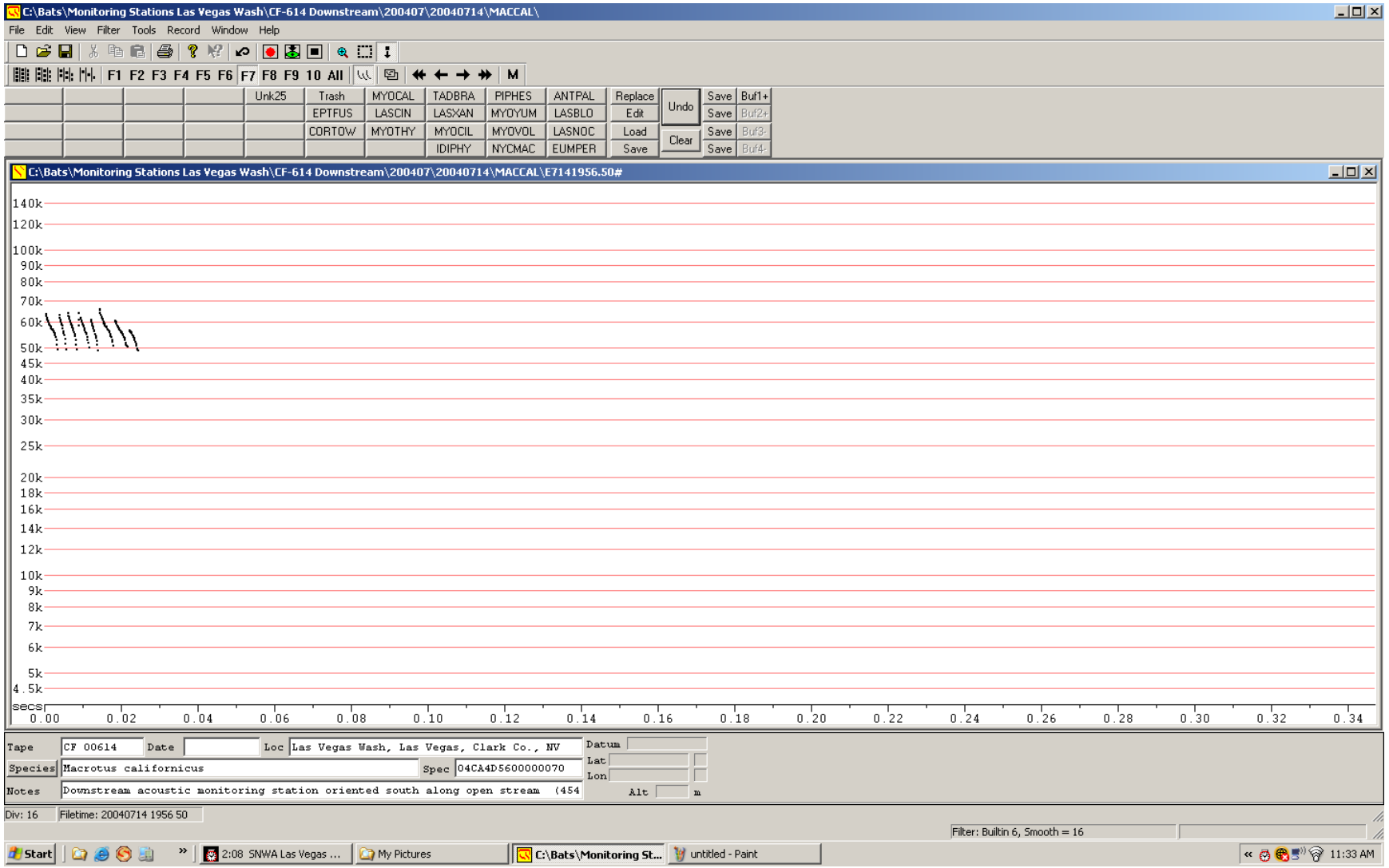
Unk25 Trash MYOCAL TADBRA PIPHES ANTPAL Replace
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load
IDIPHY NYCMAC EUMPER Save
Undo Clear
Save Buf1+
Save Buf2+
Save Buf3-
Save Buf4-
C:\Bats\Monitoring Stations Las Vegas Wash\CF-615 Upstream\200507\20050716\LASXAN\F7170108.41#
140k 120k 100k 90k 80k 70k 60k 50k 45k 40k 35k 30k 25k 20k 18k 16k 14k 12k 10k 9k 8k 7k 6k 5k 4.5k
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00615 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV
Species Lasiurus xanthinus Spec 04C75356000000E4
Notes Upstream acoustic station facing downstream along developed riparian sides (4
Datum WGS84
Lat 36.08955 N
Lon 114.99373 W
Alt 481 m
Div: 16 Filetime: 20050717 0108 41
Filter: Builtin 6, Smooth = 16
Start
5:08 SNWA Las Vegas ...
xnews
C:\Bats\Monitoring St...
untitled - Paint
2:33 PM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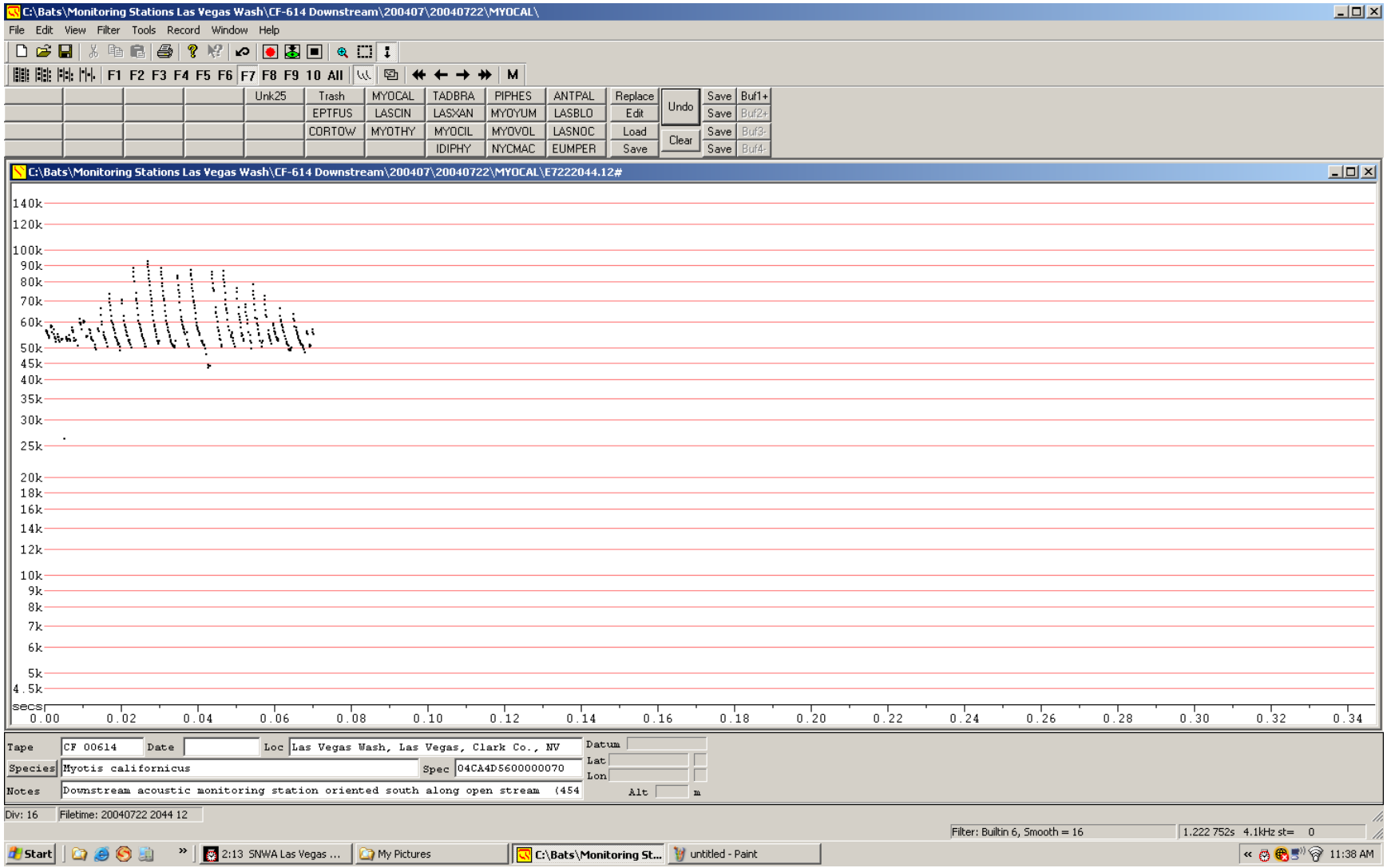
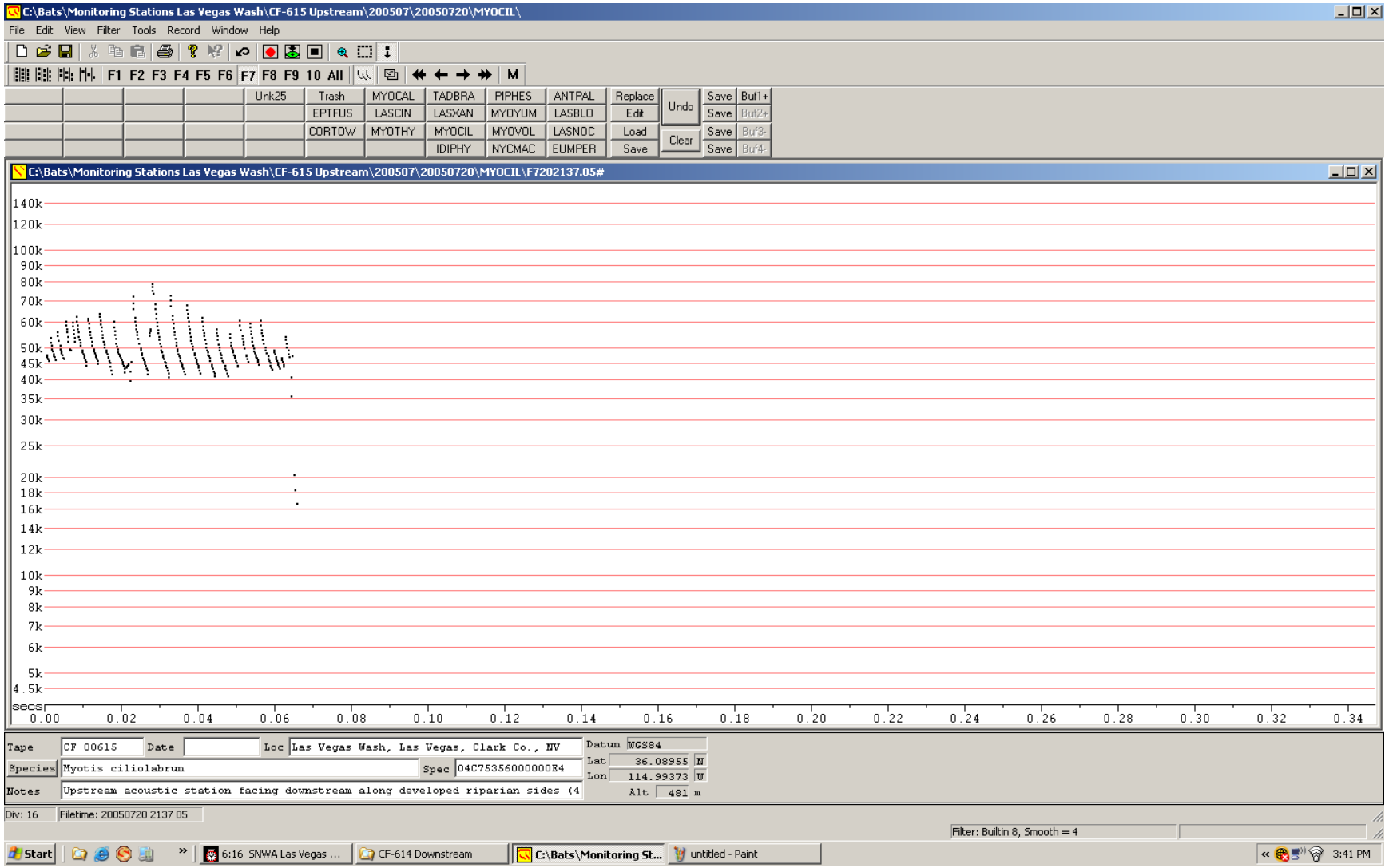
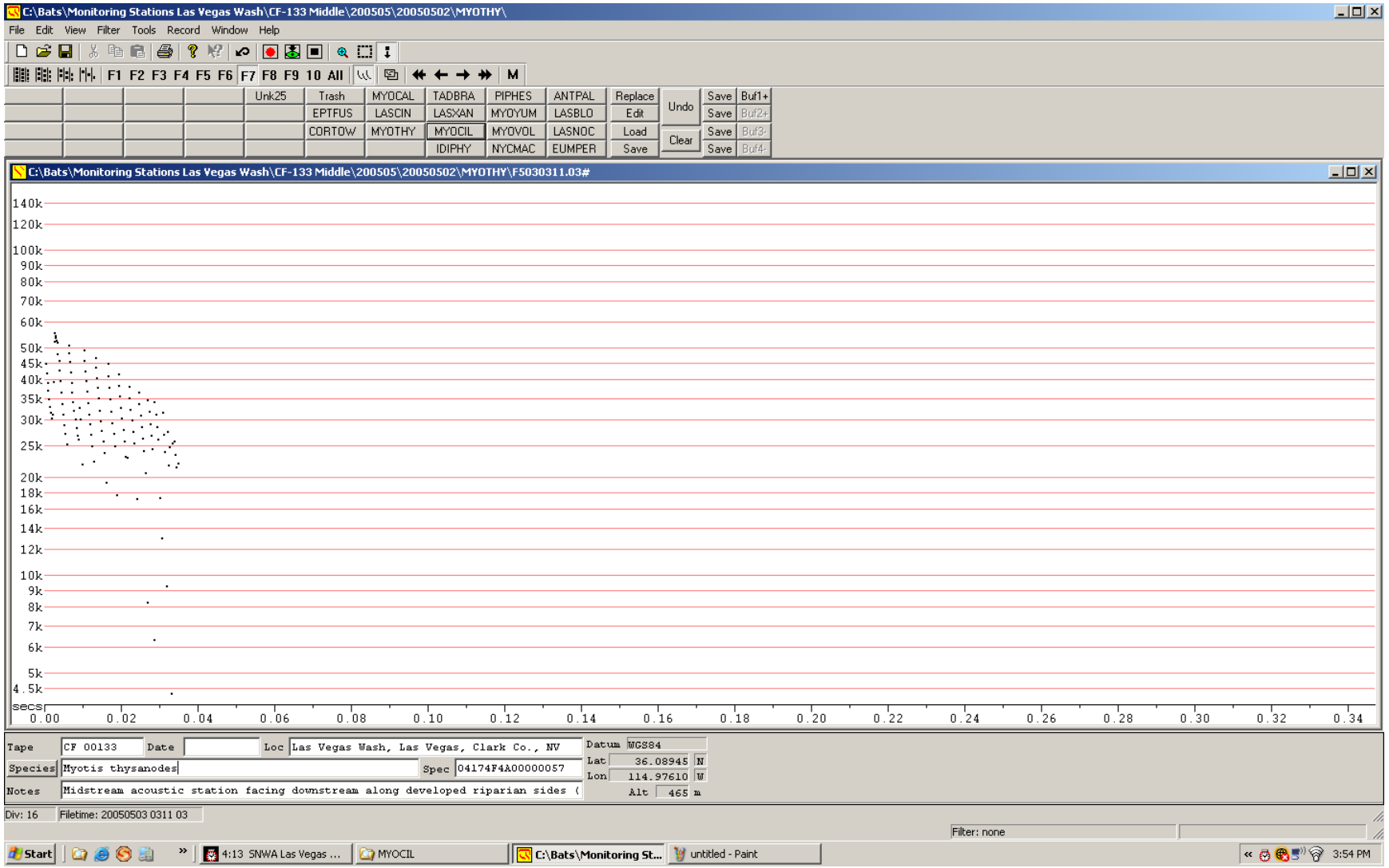
File Edit View Filter Tools Record Window Help
F1 F2 F3 F4 F5 F6 F7 F8 F9 10 All M
Unk25 Trash MYOCAL TADBRA PIPHES ANTPAL Replace
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load
IDIPHY NYCMAC EUMPER Save
Undo Clear
Save Buf1+
Save Buf2+
Save Buf3-
Save Buf4-
C:\Bats\Monitoring Stations Las Vegas Wash\CF-614 Downstream\200407\20040714\MACCAL\E7141956.50#
140k 120k 100k 90k 80k 70k 60k 50k 45k 40k 35k 30k 25k 20k 18k 16k 14k 12k 10k 9k 8k 7k 6k 5k 4.5k
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00614 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV Datum
Species Macrotus californicus Spec 04CA4D5600000070 Lat Lon
Notes Downstream acoustic monitoring station oriented south along open stream (454 Alt m
Div: 16 Filetime: 20040714 1956 50
Filter: Builtin 6, Smooth = 16
Start 2:08 SNWA Las Vegas ... My Pictures C:\Bats\Monitoring St... untitled - Paint 11:33 AM


C:\Bats\Monitoring Stations Las Vegas Wash\CF-614 Downstream\200407\20040722\MYOCAL\
File Edit View Filter Tools Record Window Help
F1 F2 F3 F4 F5 F6 F7 F8 F9 10 All M
Unk25 Trash MYOCAL TADBRA PIPHES ANTPAL Replace Undo Save Buf1+
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit Save Buf2+
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load Clear Save Buf3-
IDIPHY NYCMAC EUMPER Save Save Buf4-
C:\Bats\Monitoring Stations Las Vegas Wash\CF-614 Downstream\200407\20040722\MYOCAL\E7222044.12#
140k 120k 100k 90k 80k 70k 60k 50k 45k 40k 35k 30k 25k 20k 18k 16k 14k 12k 10k 9k 8k 7k 6k 5k 4.5k
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00614 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV Datum
Species Myotis californicus Spec 04CA4D5600000070 Lat
Notes Downstream acoustic monitoring station oriented south along open stream (454 Lon
Alt m
Div: 16 Filetime: 20040722 2044 12
Filter: Builtin 6, Smooth = 16 1.222 752s 4.1kHz st= 0
Start 2:13 SNWA Las Vegas ... My Pictures C:\Bats\Monitoring St... untitled - Paint 11:38 AM


C:\Bats\Monitoring Stations Las Vegas Wash\CF-615 Upstream\200507\20050720\MYOCIL\
File Edit View Filter Tools Record Window Help
F1 F2 F3 F4 F5 F6 F7 F8 F9 10 All M
Unk25 Trash MYOCAL TADBRA PIPHES ANTPAL Replace
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load
IDIPHY NYCMAC EUMPER Save
Undo Clear
Save Buf1+
Save Buf2+
Save Buf3-
Save Buf4-
C:\Bats\Monitoring Stations Las Vegas Wash\CF-615 Upstream\200507\20050720\MYOCIL\F7202137.05#
140k 120k 100k 90k 80k 70k 60k 50k 45k 40k 35k 30k 25k 20k 18k 16k 14k 12k 10k 9k 8k 7k 6k 5k 4.5k
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00615 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV
Species Myotis ciliolabrum Spec 04C75356000000E4
Notes Upstream acoustic station facing downstream along developed riparian sides (4
Datum WGS84
Lat 36.08955 N
Lon 114.99373 W
Alt 481 m
Div: 16 Filetime: 20050720 2137 05
Filter: Builtin 8, Smooth = 4
Start
6:16 SNWA Las Vegas ...
CF-614 Downstream
C:\Bats\Monitoring St...
untitled - Paint
3:41 PM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File Edit View Filter Tools Record Window Help
F1 F2 F3 F4 F5 F6 F7 F8 F9 10 All M
Unk25 Trash MYOCAL TADBRA PIPHES ANTPAL Replace
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load
IDIPHY NYCMAC EUMPER Save
Undo Clear
Save Buf1+
Save Buf2+
Save Buf3-
Save Buf4-
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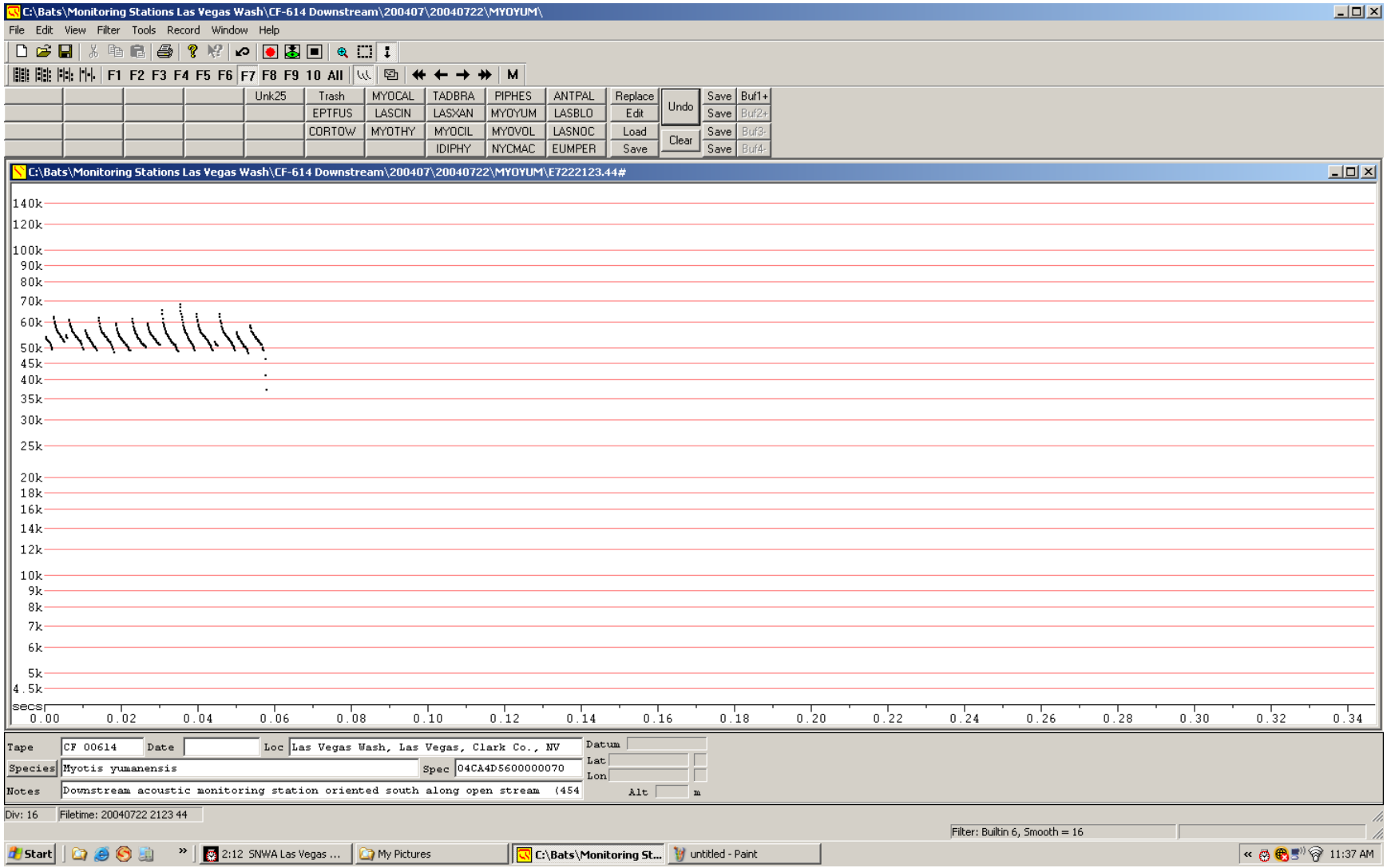
140k 120k 100k 90k 80k 70k 60k 50k 45k 40k 35k 30k 25k 20k 18k 16k 14k 12k 10k 9k 8k 7k 6k 5k 4.5k
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00133 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV
Species Myotis thysanodes Spec 04174F4A00000057
Notes Midstream acoustic station facing downstream along developed riparian sides (
Datum WGS84
Lat 36.08945 N
Lon 114.97610 W
Alt 465 m
Div: 16 Filetime: 20050503 0311 03
Filter: none
Start
4:13 SNWA Las Vegas ...
MYOCIL
C:\Bats\Monitoring St...
untitled - Paint
3:54 PM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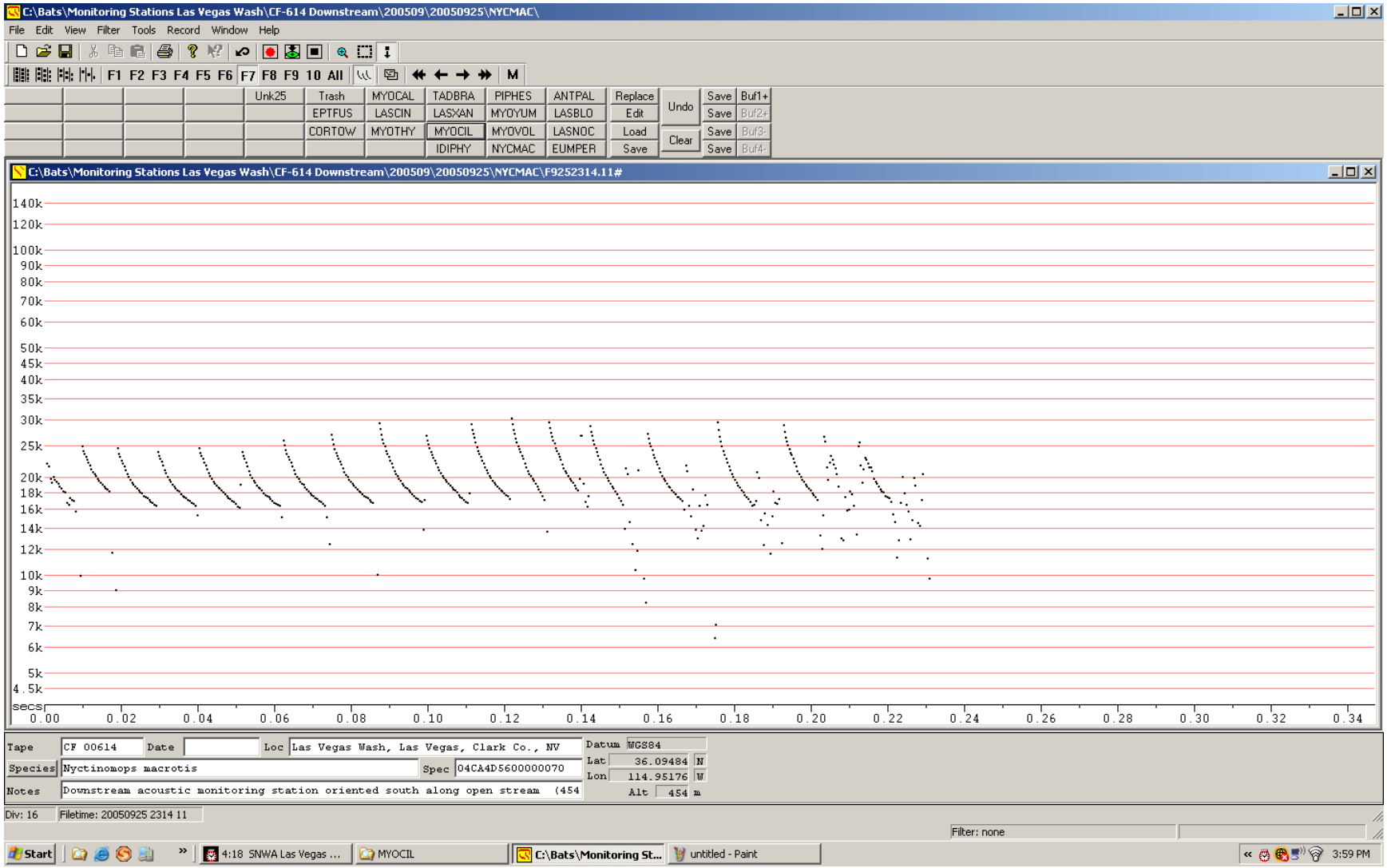
File Edit View Filter Tools Record Window Help
F1 F2 F3 F4 F5 F6 F7 F8 F9 10 All M
Unk25 Trash MYOCAL TADBRA PIPHES ANTPAL Replace
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load
IDIPHY NYCMAC EUMPER Save
Undo
Clear
Save Buf1+
Save Buf2+
Save Buf3-
Save Buf4-
C:\Bats\Monitoring Stations Las Vegas Wash\CF-614 Downstream\200407\20040722\MYOYUM\E7222123.44#
140k
120k
100k
90k
80k
70k
60k
50k
45k
40k
35k
30k
25k
20k
18k
16k
14k
12k
10k
9k
8k
7k
6k
5k
4.5k
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00614 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV Datum
Species Myotis yumanensis Spec 04CA4D5600000070 Lat
Notes Downstream acoustic monitoring station oriented south along open stream (454 Lon
Alt m
Div: 16 Filetime: 20040722 2123 44
Filter: Builtin 6, Smooth = 16
Start
2:12 SNWA Las Vegas ...
My Pictures
C:\Bats\Monitoring St...
untitled - Paint
11:37 AM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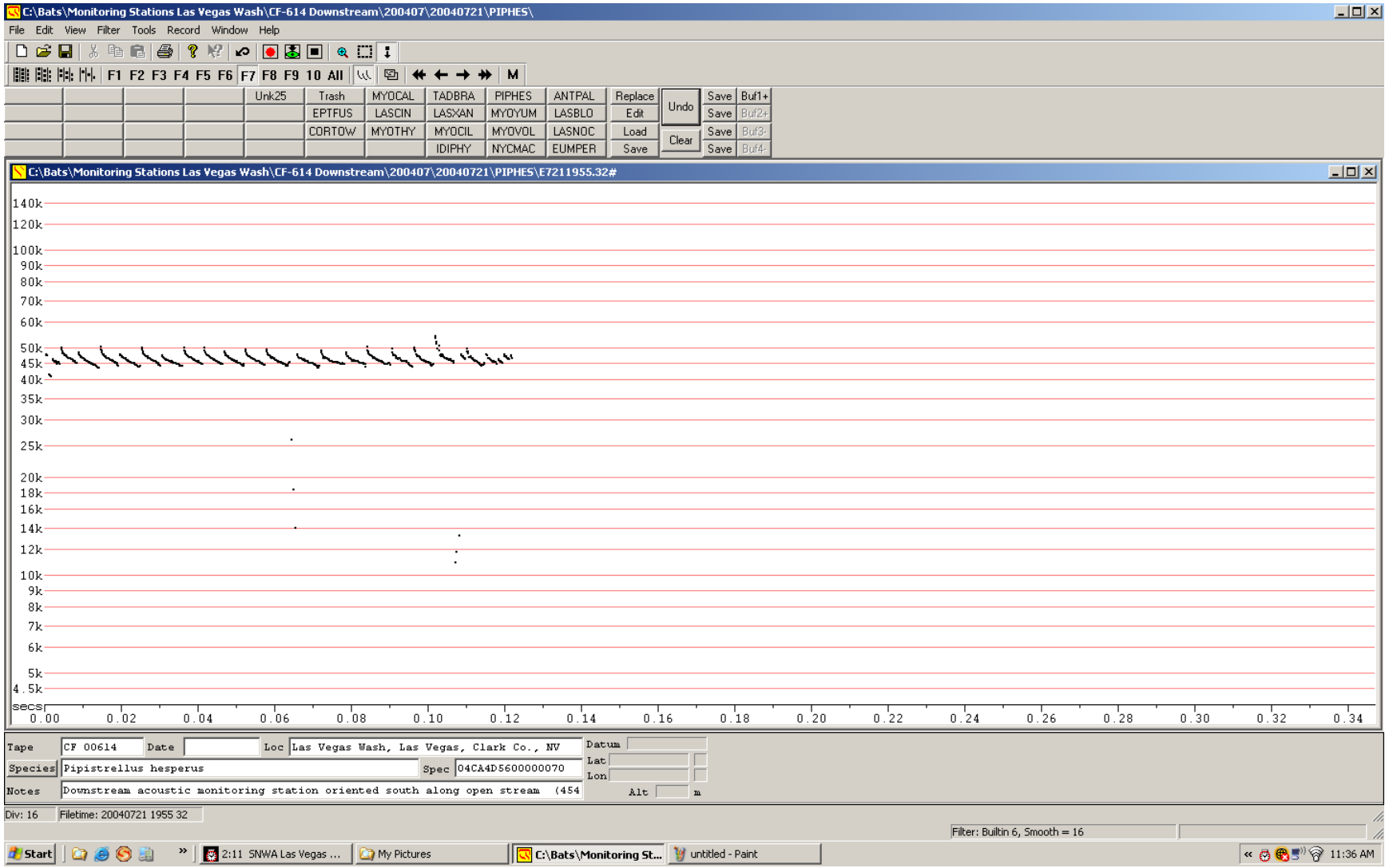
File Edit View Filter Tools Record Window Help
F1 F2 F3 F4 F5 F6 F7 F8 F9 10 All M
Unk25 Trash MYOCAL TADBRA PIPHES ANTPAL Replace
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load
IDIPHY NYCMAC EUMPER Save
Undo Clear
Save Buf1+
Save Buf2+
Save Buf3-
Save Buf4-
C:\Bats\Monitoring Stations Las Vegas Wash\CF-614 Downstream\200509\20050925\NYCMAC\F9252314.11#
140k 120k 100k 90k 80k 70k 60k 50k 45k 40k 35k 30k 25k 20k 18k 16k 14k 12k 10k 9k 8k 7k 6k 5k 4.5k
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00614 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV Datum WGS84
Species Nyctinomops macrotis Spec 04CA4D5600000070 Lat 36.09484 N
Notes Downstream acoustic monitoring station oriented south along open stream (454 Lon 114.95176 W
Alt 454 m
Div: 16 Filetime: 20050925 2314 11
Filter: none
Start
4:18 SNWA Las Vegas ...
MYOCIL
C:\Bats\Monitoring St...
untitled - Paint
3:59 PM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File Edit View Filter Tools Record Window Help
F1 F2 F3 F4 F5 F6 F7 F8 F9 10 All M
Unk25 Trash MYOCAL TADBRA PIPHES ANTPAL Replace Undo Save Buf1+
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit Save Buf2+
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load Clear Save Buf3-
IDIPHY NYCMAC EUMPER Save Save Buf4-
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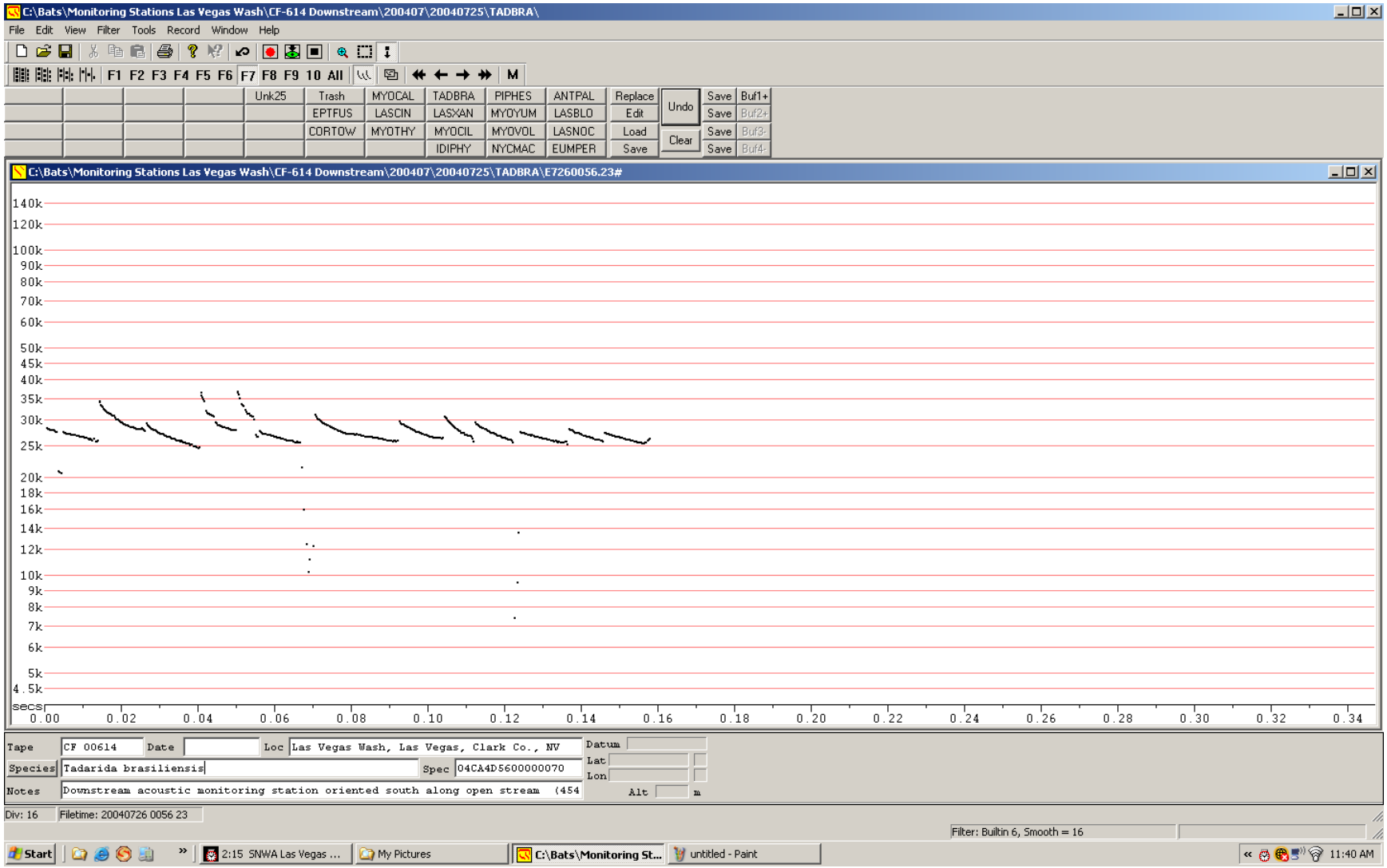
140k 120k 100k 90k 80k 70k 60k 50k 45k 40k 35k 30k 25k 20k 18k 16k 14k 12k 10k 9k 8k 7k 6k 5k 4.5k
secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00614 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV Datum
Species Pipistrellus hesperus Spec 04CA4D5600000070 Lat
Notes Downstream acoustic monitoring station oriented south along open stream (454 Lon
Alt m
Div: 16 Filetime: 20040721 1955 32
Filter: Builtin 6, Smooth = 16
Start 2:11 SNWA Las Vegas ... My Pictures C:\Bats\Monitoring St... untitled - Paint 11:36 AM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File Edit View Filter Tools Record Window Help
F1 F2 F3 F4 F5 F6 F7 F8 F9 10 All M
Unk25 Trash MYOCAL TADBRA PIPHES ANTPAL Replace
EPTFUS LASCIN LASXAN MYOYUM LASBLO Edit
CORTOW MYOTHY MYOCIL MYOVOL LASNOC Load
IDIPHY NYCMAC EUMPER Save
Undo Clear
Save Buf1+
Save Buf2+
Save Buf3-
Save Buf4-
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secs
0.00 0.02 0.04 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.22 0.24 0.26 0.28 0.30 0.32 0.34
Tape CF 00614 Date Loc Las Vegas Wash, Las Vegas, Clark Co., NV Datum
Species Tadarida brasiliensis Spec 04CA4D5600000070 Lat
Notes Downstream acoustic monitoring station oriented south along open stream (454 Lon
Alt m
Div: 16 Filetime: 20040726 0056 23
Filter: Builtin 6, Smooth = 16
Start
2:15 SNWA Las Vegas ...
My Pictures
C:\Bats\Monitoring St...
untitled - Paint
11:40 AM