EVALUATION OF CURRENT AMERICAN BURYING BEETLE (ABB), *NICROPHORUS AMERICANUS*, TRAPPING PROTOCOLS AND POPULATION ESTIMATION METHODS IN SOUTH EAST OKLAHOMA

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Abstract: Burying beetles in the genus *Nicrophorus* are carrion feeding beetles that display cooperative brood care behavior. Historically, the American Burying Beetle (ABB) (Olivier) (Coleoptera; Silphidae) was found across the eastern United States but is currently limited to three viable populations in SE OK, Block Island, RI, and Central NE. ABB were trapped over 3 years from 4 locations across SE OK. This study focused on: 1) Evaluating sampling grids of traps vs single traps for estimating ABB densities, 2) Comparing two different population density estimation methods, the program MARK and the Schnabel Index, and 3) developing current population estimates for ABB in SE OK. We showed that a single trap is sufficient for population estimates but for higher resolution a 5-trap grid sampled 2 nights a week is sufficient. MARK was able to produce population estimates regardless of recaptures and produced more conservative estimates but it requires individual capture histories which require individual marking on each animal. This is hard to accomplish safely with ABB so the Schnabel index is still the recommended population density estimation calculator. ABB populations in SE OK are within ranges found in other areas of their extant range and seem stable since records from 1996.

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CHAPTER I

INTRODUCTION

The American Burying Beetle (ABB), *Nicrophorus americanus,* is a federally listed threatened species within a group of carrion feeders widely known for their unique life cycle (USFWS 2019). While the *Nicrophorus* genus is known as burying beetles, the ABB is distinctive in its large size and bright coloration. In addition to a noteworthy life cycle and bi-parental care, ABB are also of ecological importance as they require the largest carrion sources to reproduce of any species in the genus. Although the ABB play a large role in carrion reduction, they have experienced a drastic decline in their numbers. While first documented in 1853, these beetles currently only have three established populations across North America leading to federal protection.

Occurrences of ABB has been documented in 35 states and three Canadian provinces. The first confirmed record of the ABB within the U.S. is from LeConte in 1853, who described them as "…abundant in the middle and southern states." Their population numbers appeared to remain stable until 1961 when Dillon and Dillon would be the last people to describe the species as abundant. Currently ABB is only found in three isolated locations: Southeastern Oklahoma; Block Island, Rhode Island; and Central Nebraska (Lomolino, Creighton et al. 1995, Bedick, Ratcliffe et al. 1999). Many hypotheses exist for this species' decline including: carrion scarcity, soil compaction, increased scavenger competition due to habitat fragmentation, noise pollution, and light pollution (Trumbo and Bloch 2000, Gibbs and Stanton 2001, Sikes and Raithel 2002, (Trumbo and Bloch 2000, Gibbs and Stanton 2001, Sikes and Raithel 2002, Howard 2006, Willemssens 2015, Hoops 2017, Leasure and Hoback 2017, Wormington et al. 2017, Jenkins et al. 2018, Phillips et al. 2020).

Recovery plans for endangered species require knowledge of the factors contributing to their decline and that stakeholders involved cooperate with conservation efforts. With the ABB, carcass requirements and habitat changes contribute to population decline, and understanding causes of decline remains a challenge (Sikes and Raithel 2002, Hoops 2017, Farriester et al. 2021). One challenge that the ABB faces is their specific requirements for successful reproduction. Not only do they need to acquire a carcass large enough to provide their larvae with sufficient nourishment, it must also be small enough for the beetles to bury, and be on or near soil that is suitable for the construction of a brood chamber (Scott 1998).

In 1991 the U.S. Fish and Wildlife Service (USFWS) developed a recovery plan for the ABB (USFWS 1991). The end goal of this effort was to be able to reclassify the species as no longer endangered once self-sustaining populations in each of the 4 regions of their historical range were firmly established. To do this, the USFWS recommended a variety of conservation methods including relocation programs, mitigation, captive breeding programs, and conservation banks. Portions of this plan were updated in 2008, after a thorough review of ABB data by USFWS (USFWS 1991, 2008). The 2008 review made it clear that without comparable survey methods, there would be no way to facilitate accurate range and abundance estimates of ABB. In the most recent update, USFWS claims that due to climate change, the southern populations of ABB will be extinct by 2099 regardless of conservation efforts but the northern populations will persist. This lead to the decision to change the status of the ABB from Endangered to Threatened due to the northern population being sizable and stable (USFWS 2019, 2020).

An ideal region to investigate approaches for estimating ABB populations is S.E. Oklahoma, which has a continuous and substantial population (Davis Jr 1980, Lomolino et al. 1995, Amaral et al. 1997, Raithel 2000). The research described in this dissertation was conducted throughout S.E. Oklahoma and intensively on the McAlester Army Ammunition Plant (McAAP). The region has a high-density ABB population, along with large amounts of potential carrion sources and suitable habitat (Lomolino and Creighton 1996, Hoops 2017). The primary goals of this research were to investigate 1) the accuracy of a standard baited single-trap approach for ABB and 2) explore relationships among population estimation procedures for ABB populations. The accuracy of the standard baited single-trap approach for ABB was investigated by comparing sample counts to paired landscapes with grids of baited traps that were assigned to maximize local captures without disruption. Data from gridded traps also allowed for investigation of the probability distribution of counts and subsequent calculation of number of traps needed in grids for researchers to precisely estimate ABB populations. Findings justified analysis of regional data from locations in S.E. Oklahoma and subsequent estimation of ABB density at multiple locations.

Historically, population density estimates were calculated, for ABB, using the Schnabel index, which is a modified Lincoln Peterson index (Peyton 2003, Snethen et al. 2004, Backlund et al. 2008). This model was designed for use with open populations, meaning they have regular immigration and emigration with other populations. Another method used to estimate size of open populations is the Mt model in the program Ecostat, although it is not designed for highly mobile species like ABB (Bedick et al. 1999). A more modern approach than the Mt model was necessary to compare to the

Schnabel index. The Robust design model in MARK was developed for estimating the density of open populations. MARK allows for a more complex evaluation of the relationship between parameters and covariates to be modeled alongside the various approaches for goodness of fit, model selection, and model averaging to be used.

The Robust Design program in MARK requires atypical sampling in order to draw conclusions about populations. The Robust Design program requires multiple sampling events in short succession, followed by a break in sampling, and then repeating the original sampling schedule. ABB are active between May and October in S.E. Oklahoma. The general sampling approach allowing for use of MARK is to document ABB captures in baited traps for three days in a row, known as a primary sampling event. Each individual day during the primary sampling event is known as a secondary sampling event. MARK then requires a gap in sampling to pass before performing another primary sampling event. This sampling technique allows for flexibility in the sampling regime and is structured to allow for immigration and emigration of individuals among primary samples, while incorporating temporal variation in the sampling schedule. This is an advantage when sampling during the summer months of Oklahoma, where the weather can be unpredictable, occasionally limiting sampling opportunities.

It is assumed that between the secondary sampling events there is minimal immigration and emigration, while the break in collection between primary events allows for movement in and out of the local population. This technique provides additional information on capture probability that allows for less biased and more efficient estimates of population dynamics, as well as allowing for the probability of individuals being available for capture (Kendall 2001). The time between primary sample occasions is then built into the model to account for temporal variation.

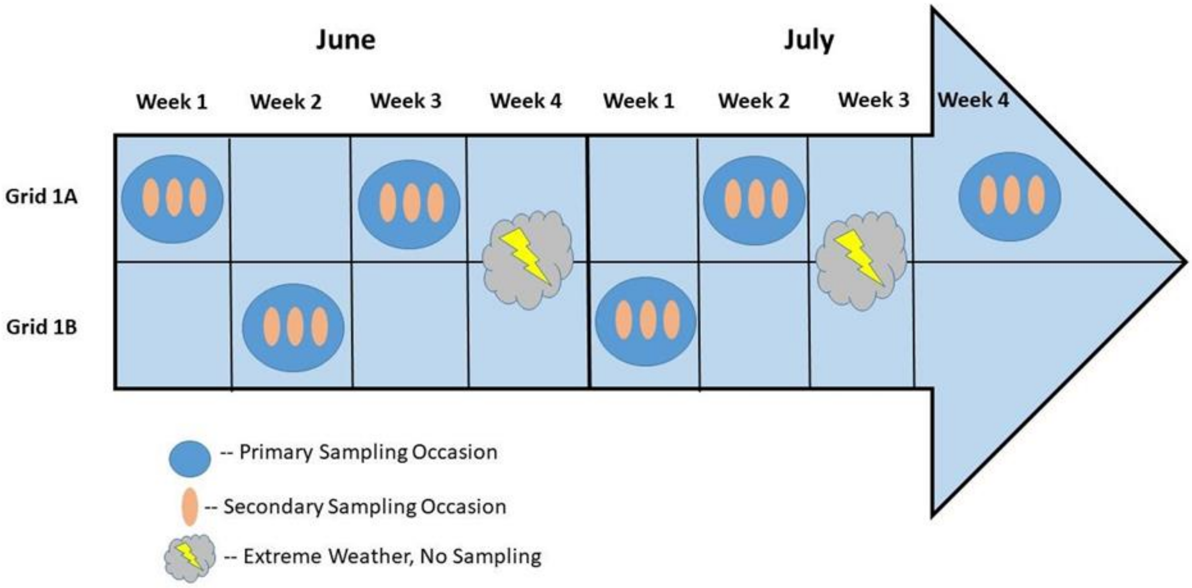

Figure 1. Example Sampling Schedule.

Ultimately precise, accurate, and efficient population estimation protocols are needed to monitor ABB populations. Unified approaches would allow for documentation of population recovery, decline and/or effects of conservation. This study aimed to expound upon previous works and offer a standardized sampling method for the endangered ABB. The specific objectives were:

1. Evaluation of sampling grids for estimating ABB densities.

2. Compare MARK vs. Schnabel estimates of ABB density.

3. Estimate regional population densities for ABB using single trap data.

CHAPTER II

LITERATURE REVIEW

ABB Biology

Physical Description

Species of *Nicrophorus* are found in temperate zones worldwide and range in size from about 11mm (*N. tomentosus*) to 45mm, with ABB being the largest North American species at 25mm to 45mm in length and a pronotum width of 6mm to 13mm (Otronen 1988, USFWS 2014). All species in the genus are black to dark brown with some pattern of orange markings on their elytra; the ABB is the only species with an orange pronotum. These orange maculations allow for relatively simple determination of species and age. A freshly eclosed ABB will have bright orange and glossy maculations, whereas a mature beetle will have darker, more sclerotized, and matte maculations. This makes it easy to determine if a beetle is recently eclosed but challenging to determine an exact age of older beetles. ABB also have orange maculations on their frons and clypeus, the latter of which allows for easy sex identification. Males have an orange square or rectangle on the clypeus whereas females have an orange triangle or trapezoid.

Seasonality

ABB are nocturnal and active in S.E. Oklahoma from April to October each year. During this time, the beetles seek out carrion sources to use for reproduction and feeding (Kozol et al. 1988). They are most active between 2 and 4 hours after sunset and are inactive almost immediately after sunrise (Bedick et al. 1999, Walker and Hoback 2007). Once nighttime temperatures begin to drop below 15.5°C, ABB begin their inactive period by burrowing into the soil anywhere from 6cm to 20cm in order to survive freezing temperatures. Beetles that are able to overwinter in association with a carrion source have a higher survival rate and lose less body mass during overwintering. The habitat that the ABB overwinter in does not seem to affect their success rate of surviving until the following spring (Schnell et al. 2008). A lack of overwintering habitat preference is not surprising as ABB are considered to have the broadest niche breadth of any *Nicrophorus spp.* in the Oklahoma-Arkansas region (Lomolino et al. 1995, Lomolino and Creighton 1996, Schnell et al. 2005). Overwintering adults emerge in late spring and produce a first generation of offspring that emerges 6-8 weeks later. Adult activity appears to peak in late summer when the first batch of tenerals has completely emerged (Ferrari 2014). As the batches of adults emerge, they pair off and retreat underground to raise their broods on carcasses they have found. Ambient light has an impact on ABB activity as well, so weather and moon phase can dictate ABB activity levels. ABB are most active when there is less ambient light at night, and new moons and cloudy nights have the highest ABB activity (Wormington et al. 2017).

Reproduction

After overwintering ABB emerge in the spring, and begin to seek out a carrion source for feeding and reproduction. Males attract females to carrion using a pheromone released when a carcass is secured (Bartlett 1987). Many factors play into the ABB's ability to successfully locate and bury a carcass including: suitable habitat for small animals, ambient temperature, reproductive status, searching ability of the individual, and the level of competition for small vertebrate carrion in the area (Wilson and Fudge 1984, Wilson and Knollenberg 1984, Lomolino and Creighton 1996, Ratcliffe 1996).

Burying beetles display unique cooperative brood care behavior in which the male and female live with and take care of the larvae for a week while larvae grow and develop. This was believed to have evolved as a response to competition with other scavengers for unpredictable and discrete resources and to prevent loss of carcasses to bacterial growth (Pukowski 1933, Milne and Milne 1976, Anderson 1982b, Trumbo 1994). The ability of two individuals to successfully raise more young than a single parent is thought to be one of the principal reasons for the evolution of burying beetle biparental cooperation (Wittenberger and Tilson 1980). Advantages of biparental care have been demonstrated in regard to direct competition with congeners (Scott 1990). While direct competition with congeners occurs regularly, there have also been occurrences of facultative interspecific brood parasitism (Trumbo 1994).

When both a male and female ABB arrive at a carcass of appropriate size they bury it, remove any body coverings present, and coat the carcass with anal and salivary secretions. These secretions have antimicrobial properties that help preserve the carcass preventing rapid decomposition, allowing the larva of the pair to feed on it until they are ready to pupate (Hoback et al. 2004, Hall et al. 2011). The pair then rolls the carcass into a “brood ball” (Kozol et al. 1988). During carcass preparation and burial, the pair of ABB will mate multiple times. Once the carcass is prepared and secure in the brood chamber the female will lay approximately 10-30 eggs, depending on the size of the carcass (Müller and Eggert 1990, Trumbo and Fiore 1994). Occasionally subordinate females will attempt to parasitize a brood by laying their eggs in the nearby soil. As long as the larva makes it to the brood ball within a specific window of time the dominant pair of beetles will raise the larva (Müller et al. 1990). The pair will remain with the larvae, feeding, protecting, and cleaning them until they are ready to pupate. The adult beetles feed the larvae by regurgitating partially digested carrion, especially during the first larval instar (Xu and Suzuki 2001, Smiseth and Moore 2002). Care by at least one parent beetle, typically the female if only one parent stays, is essential for the survival of early stage larva (Ratcliffe 1996).

ABB can reproduce on carcasses as small as 50g, the size a rat is when it is weaned, and as large as 300g, the size of a full grown rat (USFWS 1991). Broods can be as large as 25 larvae if the carcass is large enough but are typically about 12-18 larvae (Kozol 1990). If a carcass is too small to successfully feed all of the larvae that hatch in the brood chamber, the parents will cull the brood to an appropriate number for the carcass (Müller and Eggert 1990). When the larvae have matured, they migrate into the soil surrounding the brood chamber to pupate and the adults disperse. Depending on how late in the season it is, the adults either pair with different beetles to repeat the process or prepare to overwinter (Lomolino et al. 1995).

Competition

Within most guilds of animals, body size correlates with size of prey consumed, amount of territory controlled, variety of habitats occupied, and success during combat (Peters 1986). While larger species tend to have greater fitness outcomes, they may fall victim to resource limitation by smaller species (Peters 1986). Larger prey are typically less common than smaller prey, ergo larger species typically require larger territories (Lawton 1990, Damuth 1991). Larger carcasses also require more energy to prepare and bury (Creighton et al. 2009). Even though the ABB weighs in at less than ~2g and is commonly less than 5cm long, it is the largest species in a guild of beetles that utilize carrion as a reproductive resource (USFWS 2014). Body size has been shown to be the most important factor when ABB and their congeners battle to secure carrion (Kozol et al. 1988). While being the largest species in a guild is beneficial for securing resources against competitors, rarity and extinctions tend to be higher for larger species within guilds due to greater habitat and rarer resource requirements (Peters 1986, Owen-Smith 1992, Vermeij et al. 2008).

While ABB can find carcasses within 24 hours of host death (Conley 1982) and can locate a carcass from several kilometers away (Petruska 1975), they compete with a variety of other animals also striving to utilize the carrion as a protein source for survival and reproduction (Michelle P et al. 1900, Trumbo and Bloch 2002, DeVault et al. 2011). ABB are among the many taxa that decompose carrion, and flies are burying beetles' main competitors for carrion in Oklahoma (Round 1961). A single gram of carrion can produce 4 flies (Kuusela and Hanski 1982), and with ABB preferring carrion sizes between 50g-200g (Anderson 1982b), they can prevent up to 800 flies from emerging every time they reproduce. While ABB are sensitive to the scent of carrion and can locate and secure carcasses in as few as 6 hours of death, flies typically arrive at a carcass first and oviposit aggressively, resulting in the ABB needing to clear the carcass of fly eggs in order to keep it intact long enough to reproduce on (Conley 1982, Tabor et al. 2004). Fortunately, N. americanus has help from mesostigmatic phoretic mites (Poecilochirus vitzhum) that travel on the ventral side of the beetles as they move from carcass to carcass (Schwarz et al. 1998). During carcass preparation, the phoretic mites that travel with the beetles feed on dipteran eggs that have been laid on the carcass (Springett 1968). These mites reproduce on fly eggs and have a mildly mutualistic effect on the success of Nicrophorus to successfully utilize a carcass for reproduction (Wilson and Knollenberg 1987). It was originally believed that if only the beetles and flies were present on a carcass, burying beetles would be completely unsuccessful at raising offspring. However, Wilson and Fudge showed that beetles were capable of securing carcasses from fly eggs without the help of mites. Fewer flies emerged from carcasses that had mites as well as beetles but the success of the beetles was not significantly different when mites were present (Wilson and Fudge 1984). Wilson also showed that beetles in the field with mites present have larger broods, approximately twice as large as beetles without phoretic mites. Additionally, burial depth had no effect on success when mites were present; but shallow burials regularly failed when mites were not present (Wilson 1983).

Interesting dynamics can occur with phoretic mites because ABB are attracted to larger carrion for feeding (Pukowski 1933). Dozens of burying beetles can convene at a large carcass, thus allowing for potential mixing of their phoretic mites. Mixing diversifies mite populations and the brood and parent beetles are the mites' only chance for dispersal to new carcasses. None of the phoretic mites have been collected free living in the soil or at carrion sources (Springett 1968, Yoder 1973).

Habitat

ABB were initially described as a forest specialists requiring deep loamy soils for brood chamber production (Anderson 1982b). Later, in Oklahoma and Arkansas, ABB were found to be more generalist, while still being associated with forests and prairie (Lomolino et al. 1995, Leasure and Hoback 2017). In Nebraska and South Dakota, ABB are habitat generalists and associated with prairies (Kozol et al. 1988, Bedick et al. 1999, Jurzenski et al. 2014). In the Loess Canyons in

Nebraska, ABB are positively associated with woodlands (McPherron et al. 2012) and in the Nebraska Sandhills, ABB are positively associated with wetlands (Jurzenski et al. 2014). In both Nebraska areas, ABB are negatively associated with agriculture (McPherron et al. 2012, Jurzenski et al. 2014). Most recently, ABB have been shown to be positively correlated with hay fields, depressional wetlands, moist meadows, and prairies throughout their current range. They have been shown to be negatively associated with pesticide use, human population density, urban areas, croplands, and shrublands (Sikes and Raithel 2002, Leasure and Hoback 2017). It has been proposed that it is due to these impacts that ABB have been eliminated from human influenced areas when searching for carrion for reproduction (Leasure and Hoback 2017). Other factors like high densities of the invasive Eastern red cedar in prairies can significantly reduce the number of ABB and other Silphidae captured when compared to open habitat (Engle et al. 1996), while at the same time doubling the recapture rates of ABB within Eastern red cedar dominated habitats (Walker and Hoback 2007).

Suitable habitat is an important factor in the success of ABB. Many beetle species being studied are mainly associated with stable habitats of long continuity (Nilsson and Baranowski 1997, Siitonen and Saaristo 2000, Jonsell and Eriksson 2001, Jonsson et al. 2001, Jonsson 2002). Within the carrion beetles ABB is the largest, utilizes the largest range of carrion size, and most likely requires the largest home range of any Nicrophorus spp. (Kozol et al. 1988, Creighton et al. 2009). Perhaps the most important habitat factor that affects the success of ABB is soil composition (Scott 1998). Soils that are too xeric, water saturated, loose and sandy, or clay packed are hypothesized to be unsuitable for carcass burial (Raithel 2000). Disturbance can cause severe soil compaction during development and allows increased access to scavengers, thereby reducing both the soil quality and the amount of carrion that ABB can utilize for reproduction. Local disturbances, including forest removal and habitat fragmentation, that occur over large areas of ABB habitat can cause population collapse across an entire geographic range (Creighton et al. 2009).

Historic Distribution

The oldest confirmed record of ABB in the U.S. was documented by LeConte in 1853. He stated that they were “abundant” in the “middle and southern states.” (LeConte 1853). This observation was echoed during the late 1800s and early 1900s. Horn described ABB as being “widely distributed in the Atlantic region from the middle states to Texas.” (Horn 1880). Bowditch listed ABB captures from Mt. Washington, NH (Bowditch 1896); Blatchley noted ABB as “…frequent…often attracted by electric light.” (Blatchley 1910). In the summer of 1952 Walker collected 29 ABB, 16km southeast of Camden, TN (Walker 1954). The last publication to follow this pattern of ABB being frequently encountered and common in the Eastern U.S. was by Dillon and Dillon in 1961, stating that the species “…is often found at light and on larger decaying animals.” (Dillon and Dillon 1961).

The earliest known specimen existing in a collection is in the Museum of Comparative Zoology at Harvard. It was collected in Hartford County, CT in 1875 but has no collector identified (Davis Jr 1980). There are two specimens from Ontario that were collected in 1951 and 1972. These were captured by E. J. LaRoux and R. E. Roughley and are housed at Carleton University and the University of Geulph respectively (Anderson 1982a). The 1972 collection of an ABB from such a northern latitude seems to be an outlier and provides another clue as to the timeline of the species’ drastic range reduction. There are also ABB specimens collected from Michigan, Illinois, Tennessee, and Missouri, with the most recent of these being from 1961 in Michigan (Anderson 1982a). Besides the 1972 specimen from Ontario these dates seem to fall into line with the apparent late ‘60s to early ‘70s decline of the species. There are a few more current specimens from Arkansas (1969-74), but these are from Crawford and Cleburne counties, which are near or included in the ABB’s current range. There has been relatively consistent monitoring for carrion beetles through the ‘70s to ‘90s, and if ABB were present in the environment they would likely have been recorded. Although historical density estimates are lacking, the absence of ABB from large regions of North America provide convincing evidence of exceptions. Lumpkin, Johnson, Baldwin, Pirone, and Shubeck all failed to find a single ABB while trapping in the Eastern U.S. during the early and mid ‘70s (Lumpkin 1971, Pirone 1974, Baldwin 1975, Johnson 1975, Shubeck 1975). Most scientists working on burying beetles have concluded that ABB was once widespread across the entire Eastern U.S. (Horn 1880), and that formerly present forests were critical to their distribution. Lomolino and Creighton supported this hypothesis on a regional scale showing that ABB was typically found in forests or woodlands with deep soils. They also showed experimentally that breeding success of ABB was higher in forest habitat than grassland habitat (Lomolino and Creighton 1996).

A study performed in the late ‘90s confirmed that removal of trees from a well-established ABB habitat caused a severe reduction in the beetles inhabiting that area (Creighton et al. 2009). These findings suggest that ABB likely has similar ecology to the two other large species of Nicrophorus in Europe (N. germanicus) and Japan (N. concolor), both of which are primary forest dwellers. N. germanicus was found to be in rapid decline once it was realized that N. americanus was as well. This was most likely due to habitat fragmentation and human expansion (Anderson 1982a). By the 1920s primary forest in the U.S. and Canada had been reduced from 800,000,000 acres to just 100,000,000 acres (Hesse et al. 1937). In context to the other large species, N. concolor is still common in Japan today, most likely due to the cultural value of nature leading to the preservation of primary forests in Japan (Anderson 1982a).

It is well understood that rare species with smaller populations and restricted ranges are more likely to approach carrying capacity and go extinct more frequently than more common and widespread species. Perhaps, over a relatively short period of time, ABB reached carrying capacity due to increased environmental stochasticity following forest reductions. Low populations without adequate habitat are more vulnerable to environmental stochasticity, pathogen outbreaks, and human disturbance (McKinney 1997). A species with naturally dynamic population cycles, like ABB, can be especially vulnerable to extinction during the low phases in its population cycling. (O'Grady et al. 2004).

Population Comparisons

The ABB is considered univoltine through most of its current range (Kozol et al. 1988, USFWS 1991, Bedick et al. 2004). However, little has been done to classify the Oklahoma populations of ABB compared to Nebraska and Block Island populations. The Nebraska population has been estimated at over 100,000 individuals. In 1995 and 1996 the population was univoltine and female biased. Overwintering mature beetles emerged in early June and teneral beetles emerged in August (Bedick et al. 1999). Due to their assumed univoltine reproduction cycle, ABB populations rely heavily on the success of the previous year and fluctuate cyclically in response to carrion availability, major weather events, disease outbreaks, and other environmental factors. (USFWS 2008). ABB in Nebraska only reproduce once per season (Bedick et al. 1999), however, in a laboratory setting, most ABB will reproduce twice in a season, with appropriate carrion supplied quickly, as long as temperatures remain above 15.5°C at night (Bedick et al. 1999) . This would suggest that ABB in Oklahoma are capable of producing two broods in a single season due to the longer summers. However, it is still unclear if the first group of active adults produces a second brood during the summers in Oklahoma or if the first generation of teneral beetles is reproducing after emergence (Ferrari 2014).

Conservation

Standardizing habitat management recommendations has proven to be difficult when pursuing conservation goals because of differences between regional populations. The variation of habitats between the different regions, and even local habitat interactions with populations dynamics, makes national level conservation rules for habitat management protocols difficult. Since 2010 there have been GIS-based approaches that have made progress towards describing regional habitat associations at landscape levels, but recommendations acceptable by all stakeholders involved remain conceptual (Crawford and Hoagland 2010, McPherron et al. 2012, Jurzenski et al. 2014, Leasure and Hoback 2017).

Other Factors Associated with ABB Decline

ABB require carrion of a specific mass to successfully reproduce. Carrion is a very finite, scattered, and ephemeral resource. Requiring such a limited resource contributes to their high risk of extinction (Karr 1982, Peck and Kaulbars 1987, Pimm et al. 1988). Some of the most plentiful species that fall into the ABB's preferred host mass range have been steadily declining since the 19th century, including: passenger pigeon (*Ectopistes migratorius*), greater prairie-chicken (*Tympanchus cupido*), wild turkey (*Meleagris gallopavo*), and the black-tailed prairie dog (*Cynomys ludovicianus*) (USFWS 1991). Most of carrion used by ABB from these species are the young of the year each season. *Ectopistes migratorius* used to be considered one of the most plentiful birds in the world, with population estimates ranging from 3 to 5 million at a given time (Ellsworth and McComb 2003). *Cynomys ludovicianus* was quite prevalent in the ABBs historic range, but has since gone through significant decline in range and population size due to poisoning, shooting, and habitat loss from agriculture and urbanization (Luce 2003). Thanks to conservation measures, wild turkey populations are beginning to recover throughout the Midwest (Hughes and Lee 2015). If these animals were at the historic ranges and numbers, there would likely have been plenty of carrion of the appropriate mass for ABB to utilize (Miller et al. 1990, USFWS 2008).

Beginning with the westward expansion of settlers in the U.S. in the 1840s, land use has been progressively changing (Billington and Ridge 2001). As large stands of forest, wetlands, and grasslands were developed and broken up, the habitats became fragmented, creating more edge habitat. Habitat fragmentation can increase competition for ABB. Forest and grassland fragmentation has been shown to reduce the species diversity of an area, while increasing the prevalence of common mesopredators that use disturbed areas such as the raccoon (*Procyon lotor*), coyotes (*Canis latrans*), striped skunk (*Mephitis mephitis*), American crow (*Corvus brachyrhynchos*), red fox (*Vulpus fulva*), opossum (*Didelphis virginiana*), and other scavengers and opportunistic predators (Wilcove et al. 1986). Habitat fragmentation not only allows more access by scavengers (DeVault et al. 2011) but can completely change the insect communities in those areas (Gibbs and Stanton 2001). One study in Oklahoma found 83% of small animal carcasses are secured by ants, flies, and vertebrate scavengers; 11% are claimed by *Nicrophorus orbicolli*; and only 1% are claimed by ABB (Matthews 1995). The removal of large predators such as the grey wolf (*Canis lupus*) and the Eastern Cougar (*Puma concolor*) from North America has potentially impacted the beetle as well. Large predators elicit fear in the environments they live in, resulting in reduced population size and reduced scavenging. With the large predators removed, mesopredators scavenge more and reduce the availability of carrion for use by other taxa (Suraci et al. 2016).

Current Conservation Efforts

Several reintroduction efforts are underway to reestablish historic ABB populations. However, the long daily flight distances and other behavioral aspects of ABB makes reintroduction into a different habitat challenging. A reintroduction attempt is being made on Nantucket Island, MA but has not reached a population size required for long-term persistence. However, the number of ABB on the island decreased from 2006 to 2011 (Mckenna-Foster et al. 2016). In 2011 another reintroduction effort was initiated in the Wayne National Forest in Ohio but no ABB recaptures have been recorded from this location. In 2012 a reintroduction effort began in Michigan and while the population viability remains unknown, there was documented successful reproduction (Selbo 2009). In 2015 a follow-up survey was done in Southern Michigan, and while many Nicrophorus spp. were collected, no ABB were found (Cuthrell 2015).

Due to ABB's high mobility and large home range, large tracts of native habitat appear to be required to support successful populations (USFWS 2014). Ft. Chaffee in Arkansas, Camp Gruber, and the McAlester Army Ammunition Plant (McAAP), are all examples of large protected parcels of land that support ABB populations (Ferrari 2014, Schnell et al. 2014, Santos 2020). Additional lands have been established at the Tallgrass Prairie Preserve through ABB mitigation funds and ABB mitigation banks have been established in Oklahoma (USFWS 2014). These efforts are designed to support and promote long-term, self-sustaining populations in habitats that are maintained for ABB.

Sampling

Sampling for ABB remains a challenge because of their relatively low densities, unique terrestrial biology and regular movement. The basic quantitative components of entomological ecology include population density estimation, distribution, and dispersal documentation for sampling of wild or experimental populations (Doak and Mills 1994, Hedin and Ranius 2002). Density is the number of individuals per unit area or number of individuals per sampling unit (Pedigo and Buntin 1993). Population density is most often estimated by collecting a series of samples and recording the number of individuals per unit; rounding the preliminary measurement known as the sample mean (Pedigo and Buntin 1993). Sampling is essential and a requirement for accurate and precise estimates of species abundance and population dynamics (Morris 1955, Pedigo and Buntin 1993, Southwood and Henderson 2009).

Typically, insect conservationists must rely on inconsistent and fragmented data from collections to determine current and past distributions, making it hard to get precise estimates of population density (Davis Jr 1980). Ecological studies on insects typically focus on those that can be netted or trapped in sufficient numbers with a bias towards noticeable and diurnal insects (Zonneveld et al. 2003, Thomas 2005, Collier et al. 2008). This becomes an issue when a species has low population densities, is inconspicuous, or is nocturnally active since there will be limited data to examine. For many of these less conspicuous species, monitoring with baited traps can greatly facilitate studies focusing on distribution and abundance (Larsson et al. 2009).

For ABB, carrion-baited traps are used most-often and captures give a density-activity index, which is completely dependent on the current activity of the population, the environmental conditions, and the physiological conditions of the individuals in the population (e.g. mating vs feeding). Even without taking these conditions into consideration, a density-activity index cannot give an absolute density of the individuals in an area since it is seldom practical to catch all of the individuals in an area at any given time. The larger body of research on baited traps has focused on using pheromones to sample Lepidoptera (Cardé 1979, Elkinton and Cardé 1980, Kong et al. 2014), and improving trap design and deployment to increase trapping efficiency when sampling (Reissig 1976). Lure traps have been developed to use a variety of baits from food, to heat, to sex pheromones (Navarro-Llopis et al. 2008, Anderson et al. 2009). Prior to the 1980s, utilization of pheromone trap catches to estimate spatial distribution was almost impossible because of limited methodology (Cardé 1979). In order to use trap catch numbers from active traps to estimate population density, the variation in trap catch must be determined for different trap densities, population density, habitat, and environmental variables including wind speed, temperature, or light pollution (Elkinton and Cardé 1980). Active trapping procedures are particularly useful in supplying population estimates during monitoring or survey situations where the biology of the animal or density of the population being sampled is below a level that can be reliably measured by more traditional means, like egg mass surveys (Elkinton and Cardé 1980).

Using a mark-recapture method of sampling can help to overcome many of the shortcomings associated with simple baited trap counts and this approach has been utilized for ABB (Willson et al. 2011, Zimmerman and Palo 2011). In many current studies, pheromone traps are frequently used for mark-release-recapture to estimate dispersal distance and population dynamics. In a 2003 study done by Yamamura, most beetles (Melanotus okinawensis) that were point released were captured in the nearest trap to the release point, and that after the first day it was unlikely that they were recaptured (Yamamura et al. 2003). This lead to the assumption that the beetles being released were dying or leaving the area quickly. Population dynamics studies in such systems require estimates of mortality and emigration which can easily be underestimated in this manner, as the insects may have died if they had not been lured to the trap (Elkinton and Cardé 1980).

Finally, research on baited trap deployment and density estimation has focused on maximizing attraction by using multiple traps without influencing bait detection and subsequent interference or disruption (Morris 1960, Leather and Watt 2005). Alternatively, oversaturation of pheromone baited traps is an approach utilized within many pest management programs to cause mating disruption (Carde and Minks 1995). Evidence is quite clear for the negative effects of pheromone traps in general; as the number of lures in the environment increases, the proportion of males recaptured decreases due to plume saturation. This makes optimizing trap deployment for density estimation a challenge. Research in this area is limited, but for ABB it would be expected that as the number of lures (carrion or baited traps) in the environment increases, that there would be fewer captured beetles in the experimental lures. For ABB, details remain missing on how to optimize spatial arrangement of traps to accurately reflect local beetle populations.

Developing a Sampling Plan

Developing an arthropod sampling program (e.g. number of sample sites [N] and number of sample occasions [T]) is commonly initiated based on the intuition of experts, more so than through scientific means (Taylor et al. 1998). This is typically a challenging approach, especially when the program developers have a good understanding of the biology and typical relative density of the target species. Before a researcher can develop a sampling plan for a particular organism, some sampling concepts must be defined in terms of the organism in question. The sampling universe refers to the entire habitat in which the population being examined occurs (Morris 1955). The goal of defining a sampling universe is to prevent samples from being taken from uninhabited areas, thus reducing variability between samples. A sampling unit is a portion of a habitable space from which counts of the arthropod in question are taken (Morris 1955, Pedigo and Buntin 1993). The total population being examined can be envisioned as being comprised of a finite number of unique sampling units. Traditionally sampling units are defined by the researcher performing the sampling. A sample unit should represent the target arthropod within the sample universe, must be distinct, and cannot overlap (Morris 1955, Morris 1960). Identifying sampling units should follow all of the 6 guidelines proposed by Morris in 1955: 1) all units of the universe should have an equal chance of selection, 2) the unit should be stable and easily delineated in the field, 3) the proportion of the arthropod population using the sample unit must remain constant at least within each sample period, 4) the sample unit size should provide a reasonable balance between cost and variance, 5) the sampling unit should be scaled to the arthropod’s size, mobility, and relative abundance, and 6) the sample unit should be convertible to units of area.

Once a sample unit is determined, usually via quantitative analyses of variation in counts among spatial scales, a sample technique must be developed. The sample technique refers to the method chosen to collect information from a single sampling unit (Allee et al. 1949). More specifically, the sampling technique refers to the equipment and how a count is accomplished. Sampling techniques can be generally classified into two groups: passive or active. Relative to traps, a passive approach is one that relies entirely on chance to capture an individual. These have no form of attraction built in, such as a standard pitfall trap. An active approach is one that takes advantage of the behavior of an insect to collect specimens; using lures such as chemical attractants, baits, color, and light.

Baited traps are useful for monitoring the activity density of many insects and they can be altered for different species to improve trapping efficiencies (Finch 1990). Baited traps have obvious directional effects and individuals downwind are more likely to travel to a trap using chemical attractants. Variation in efficiency of capture rates for any insect occurs because wind speed and direction are constantly changing and the bait “plume” of attractant is constantly broken up by obstacles like trees, buildings, and the terrain (Turchin and Odendaal 1996). Variation in trap captures can also occur because each baited trap has a specific attractive area and if traps are placed too closely to each other, the attractive areas will overlap, trap captures will go down, and recapture rates be affected (Elkinton and Cardé 1980). Additionally, traps nearer release sites can deplete the number of dispersing individuals, thereby biasing the recapture probability at traps farther from the release sites (Turchin and Thoeny 1993). Altogether, using baited traps as sample units to estimate density can be challenging.

Plume dynamics

When using baited traps either singly or multiples, the possibility of the scent plumes saturating the environment is also a concern. Insects are attracted to pulses of scent detection and no detection, and both are required for bait finding (Elkinton et al. 1987). Without these pulses, saturation of attraction occurs and insects are not able to find the source (Cardé 1979, Carde and Minks 1995). Mating disruption involves spatial deployment of many baited traps in an area and works by releasing large amounts of sex pheromone into the environment, resulting in saturated plumes of the pheromone causing males to arrest in the environment and resulting in failure to locate females. This works because normally females release pheromones in pulses which allows the males to encounter a pulse and turn upwind until the next pulse. If they lose the plume, they will perform a casting behavior in order to find it. In an environment saturated with pheromone, males arrest movement because they cannot determine directionality and are not able to find females (Carde and Minks 1995). Plume dynamics are important for all insects monitored by baited traps, but is unknown how ABB is influenced by plumes of carrion scent in low and high density host scenarios.

Dispersion pattern

For most insect sampling programs, especially those estimating density and optimizing efficiency, we must understand dispersion patterns (probability distribution). The spatial distribution of organisms is an intrinsic characteristic of the species being studied and is shaped by behavioral and environmental factors (Taylor 1984). Knowledge of the spatial distribution of insects has been, and continues to be, consistently applied in agricultural entomology and insect ecology when designing reliable and efficient sampling schemes (Thistlewood 1989, Steiner 1990, Ho 1993). Typically, a successful sampling program can be derived from the knowledge of how many specimens are captured by a particular sampler and an educated guess of how many captures would be necessary to obtain an adequate population estimate. However, when sampling an endangered species, efficiency and accuracy are key.

Dispersion patterns are, at minimum, classified into three categories: uniform, random, and aggregated. The dispersion pattern for a particular species is largely determined by the species behavior. Uniform (regular) dispersion indicates some degree of repulsion between individuals. This type of dispersion pattern tends to equalize the number of individuals per sample (Iwao and Kuno 1971). Due to the low variability in sample counts resulting from a uniform dispersal pattern, the sample variance (s2) will typically be smaller than the sample mean. A common example of an insect that demonstrates random dispersal is dragonflies. Since they are territorial, they repel each other resulting in individuals evenly spaced throughout the sample universe. Random dispersal creates equal probability of an organism occupying any point in space. This is a result of the presence of one individual having no influence on the distribution of another (Southwood and Henderson 2009). Random dispersal will typically result in the variance (s2) being equal to the mean. In reality, complete independence between individuals in the environment is non-existent. There are some species whose dispersion is indistinguishable from a random distribution, such as winter moth on oak leaves (Kao 1984). Aggregated dispersion is the most common type among insects (Pedigo and Buntin 1993). It is common to find samples from aggregated populations to have very few or a large number of individuals per sample. In aggregated populations the variance (s2) exceeds the mean. Aggregated dispersion is common among insects attracted to a source, but also those that rapidly reproduce after colonization (Vinatier et al. 2011).

All current approaches to describe a species' spatial distribution depend upon the objectives of the study and the quality of the data collected. Typically, to get an accurate description of a population's dispersion, multiple different techniques will need to be used (Myers 1978). A "perfect coefficient" to evaluate dispersion would have six traits: 1) provide real and continuous values for the complete range of spatial distribution, 2) be uninfluenced by the number of sample units, the size of the unit sample, and the number of individuals, 3) be easy to calculate, 4) the values for the index appropriate to some theoretical expectation should be central in position, 5) tests of significance should be available, and 6) its descriptive function should be clearly separated from any supposed theoretical justification (Green 1966, Lefkovitch 1966, Taylor 1984). Documenting spatial distribution for natural populations of ABB would be nearly impossible because of their relatively low densities, but more so because of their movement and underground existence. More plausibly, spatial distribution of baited trap captures could provide insights into how aggregated populations are, as long as capture counts are reflective of natural population levels.

Mark-Recapture

Mark-recapture has been used since 1889 when Peterson began to study the growth and migration of flat-fishes and it is a critical component of sampling for ABB (Peterson and Cederholm 1984).

Peterson used a method that only estimated relative abundance from length-frequency graphs and did not calculate a total population size. The first time a total population size was calculated using mark-recapture was by Lincoln when he estimated the total number of ducks in North America (Lincoln 1930). The process behind this was simple enough: a subset of individuals from a population were captured, marked, and released. When enough time had passed that the marked animals had randomly dispersed back into the population another subset was captured and the proportion of marked animals was recorded. By dividing the total number of marked animals released by the proportion of marked to unmarked animals in the second capture, a total population size could be estimated (Lincoln 1930). Through the ‘30s and ‘40s similar population estimates were done with tsetse flies and Lepidoptera, with the addition of calculating birth and death rates (Jackson 1933, Fisher 1947). While these researchers were developing the basic ways to calculate a total population estimate, little consideration was given for the precision of these estimates (Bailey 1952). In 1943 Schumacher and Eschmeyer used a different method of analyzing their mark-recapture data, and while they were able to also calculate their standard error, the overall estimates were not accurate. In 1946 a group of researchers used mark-recapture data, along with the standard error of the total captures, and the error of the estimated mean population density to estimate the total size of a population of blow flies and found it to be a vast improvement over previous methods (Gilmour et al. 1946). Today, many researchers still utilize modified techniques of the original bayes algorithms as well as utilizing the variance-to-mean ratio, since it is a simple and fundamental index to compare to the Poisson series (Carvalho et al. 2020, Davis 2020).

Assumptions of mark-recapture estimates are that the animals captured for marking are selected at random from the population, that marked animals have the same birth and death rates as unmarked individuals, and that marked individuals are equally likely to be caught as unmarked individuals (Bailey 1952). These factors can become complex when using attractive trapping. Depending on the type of lure (food, pheromones, etc.) the trap may be selecting for one sex or life stage over another. For example, using a CO2 trap to catch mosquitoes will only (with rare exceptions) capture un-fed females (Bellamy and Reeves 1952). Males only feed on nectar and recently blood-fed females will not be attracted to CO2 because they have enough protein to oviposit and are no longer host-seeking. Depending on the marking technique, marked individuals may not survive or disperse as well as non-marked individuals. This is a concern whenever marking individuals, especially an endangered species. ABB marking protocols have been changed many times to optimize mark-recapture procedures, with the most current protocols calling for marking with little to no negative effects (Jenkins et al. 2016).

Pitfall Traps

Prior to the ABB review in 2008, several iterations of pitfall traps were tested for efficacy in sampling burying beetles, along with the effects of trap spacing, amount of bait in the trap, and length of trapping (USFWS 2008). Historically there have been two primary approaches to monitor ABB activity density: transects of 5-16oz cups buried to the rim and single-bucket pitfall traps set every 2km (Bedick et al. 2004). These two protocols differed in size of the trap, trap spacing, quantity of bait, access to bait, and number of nights trapped. All of the aforementioned factors can impact captures (Greenslade and Greenslade 1971, Digweed 1995, Bedick et al. 2004). In 2013, Butler was able to show that a transect of 5 cups spaced 0.5km apart is statistically equivalent to the standard single large bucket pitfall trap. Unfortunately, the cups had higher ABB mortality rates than the buckets, resulting in the current recommended protocol of using single bucket (above or below ground) pitfall traps (Butler et al. 2013). It was recommended that a large pitfall trap (18.9L bucket), spaced at least 1.6km apart, and surveyed for 5 nights may be the most efficient way to determine presence or absence of ABB in a habitat (Bedick et al. 2004).

Relative to use of large bucket pitfall traps, and due to the risk of harming the beetles, captured ABB are recommended to be fed, marked, and released (Bedick et al. 2004, Butler et al. 2012). This approach is hypothesized to account for most beetle behaviors, including typical flight distances, and expected levels of satiation, which ultimately impact the capture rates (Wallin 1991, Fournier and Loreau 2002, Szyszko et al. 2004). The next step would be to evaluate the impact of access to the bait by the beetles on capture rates (Walker and Hoback 2007, Butler et al. 2013).

Even with a better understanding of ABB trapping techniques and behavior, it is difficult to standardize a national level trapping protocol due to the wide array of habitats that the beetles live in throughout their range. Densities of silphids vary widely across these ranges, even among neighboring portions of the same state (Walker and Hoback 2007). Scientists studying ABB continue to improve the efficacy of sampling protocols using single-bucket traps, but concerns continue to exist and include optimizing trap spacing and utilization of temporal recapture data for more accurate density estimates (Leasure et al. 2012, Jenkins et al. 2016, Leasure and Hoback 2017).

Sampling Programs

A sampling program is a list of procedures for the sampling technique in order to obtain a sample (Pedigo 1989). Sampling programs must dictate sample unit size, number of sample units, spatial pattern of the sample units, and timing of the samples to produce the most accurate population estimate possible (Southwood and Henderson 2009). In order to build a successful sampling plan, a researcher must understand the nature of the population they are attempting to classify. A population is a group of living individuals set in a frame that is limited and defined in respect to both time and space (Pearl 1937). Most entomologists further define the meaning of "individuals" to individuals of the same species (Pedigo and Buntin 1993). The major properties of a population that can be estimated through population sampling include: 1) density- an expression of a species abundance in a defined area, 2) dispersion- the spatial distribution of individuals of a species, 3) natality- birth rate, 4) mortality- death rate, 5) age structure- relative proportions of individuals in different age classes, and 6) growth form- the shape of population growth curves (Allee et al. 1949).

There are two general types of sampling programs: extensive and intensive. Extensive programs are usually performed over broad areas and are mainly used to determine species distribution. For this type of sampling, generally a single life stage is sampled and only a few samples are taken each season. A primary emphasis of extensive sampling programs is maintaining low costs (Pedigo and Buntin 1993), but the objective of an extensive program is to primarily detect the presence of a species and occasionally provide additional information. Intensive programs are commonly used as part of population ecology and dynamics research. These are programs that are performed frequently and are restricted to a small area. Depending on the goals of the program, all life stages are sampled and a high degree of precision is desired (Pedigo and Buntin 1993). The objectives of an intensive plan are to accurately estimate population density and provide information on the status of the target species.

Detection sampling, which is designed to detect a species of interest, is a common example of an extensive sampling program (e.g. ABB surveys). These plans are often used to prevent the spread of undesirable species and are commonly used in quarantine efforts to prevent importation of exotic pests (Ruesink and Kogan 1994). However, species status sampling programs are another common example of an extensive sampling program. These programs can also be used to classify population levels in relation to critical densities. The emphasis of species status sampling plans is on minimizing sampling complexity, costs, and effort so that many habitats can be sampled in a short time. But, these plans can be used to direct real-time decisions regarding pest management (Pedigo and Buntin 1993).

Independent single bucket pit-fall traps remain as the primary way to document the activity of ABB (Creighton et al. 2003, Bedick et al. 2004). But an aspect required for documenting overall density is evaluating spatial movement, which a single trap does not do efficiently. This approach is approved for documenting activity and presence as well as trap-out procedures. When attempting to describe the local population of such a mobile species that varies so widely among habitats, spatial variation of density must be incorporated into the population estimations (Brown 1984, Pulliam et al. 1992, Southwood and Henderson 2009). For this reason, determining the local density of ABB using single bucket pit-fall traps can pose a challenge.

Incorporating Behavior and Environmental Variables for Sampling Programs

When developing a sampling program for any organism, a researcher must consider a large number of variables that can impact sampling of a species. The amount of data required can vary wildly between a presence/absence sampling program and a population estimation program. The time of day that the sampling must occur is imperative, so it is necessary to know if the species is nocturnal, diurnal, or crepuscular. Weather conditions can also alter the reliability of sampling results. A windy cool day will drastically reduce the number of flying insects in an area, while dry hot conditions may force some species down near the soil when they would normally be in the canopy of a crop. Soil conditions, such as compaction or content, can have a major impact when looking for soil dwelling organisms (e.g. nematodes, mites, collembolans, etc.). Phenological development can impact where the animals are living at a particular point in their lives. A caterpillar and butterfly inhabit very different habitats, as do a fledgling bird and an adult. The final use of the sampling data can have a major impact on how it is collected. But overall, sampling for pests in a management program, while needing to be reliable, can accept lower levels of accuracy than when sampling for research (Norris et al. 2003).

On top of their intermittent activity levels, factors such as temperature, light, and humidity all play large roles in insect activity. For example, Xylosandus germanus does not fly at temperatures below 21°C and most bark beetles are only captured in traps when it is warmer than 15°C (Weber 1983, Gaylord et al. 2014). Ambient light levels also influence beetle activity. ABB activity slows with increases of ambient light, resulting in more activity on cloudy nights and less on full moons (Wormington et al. 2017). Some Silphidae, Histeridae, and Staphylinidae have even been shown to have upper thresholds of relative humidity for activity (Shubeck and Blank 1982). ABB are highly mobile when seeking carrion, resulting in very open populations over large landscapes and a variety of habitat types. Because ABB sampling protocols include mark-recapture values, this behavior has a significant influence on population estimates (Creighton and Schnell 1998, Walker and Hoback 2007, Leasure and Hoback 2017, Jenkins et al. 2018).

Landscape impact on sampling

Landscape characteristics can have a major impact on an arthropod sampling plan. A landscape refers to a heterogeneous land area composed of a series of interacting ecosystems that is repeated in similar form (Forman 1995). Every landscape can be considered a separate ecosystem, however, neighboring landscapes can have a considerable amount of interaction (Pedigo and Buntin 1993).

Patches are landscape elements that can have varying size and shape. Patch characteristics can have a significant impact on arthropod populations, especially in relation to predictions of the resource concentration hypothesis proposed by Root in 1973. This hypothesis states that herbivorous insects should be more abundant (dense) in large patches of host plants, due to the insects being more likely to find and stay longer within the larger patches than they would in a smaller patch (Root 1973). This hypothesis has subsequently been shown to be organism-dependent within herbivorous insects (Grez and Gonzalez 1995). Insects are typically associated with one or more patches through their life cycle (Pedigo and Buntin 1993). These associations are typically referred to as either spatial associations or temporal associations. Spatial associations refer to patches that are in close spatial proximity that frequently constitute a source/sink relationship for insect populations. Temporal associations are used to describe when insects are affected by the temporal relationship of patches. This temporal effect can be exaggerated within agricultural landscapes where the patch turnover rate is extremely high (Pedigo and Buntin 1993).

Corridors are landscape elements that can influence abundance and distribution of arthropods within the landscape. A corridor can act as a conduit for the movement of species along a feature, or even as a barrier. Corridors are, by definition, highly elongated patches with a large surface area to volume ratio. Corridors and other patches are typically expected to have a high degree of interaction with closely associated landscape elements (Forman 1995).

The two largest remaining ABB populations are in Nebraska and Oklahoma. Within these ranges ABB have similar habitat preferences in that they avoided human population centers and agricultural areas. Northern Nebraska populations were associated with wetter areas while the Southern Oklahoma populations were more closely associated with sandy soils, native forests, and grasslands (Leasure and Hoback 2017).

Sampling ABB

Due to the unique biology and life history of ABB, creating a sampling plan poses challenges. ABB are strong fliers, making it apparent that populations within a region have regular movement and gene flow and must be considered “open” when performing population modeling and estimates. The ABB can move relatively long distances on a daily basis. Creighton and Schnell (1998) showed that out of the ABB captured and released in one location, up to 30% of the beetles released moved to a different location that night. ABB can travel an average of 1.23km a night, with a maximum observed range of 10km in 6 nights (Creighton and Schnell 1998).

Studying such an itinerant species makes the creation of an adequate sampling plan imperative and in order to classify a population of ABB, trap-release-recapture techniques must be used.

Larval sampling is nearly impossible due to the labor required to process vast land areas and is prohibitive since destructive sampling is unacceptable for an endangered species. The best protocol developed to date is documenting adult ABB activity density by using baited traps. Due to ABB using chemosensory cues to locate carrion, they can be lured to traps using carrion as bait. This method has limitations, such as only being able to sample down-wind of traps. Beetles can move long distances to locate a carrion source so traps may not always be sampling the local environment and carrion attracts many other insects and scavengers, which can cause harm to the ABB in a confined trap.

Marking

Using a mark-recapture technique for population estimation requires that all ABB captured are marked in some way so that each beetle can be identified if recaptured in the future. A useful mark should be easy to apply, easy to detect/identify, permanent, require minimal manipulation of the animal, maintain constant signal, and have no impact on the development, behavior, or mortality of the animals (Akey 1991, Steffan et al. 2001, Ginzel and Hanks 2002, Southwood and Henderson 2009).

Not only can capturing ABB adults be difficult, but marking them for accurate recapture identification and population estimations comes with an entirely new set of problems. While multiple marking techniques have been used in the past, many of them have been shown to have a negative impact on beetle behavior and longevity (Butler et al. 2012). Historically, elytral clipping, elytral cauterizing, painting, and attaching bee tags have all been used (Lomolino et al. 1995, Creighton et al. 2003, Peyton 2003, Butler et al. 2012). These techniques can be classified as either permanent (elytral cauterizing and notching) or temporary (paint and bee tags). Elytral clipping impacts their ability to stridulate and communicate with other *N. americanus* and bee tags have been shown to build up enough dirt to double the weight of the beetle (Butler et al. 2012). This can be detrimental to a species that burrows and flies on a daily basis.

A commonly used permanent marking technique in insects is coating the insect in fluorescent dust. This has been shown to have no effect on beetle survival and dispersal (Cook and Hain 1992). The reason this is not a viable technique for ABB is that all captured beetles must be taken back to the lab to be examined under ultraviolet lamps for fluorescent dust. A beetle can only be considered recaptured if there was dust on the flight wings, since dust from other beetles in the trap could get on the legs and elytra during their time spent in the trap (Turchin and Thoeny 1993). Due to the critically endangered status of the ABB, the beetles cannot be transported to a laboratory to observe their flight wings under a fluorescent light, nor would the stress involved in this procedure be acceptable.

Out of the temporary methods, bee tags are retained longer than paint. Bee tags were lost on average after 12.8 days, whereas the paint only lasted 7 days (Butler et al. 2012). The speed at which the paint is lost is not surprising when considering that the beetles spend a lot of their time burrowing through the soil. When a combination of a permanent (cauterization) and temporary (bee tag) marks were used in the field, 19.7% of marked beetles ended up losing their bee tags (Butler et al. 2012). For a species that is so mobile and burrows so regularly a permanent and non-detrimental mark is a must.

While the permanent marks normally used on ABB have not been shown to decrease mortality, they can have other impacts on the life of the beetle. It is not uncommon for insects to use sound and vibration to communicate with one another in order to advertise sexual readiness, mate choice, or localization. (Alexander 1967). In particular, beetles and crickets commonly use specialized structures on their wings or elytra to stridulate (Alexander et al. 1963). Due to this, researchers at Augustana College tested the fecundity of ABB that had their elytra notched. They found that elytral clipping had a major impact on the beetles ability to stridulate and that notched beetles produced fewer young (Hall et al. 2015). For this reason, an alternate permanent marking method was needed. Researchers at Oklahoma State University have found that branding the elytra with a cautery pen, instead of cutting or notching, is safer for the beetle and faster for the researcher administering the treatment (Jenkins et al. 2016). Further testing is required to determine if branding of the elytra has a detrimental effect to the beetle’s stridulation or long-term fitness.

Population Density

Population densities can be measured in two ways: absolute density or relative density. Absolute density is a total count (or estimate) of all the arthropods in a given area, usually expressed in units of land surface area (e.g. #/m2) (Morris 1960). Absolute density is reported through absolute or related estimates in one of three ways: 1) absolute estimates proper, 2) population intensity estimates, or 3) basic population estimates. Absolute estimates quantify the actual numbers in the arthropod population according to the surface-area units. Estimates of this accuracy are typically difficult to complete, can be quite expensive, and are most commonly used in research. The most common methods to create an absolute estimate proper include: fumigants to kill all of the arthropods within an enclosure (Pedigo et al. 1972), extraction funnels (Macfadyen 1962), removal of vegetation followed by laboratory processing to count all individuals on the vegetation (Hammond and Pedigo 1976), and suction traps (Lewis and Taylor 1965). Population intensity estimates are expressions of arthropod numbers per unit of the available food supply (e.g. #/leaf, #/fruit, etc.) (Morris 1960). Population intensity estimates can lack stability due to the possibility of changes in the habitat and are only suited for habitats that will remain stable through the entirety of the sampling plan (Morris 1960, Southwood and Henderson 2009). Basic population estimates are expressed as number per standard unit of habitable surface area (Pedigo and Buntin 1993).

Counting all individuals in a population (a census) is the most direct and accurate method of determining an absolute estimate of population density (Allee et al. 1949, Andrewartha 2012). Censuses are not usually used for arthropod populations due to the large number and small size of the individuals and the cryptic nature of their habitats (Nyrop 1991). Since a census is not reasonable for arthropod populations, representative units of the population are counted and extrapolated in order to estimate the total population (Elliott 1971).

Population indices are commonly used to monitor arthropod populations. Population indices are related to relative estimates in that the absolute density of the arthropod population being observed is not known directly from the indices. These are commonly used to describe any obvious representation (webs, nests, exuviae, frass, etc.) that gives a relative estimate of the population (Morris 1960, Southwood and Henderson 2009).

Absolute vs Relative Estimates

Relative density is a count of arthropods in a sampling unit that has no direct relationship to land surface area. Instead of the land area being constant, the sampling technique is constant. This makes relative densities only comparable among estimates that used the same sampling procedure (Morris 1960). These are commonly expressed as counts per unit effort or counts per trap (Southwood and Henderson 2009). Accurate relative estimates require faithful repetition of sampling procedures in similar settings through time at the same location, or at one time across different locations. The advantage of relative estimates is the relatively low cost and time requirement compared to absolute or related estimates (Pedigo and Buntin 1993).

A statistical approach to converting relative estimates to absolute estimates is achieved by making paired relative and absolute estimates from a series of populations, followed by analyses that regress the relative estimates on the absolute (Pedigo and Buntin 1993). This will allow the researcher to convert any future relative estimates to absolute, thereby reducing the costs and time of future sampling plans. One of the drawbacks of using active trapping for insect sampling is that it provides an estimate of relative population density. A common statistical approach to remedy this is to determine a trap's absolute efficiency, or the trap's effective sampling area (Turchin and Odendaal 1996).

Experimental approaches utilize artificially established populations with known density in order to determine a calibration of relative estimates to absolute estimates (Pedigo and Buntin 1993). An example of an experimental approach would be to mark individuals and place them inside a closed area with a trap. If it is determined that 75% of the marked individuals are captured, this gives the calibration of the relative estimates to absolute estimates.

Analysis of Populations

Scientists studying ABB have long suggested that activity and density measures that incorporate temporal recapture rates could be used to estimate local ABB population density more accurately. A major limiting factor in this type of trapping is manpower and resources. Therefore, it is crucial that the most efficient method possible be determined while still maintaining accurate and precise data. A continuing issue surrounding ABB population estimates is the accuracy of single baited pitfall traps deployed at large distances apart, versus more concentrated groups of baited pitfall traps designed to more accurately reflect local population abundance.

Population Estimates

Long-term capture-recapture population analysis that include natality, immigration, mortality, and emigration have traditionally used the Jolly-Seber model, or some variant of it, to calculate population estimates (Pollock et al. 1990). Jolly-Seber data is based on a single capture occasion per period of sampling and an assumption that the samples are collected instantaneously. An instantaneous sample is extremely difficult to achieve, and impossible when using a baited trap to sample. Collecting a sample over a longer period of time does not bias the parameter estimators if the population being sampled remains static throughout the sampling period (Kendall 2001).

In 1982, Pollock suggested a more robust way to calculate estimates for open populations of wildlife. By design, closed-population abundance estimators are stronger but a combination of these two methods for an overall analysis is more robust. The idea was to use closed-population methods to analyze data from sampling periods within a set time frame and then use the Jolly-Seber method to analyze data from multiple periods. From 1995 to 1997, Kendall and colleagues adjusted these models for individual animals that were unavailable at times. These individuals are referred to as temporary emigrants. Three specific cases to allow for temporary emigrants were developed: 1) when probability of availability is completely random, 2) the individual is available for capture, or 3) when the individual is captured in the previous period. The main factors affecting availability of the individuals being sampled are the study area and the behavior of the species being sampled (e.g. mammals going into torpor in the winter, breeding individuals not being available for sampling, etc.).

Statistics of population estimates include five characteristics: 1) accuracy- the extent to which an estimated mean deviates from the true population mean, 2) bias- the degree of systematic error in estimating the mean, 3) efficiency- the level of precision per unit of cost of sampling effort, 4) fidelity- the accuracy with which population estimates over time reflect actual changes in population numbers, and 5) precision- the degree of statistical error in making estimates of population number (Eisenhart 1968, Pedigo and Buntin 1993). Accuracy is important in order to get viable and reliable estimates of the absolute mean density. The accuracy of relative techniques often refers to the correct identification of the target species and correct counts of the target species from each sampling unit (Fleischer and Allen 1982). Clearly each of these are important factors when attempting to describe ABB populations, but accuracy of the local population estimates is most relevant to endangered species.

Over-Attraction with Multiple Traps

Single baited pitfall traps create plumes of attractive odor for ABB and they are estimated to attract beetles from a minimum of 1km without creating disruptive effects (Bedick et al. 2004).

For sampling designs that utilize multiple baited pitfall traps in an effort to simulate typical carcass arrangement in an area, the possibility of disruptions or over attraction must be addressed. Disruptions that reduce trap captures have been previously discussed, but over attraction could mean that the high number of traps are artificially drawing in more beetles than would otherwise be in the area. This concern must be addressed statistically by determining the probability distribution of trap captures among traps, and then accounting for any evidence of over attraction to a group of traps.

Taylor's Power Law and Multiple Traps

Taylor's power law states that the variance (V) of samples taken of a population accelerates as a fractional power of the mean density, where A=log(a) is the intercept and b is the gradient of the log transformed power law (Taylor et al. 1978, 1979, 1980). The gradient of the log transformed power log (b) is most likely stage-specific for most species due to the niche partitioning between immature and adult insects and influenced by environmental conditions (Taylor et al. 1980, Elliott 1981). Behavior, demographic factors, and environmental differences all contribute toward the actual spatial pattern displayed by a population. Some researchers have argued that due to drastic differences in the environment and demographics geographically, Taylor's b must only be applicable to local and identical systems and cannot be applied to a species over multiple ecozones (Downing 1986, Trumble et al. 1989).

There is some controversy about whether b is sufficiently stable to be representative of the spatial organization of a pest species of a crop in any field as opposed to varying on a field by field basis. This debate was most likely sparked by a symposium article titled "Aggregation as a species characteristic” (Taylor 1971). If b was truly species specific, then a single sampling program for a pest species would work for every field of every crop where that pest is found. There is evidence from Taylor’s power law publications, as well as other data and analysis, that show that the distribution changes between cropping systems, different stages of the same crop, different parts of the same plant, the air above the crop and the canopy as a result of pesticide application, and even just different geographical regions (Taylor 1973, Taylor et al. 1979, Trumble 1985, Taylor 1987, Davis and Pedigo 1989, Trumble et al. 1989, Reed et al. 1991). This becomes even more obvious when arguing that demographics of a population and environment vary widely between geographic locations. This would lead us to conclude that Taylor’s b is solely a local phenomenon and does not correlate within a species over a wide area (Downing 1986, Trumble et al. 1989, Taylor et al. 1998). With this in mind, one must consider local habitat the largest environmental variable when sampling. It has shown that variation within a species can be a result of something as simple and straightforward as the host plant by showing that survival and reproductive potential vary significantly between hosts (Robb 1989, Taylor et al. 1998).

Taylor was able to test the hypothesis that Taylor’s b is uninfluenced by a range of environmental and demographic conditions. This was originally hypothesized in 1988 by Taylor and shows that the power law is a useful tool for ecology in both conservation and agriculture. Through sampling thrips in different greenhouses, Taylor was able to show that behavior was the only trait that readily influenced b (Taylor et al. 1998). The differences between b’s cannot be caused by demographic or environmental differences since a population of thrips sampled within and above the canopy were reproductively the same (Taylor et al. 1988). The only difference between the populations was a behavioral character: flight in this case (Taylor et al. 1998).

Taylor's Power Law is useful for baited trap data collected from multiple traps in an area and allows for calculation of dispersion (b) but also inclusion in sample size formulas allowing for determination of appropriate number of traps to be deployed with a given level of precision. Indeed, multiple studies have been conducted with baited traps deployed in gridded designs, and following calculation of dispersion, optimal sample unit requirements have been calculated (Green 1966, Greenslade and Greenslade 1971, Pedigo and Buntin 1993, Leather and Watt 2005, Navarro-Llopis et al. 2008).

CHAPTER III

METHODS & MATERIALS

Objective 1: Evaluation of Sampling Grids for Estimating ABB Densities.

The McAlester Army Ammunition Plant (McAAP) is considered a favorable environment for ABB consisting of loam-based soils and mainly post oak (*Quercus stellate*) and blackjack oak (*Quercus marilandica*) forest with occasional oak-southern pine forest (*Quercus spp*. and *Pinus spp*.) (Leasure and Hoback 2017). It is heavily wooded with a few ponds and hay meadows dispersed throughout. During 2013, 2014 and 2015, traps on McAAP were organized into 6 grids in 3 pairs (Fig. 2, 3, 4) Each grid consists of 16 traps organized into 2km x 2km squares that trapped ~13km^2 and had a center location designated. When a grid was sampled, the center trap of its paired plot in the same habitat was also sampled. Previous work done with lures suggest that properly designed grids can more accurately reflect density (Cardé and Elkinton 1984, Weihong et al. 1999, Kong et al. 2014). Grid traps (16/grid) were spaced ~0.33km apart in order to overlap activity/trapping areas and ensure maximum attraction without disruptive oversaturation of bait odor (Oehlschlager et al. 1995). Single traps are predicted to effectively assess ABB activity up to 1km away, therefore grids represented an attempt to increase efficiency of trap captures in a large area, without too much overlap that would interfere with attraction to traps within the grids. Center traps were located as close to the physical center of the grid as possible. Within each of 3 years, sampling was conducted for three consecutive days per week, followed by a break of at

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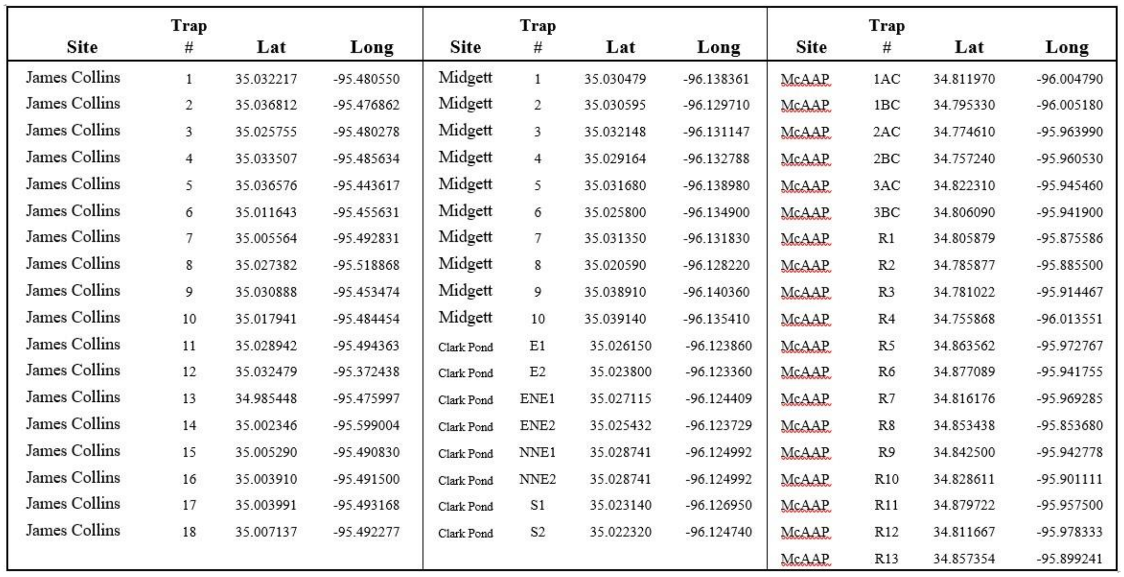
least 4-5 days. Although longer periods of sampling has been shown to increase the accuracy of captures in enclosed cages (Butler et al. 2013), a 3-day period has been utilized in previous studies but methods were updated in 2018 to a 5-day period (Bedick et al. 2004, USFWS 2018) and is likely to reflect multiday activity in open systems. All traps were checked by 10:00am, following USFWS protocol, in order to minimize the risk of mortality due to high temperatures (USFWS 2005). Because of significant time required for trap deployment and sample processing, the grid sampled was rotated weekly, resulting in each grid getting sampled roughly once every 3-6 weeks. Grid trap GPS coordinates are listed in Table 1.



Site	Trap #	Lat	Long	Site	Trap #	Lat	Long	Site	Trap #	Lat	Long
James Collins	1	35.032217	-95.480550	Midgett	1	35.030479	-96.138361	McAAP	1AC	34.811970	-96.004790
James Collins	2	35.036812	-95.476862	Midgett	2	35.030595	-96.129710	McAAP	1BC	34.795330	-96.005180
James Collins	3	35.025755	-95.480278	Midgett	3	35.032148	-96.131147	McAAP	2AC	34.774610	-95.963990
James Collins	4	35.033507	-95.485634	Midgett	4	35.029164	-96.132788	McAAP	2BC	34.757240	-95.960530
James Collins	5	35.036576	-95.443617	Midgett	5	35.031680	-96.138980	McAAP	3AC	34.822310	-95.945460
James Collins	6	35.011643	-95.455631	Midgett	6	35.025800	-96.134900	McAAP	3BC	34.806090	-95.941900
James Collins	7	35.005564	-95.492831	Midgett	7	35.031350	-96.131830	McAAP	R1	34.805879	-95.875586
James Collins	8	35.027382	-95.518868	Midgett	8	35.020590	-96.128220	McAAP	R2	34.785877	-95.885500
James Collins	9	35.030888	-95.453474	Midgett	9	35.038910	-96.140360	McAAP	R3	34.781022	-95.914467
James Collins	10	35.017941	-95.484454	Midgett	10	35.039140	-96.135410	McAAP	R4	34.755868	-96.013551
James Collins	11	35.028942	-95.494363	Clark Pond	E1	35.026150	-96.123860	McAAP	R5	34.863562	-95.972767
James Collins	12	35.032479	-95.372438	Clark Pond	E2	35.023800	-96.123360	McAAP	R6	34.877089	-95.941755
James Collins	13	34.985448	-95.475997	Clark Pond	ENE1	35.027115	-96.124409	McAAP	R7	34.816176	-95.969285
James Collins	14	35.002346	-95.599004	Clark Pond	ENE2	35.025432	-96.123729	McAAP	R8	34.853438	-95.853680
James Collins	15	35.005290	-95.490830	Clark Pond	NNE1	35.028741	-96.124992	McAAP	R9	34.842500	-95.942778
James Collins	16	35.003910	-95.491500	Clark Pond	NNE2	35.028741	-96.124992	McAAP	R10	34.828611	-95.901111
James Collins	17	35.003991	-95.493168	Clark Pond	S1	35.023140	-96.126950	McAAP	R11	34.879722	-95.957500
James Collins	18	35.007137	-95.492277	Clark Pond	S2	35.022320	-96.124740	McAAP	R12	34.811667	-95.978333
								McAAP	R13	34.857354	-95.899241

Table 1. Grid Trap Locations on McAAP. Grid Trap Locations Were Used in 2013, 2014, 2015.

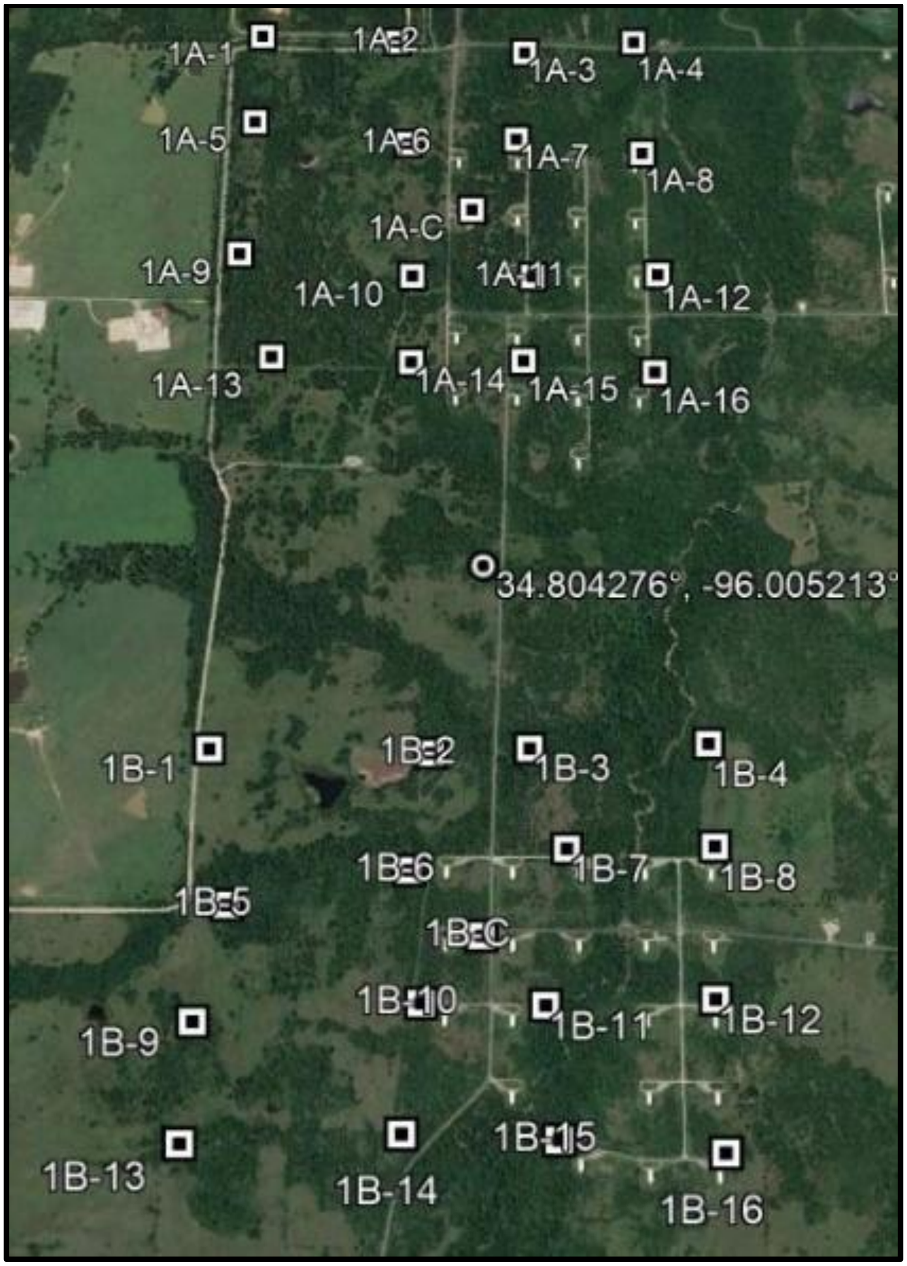


Figure 2. 2013-2015 Intensive Sampling Grids 1A and 1B at McAAP McAlester, OK.

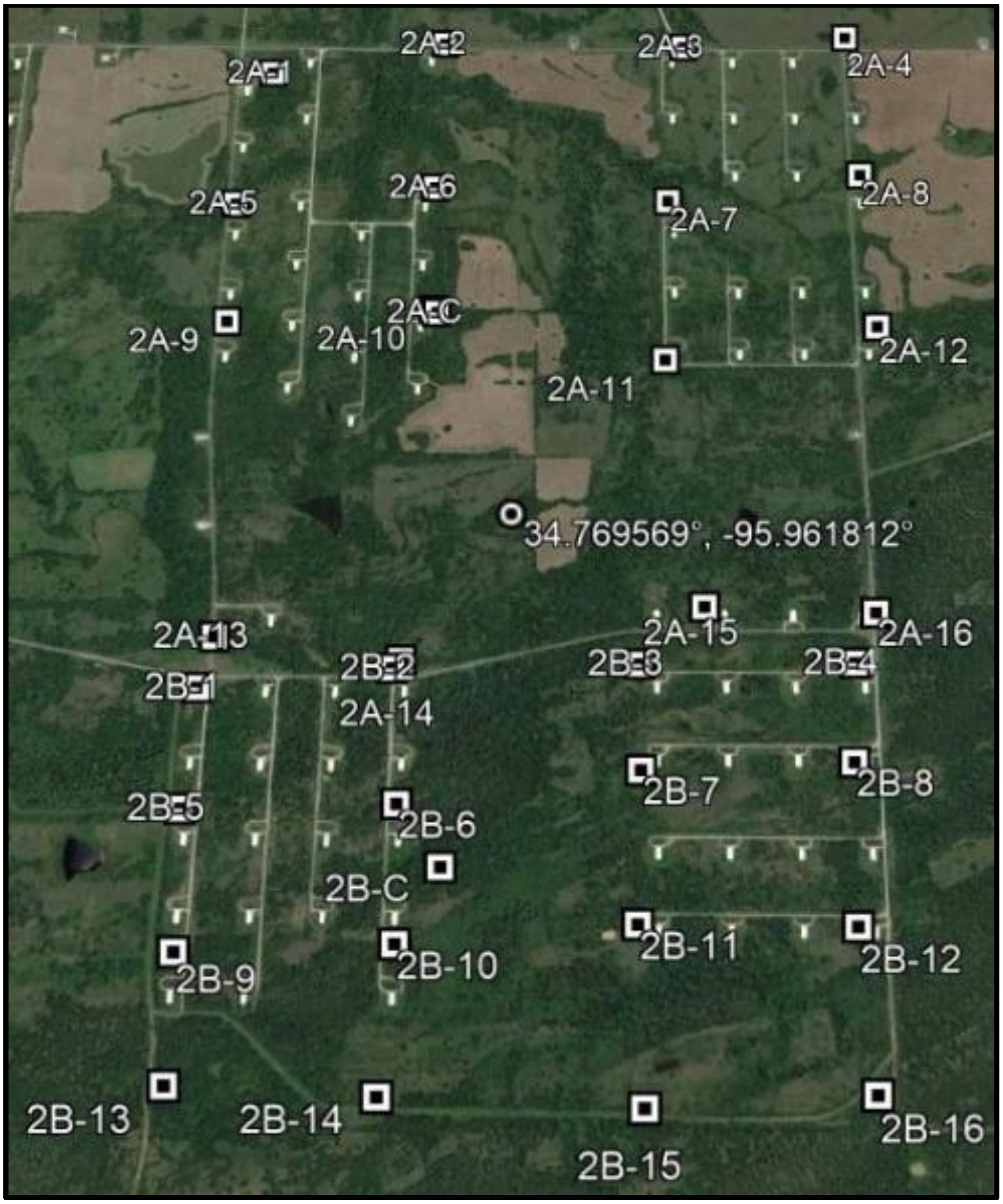


Figure 3. 2013-2015 Intensive Sampling Grids 2A and 2B at McAAP McAlester, OK.

Figure 4. 2013-2015 Intensive Sampling Grids 3A and 3B at McAAP McAlester, OK.

Details of Trap Preparation and Monitoring

The ABB traps used were modified versions of the Kozol protocol (Kozol 1989). Traps consisted of five-gallon buckets with 48 1/16” holes drilled around the sides and on the bottom to maximize scent dispersion, allow adequate air flow, and to prevent the trap from filling with water during a rain event (Fig. 5). Lids consisted of plywood boards that had a groove for the bucket lip routed into it and a 6” hole cut out of the center. A 6” funnel was installed in the hole in the center of the lid and a 10” Frisbee was mounted above the funnel using 5cm spacers to minimize the water that got into the trap during a rain event. A 5/16” J-bolt was fitted on either side of the opening to secure the lid in place and allow easy removal of the lid during trap checking while still allowing the trap to remain attached to a tree.

Trap substrate consisted of a 70/30 mixture of peat and sphagnum moss, respectively. This mixture allowed for adequate moisture retention without the substrate becoming muddy after a rain. Moistened substrate (2.2L) was added to each trap to keep humidity levels in the trap high while allowing any beetles captured to hide from other insects captured in the trap. The substrate was moistened nearly to saturation every week before setting traps.

Traps were baited with large previously frozen rats (180-280g), supplied by Big Cheese Rodents™, that were aged for 48-72 hours before deployment. These were contained within Gladware™ plastic containers (~1200ml) with removable lids that had approximately 20 1/16” holes drilled into the lid and placed in the trap. The length of aging was dependent on the ambient temperature. If the rats were kept at room temp (25°C) for the duration of the aging, 72 hours was appropriate. If the rats were exposed to warmer temperatures (e.g. 32°C and higher) they were not aged for more than 48 hours to ensure rats did not become bloated before baiting.

Rat containers, with appropriately aged rats, were placed in traps already containing 2.2L moistened substrate and trap lids were secured using the installed J-bolts to prevent any scavengers from gaining access to the bait (Fig. 5). Baited traps were set the day before a three-day sampling event. When initially set, GPS coordinates for each trap were recorded using Garmin Rino 130™ or eTrex10™. Two 1.5m lengths of 6-gauge wire were cut and used to secure the trap to a tree, a minimum of 15cm off the ground. Having the trap this far off the ground prevents ants from locating the bait as quickly and prevents over saturation of the substrate within the trap during a rain event. It was important that the trap lid was touching the tree after installation in order to maximize ease of access by any beetles climbing the tree in search of bait. The tree and trap locations were selected to maximize the shade covering the trap during the morning hours in order to minimize desiccation risk of beetles captured overnight.

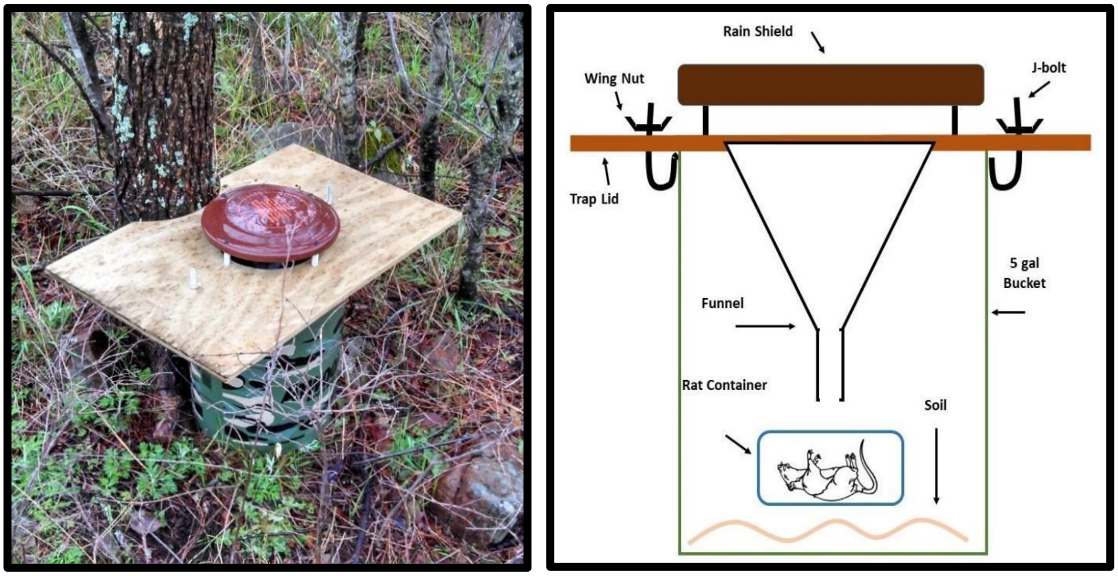


Figure 5. New ABB Trap Installation and Design.

Individuals checking traps had four 2.2L plastic containers with them. One container for any ABB in the trap, one for any non-ABB Nicrophorus, one for other insects, and one for soil. The lids of the traps were removed without removing the trap from the tree. To check the trap, one handful of soil at a time was removed from the trap and placed in the soil container. Each handful of soil was thoroughly searched before the next was removed. When an insect was found in the trap, small amounts of soil were put in the 2.2L containers with them to prevent desiccation. Once all soil was thoroughly searched and all insects removed, the soil and the rat were placed back into the trap and the lid was secured. All insects collected were transported for processing in a 2.2L plastic container with moist soil. Any non-ABB Nicrophorus were identified, measured, counted, and stored separately. All other non-ABB insects were identified, counted, and stored separately. Fire ants infested 6 traps through the 3 years but there was no ABB mortality from those infestations. Ant infested traps were cleaned out, given new soil and bait, and moved to a suitable location close to the GPS coordinates for that trap.

ABB Processing, Marking and Release

Each ABB captured was measured across the widest part of its pronotum using a Kobalt™ 6" metric and SAE calipers (accuracy = 0.025mm) then placed in a plastic container with a small amount of wet dog food. If the ABB was hungry, it typically fed, allowing for non-disruptive marking. Marking techniques changed slightly each year of the project to adjust for recent findings and requirements, but overall each technique allowed for calculation of acceptably accurate recapture rates. In 2013 a precise applicator was used to place a dot of outdoor, water/UV resistant, non-toxic, acrylic paint on the top or bottom of either the right or left elytra. Color was pre-determined for each trap and week. A bee tag was also attached to the middle of the right elytra using a small amount of gel superglue while the ABB was eating or held firmly. Unfortunately, the paint wore off quickly due to typical beetle burrowing activities but was sometimes detectable during recaptures and confirmed with bee tags. In 2014 a cauterizing pen was used to make a small notch in the back of the right elytra and a bee tag was also applied. Notching the elytra has also been shown to inhibit stridulation and reduced reproductive success of ABB and bee tags can accumulate moist soil reducing mobility and reproductive success (Butler et al. 2012, Hall et al. 2015). T two-stage approach was considered adequate for estimating recapture rates. For 2015, branding was identified as a permanent and harmless way to mark; a cauterizing pen was used to lightly uniquely brand the hind orange emaculation of the right elytra (Jenkins et al. 2016). Each sample period, all beetles were released near the trap site in a one-inch-wide and four to six-inch-deep hole that was dug by the releaser in a shaded area. As previously mentioned trapes were checked by 10:00 am to minimize mortality (USFWS 2005).

Data Summary and Analysis

Distribution of ABB Captures in Sampling Grids

Exploratory spatial analysis of grid captures from 2013, 2014 and 2015 was conducted using PROC REG, SAS 9.4 (SAS Institute 2011) in order to evaluate the probability distribution of ABB captures separately for 1) nightly captures and 2) summed 3-day captures. Previous studies have investigated spatial distribution of baited trap catches as an approach to improve future sampling efficiency (Oehlschlager et al. 1995). Both analyses were conducted but based on ABB research to date, summed 3-day captures were considered more representative of local activity.

One goal was to investigate whether the grid with traps placed ~0.33km apart created a stronger spatial effect of attracting ABB from surrounding areas. The effect would be revealed if trap catches were highly aggregated (likely at grid edges) and evidenced by estimation of the aggregation coefficient b from Taylor's Power law regression. In its simplest form, Taylor's power law is a model that assumes that spatial variance is proportional to a fractional power of the mean population density (Taylor et al. 1978):

$$s^2 = am^{b}$$

Where m is the sample mean, s^2 is the sample variance, b is the slope, and a is the anti-log of the intercept. The b value indicates distribution of counts from multiple sample universe data with a range of means and variances. Values of b equal to 1 would indicate a random distribution of counts and no consistent aggregation, whereas values of $b > 1$ would indicate consistent aggregation (location within grid would be determined post-analysis). Simple t-tests of b-values were used to determine if $b = 1$ ($P = 0.05$) (Pedigo and Buntin 1993).

A post Taylor's Power law regression that was to evaluate efficiency of the 16 traps deployed within grids for estimating means. Using Green's formula of Fixed Precision (Green 1970), and chosen values for m, the number of traps required to reach a chosen precision level of 0.1 was calculated.

Relationship Between ABB Captures in Sampling Grids and Paired Single Traps

Before comparing different population estimation methods (objective 2) and estimating regional populations (objective 3), it was imperative to determine whether captures from a single trap have predictable relationships to captures from traps in intensely sampled grids. Simple linear regressions were run using PROC REG, SAS 9.4 (SAS Institute 2011) to compare single trap captures to captures from paired grids in the same habitat for 2013, 2014 and 2015 data. Regression is a suitable strategy to analyze a theoretical relationship between absolute (grid) and relative (single trap) densities. Goodness of fit and the slope of the regression would indicate predictable relationships, but also whether the grid was more efficient at capturing ABB per km2. That is, are single traps just as efficient per unit area of influence as the larger grid of traps deployed. Single traps have been shown to influence trap captures up to 2km^2 (USFWS 2005). The grid area, with half circles of 1km radius extending from each trop, was calculated at 13km^2 area of influence.

Objective 2: Comparing MARK vs. Schnabel Estimates of ABB Density.

For the MARK vs. Schnabel comparisons only grid captures from McAAP during 2015 were used, as the data represented the most complete and uninterrupted sampling effort of ABB populations. As previously described, during 2015, trapping occurred in 3-day events, with at least 4 days of no trapping in between and capture totals were grouped into either daily captures or 3-day event totals. Because it was common for individual days to not have recaptures, a Schnabel estimate could not be calculated for those days. But it was rare for a 3-day trapping event to have no recaptures. Combining the individual days into weekly events generated a more consistent and locally representative data set for calculating population estimates.

The Schnabel index is an extension of the Peterson method for population estimates using mark-recapture methods. The Peterson method is a way to estimate populations using a single mark-recapture event, where only two trapping events are completed (Peterson and Cederholm 1984). The Schnabel method builds on the Peterson method in that it extends the sampling to a series of samples in which there is a 2nd, 3rd, 4th, …nth sample. Each individual captured is examined for marks, if they were not previously marked they will be marked and released (Schnabel 1938). Only a single type of mark is needed since, when using the Schnabel index, individuals are only distinguished between marked and unmarked (Krebs 1989). For the Schnabel method we determine: Ct is the total # of individuals captured in sample t, Rt is the number of individuals already marked when captured in sample t, Ut is the number of individuals marked for the first time and released in sample t, and Mt is the number of marked individuals in the population just before the tth sample is taken (the sum of all previous Ut's). The Schnabel method treats multiple samples as a series of Peterson estimates and obtains a population estimate as a weighted average of Peterson estimates represented by:

$$\hat{N} = \frac{\sum_t (C_t M_t)}{\sum_t R_t}$$

The Robust design model of MARK was used and this model is designed to give population estimates for highly mobile, open populations. The sampling events consist of multiple "sessions" that take place in close succession. This assumes minimized movement of the individuals so that the population being sampled can be considered "closed" in between the sessions. Then a period of time, a minimum of 4 days in our case, is left between the sampling events to allow for immigration and emigration of individuals among populations. The time between sampling events is built into the model in MARK so that longer breaks can be considered when calculating the population size over long periods.

MARK is a Windows program that provides parameter estimates from marked animals in open populations when they are re-encountered at a later time (White and Burnham 1999). The time intervals between re-encounters do not have to be equal. The time intervals default to one in the program, but can be recorded to reflect the actual interval lengths. All time intervals were edited to reflect the number of days between sampling events during this study. The basic input into the MARK program is the encounter history of each animal. Due to poor marking techniques during the first two years, only 2015 had reliable individual capture histories useable with MARK. Of the models available in MARK, the one used for this study is the Robust Design model. The Robust Design model is a combination of the CIS live recapture model and the closed capture models (Kendall and Nichols 1995, Kendall et al. 1995, Kendall et al. 1997). Instead of just one capture occasion between survival intervals, multiple capture occasions are used that are close together in time. These closely spaced encounter occasions are termed “sessions”. For each trapping session (j), the probability of first capture (p(ji)) and the probability of recapture (c(ji)) are estimated along with the number of animals in the population (N(j)). For the intervals between sessions, the probability of survival (S(j)), the probability of emigration (ɣ”(j)) and the probability of an animal that was not in the area staying away from the area (ɣ’(j)) are estimated.

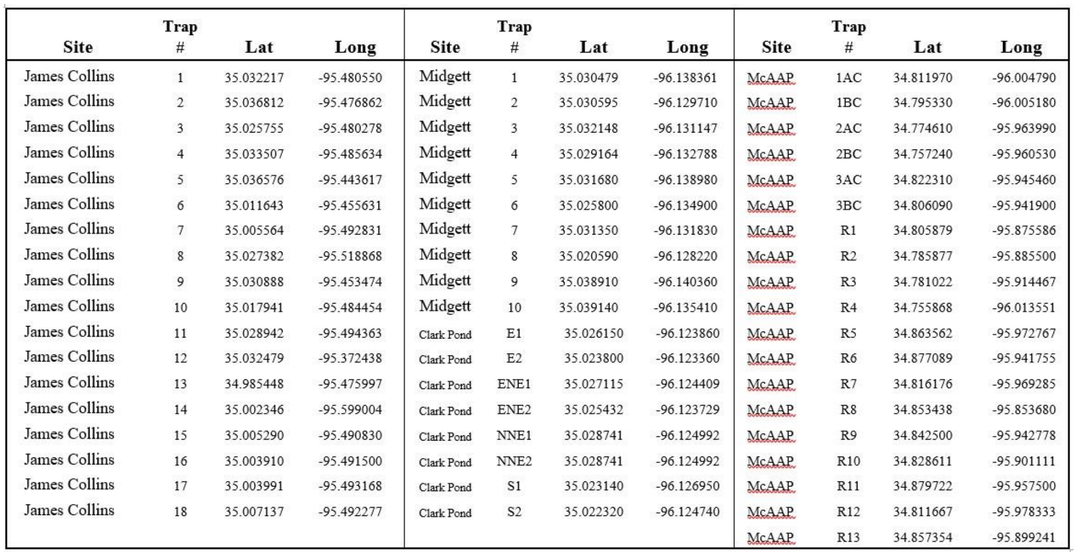
Spatial data from the grids indicated a random dispersion pattern approaching aggregated, which raised concerns about whether the number and location of traps in the grids was creating an over-attraction effect into the grid area. Because of this, we conducted exploratory calculations from different groups of traps: grids were analyzed with all 16 traps, with the north and west side traps removed resulting in 9 traps, and with all 4 sides removed resulting in 4 traps. The north and west sides were removed since the predominate winds in the area are out of the Southeast. If there is an over-attraction effect, the north and west sides of the grid would be the first traps any beetles coming into the area would encounter and be representative of populations larger than the grid. Population estimates were calculated for 16 traps from whole grids, 9-trap grids, and 4-trap grids using both MARK and the Schnabel Index. The results were summarized and regressions were evaluated between the two ABB population estimate approaches.

Objective 3: Regional Population Estimates for ABB Using Single Trap Data

Findings from objective 1 and 2 indicated that single traps were similarly effective to grids for estimating ABB density. Therefore, we summarized intensively sampled single trap data from four locations in South Eastern Oklahoma and utilized the Schnabel and MARK methods to estimate ABB populations. During 2013, 2014 and 2015, data collected from the James Collins Wildlife Management Area (JCWMA), the McAlester Army Ammunition Plant (McAAP), Clark Pond, and Midgett; the last two of which are privately owned land near Lamar, Oklahoma. All locations sampled had loam-based soils and McAAP and JCWMA are mainly comprised of post and blackjack oak forest with occasional oak-southern pine forest. They are both heavily wooded with a few ponds and hay meadows dispersed throughout. The Lamar locations varied in terrain type but had post and blackjack oak forest or oak-southern pine forests.

Trapping methods were previously described and single traps were deployed at least 1km apart, following USFWS protocol (USFWS 2010). Individual trap GPS coordinates are listed in Table

2. The trapping locations in Lamar, OK, shown in figure 8, are both the Midgett sites (Lamar #1-10) and Clark Pond sites (directional names e.g. East 1, East North East 1, etc.). These two sets of traps were near each other but were owned by different land owners and required access from separate locations. McAAP (19 traps) consists of 182km² of continuous habitat, JCWMA (18 traps) consists of 86.4km² of habitat, and both Clark Pond (8 traps) and Midgett (10 traps), the Lamar locations, are 2km² each.



Site	Trap #	Lat	Long	Site	Trap #	Lat	Long	Site	Trap #	Lat	Long
James Collins	1	35.032217	-95.480550	Midgett	1	35.030479	-96.138361	McAAP	1AC	34.811970	-96.004790
James Collins	2	35.036812	-95.476862	Midgett	2	35.030595	-96.129710	McAAP	1BC	34.795330	-96.005180
James Collins	3	35.025755	-95.480278	Midgett	3	35.032148	-96.131147	McAAP	2AC	34.774610	-95.963990
James Collins	4	35.033507	-95.485634	Midgett	4	35.029164	-96.132788	McAAP	2BC	34.757240	-95.960530
James Collins	5	35.036576	-95.443617	Midgett	5	35.031680	-96.138980	McAAP	3AC	34.822310	-95.945460
James Collins	6	35.011643	-95.455631	Midgett	6	35.025800	-96.134900	McAAP	3BC	34.806090	-95.941900
James Collins	7	35.005564	-95.492831	Midgett	7	35.031350	-96.131830	McAAP	R1	34.805879	-95.875586
James Collins	8	35.027382	-95.518868	Midgett	8	35.020590	-96.128220	McAAP	R2	34.785877	-95.885500
James Collins	9	35.030888	-95.453474	Midgett	9	35.038910	-96.140360	McAAP	R3	34.781022	-95.914467
James Collins	10	35.017941	-95.484454	Midgett	10	35.039140	-96.135410	McAAP	R4	34.755868	-96.013551
James Collins	11	35.028942	-95.494363	Clark Pond	E1	35.026150	-96.123860	McAAP	R5	34.863562	-95.972767
James Collins	12	35.032479	-95.372438	Clark Pond	E2	35.023800	-96.123360	McAAP	R6	34.877089	-95.941755
James Collins	13	34.985448	-95.475997	Clark Pond	ENE1	35.027115	-96.124409	McAAP	R7	34.816176	-95.969285
James Collins	14	35.002346	-95.599004	Clark Pond	ENE2	35.025432	-96.123729	McAAP	R8	34.853438	-95.853680
James Collins	15	35.005290	-95.490830	Clark Pond	NNE1	35.028741	-96.124992	McAAP	R9	34.842500	-95.942778
James Collins	16	35.003910	-95.491500	Clark Pond	NNE2	35.028741	-96.124992	McAAP	R10	34.828611	-95.901111
James Collins	17	35.003991	-95.493168	Clark Pond	S1	35.023140	-96.126950	McAAP	R11	34.879722	-95.957500
James Collins	18	35.007137	-95.492277	Clark Pond	S2	35.022320	-96.124740	McAAP	R12	34.811667	-95.978333
								McAAP	R13	34.857354	-95.899241

Table 2. Single Trap Locations in Southeast OK.

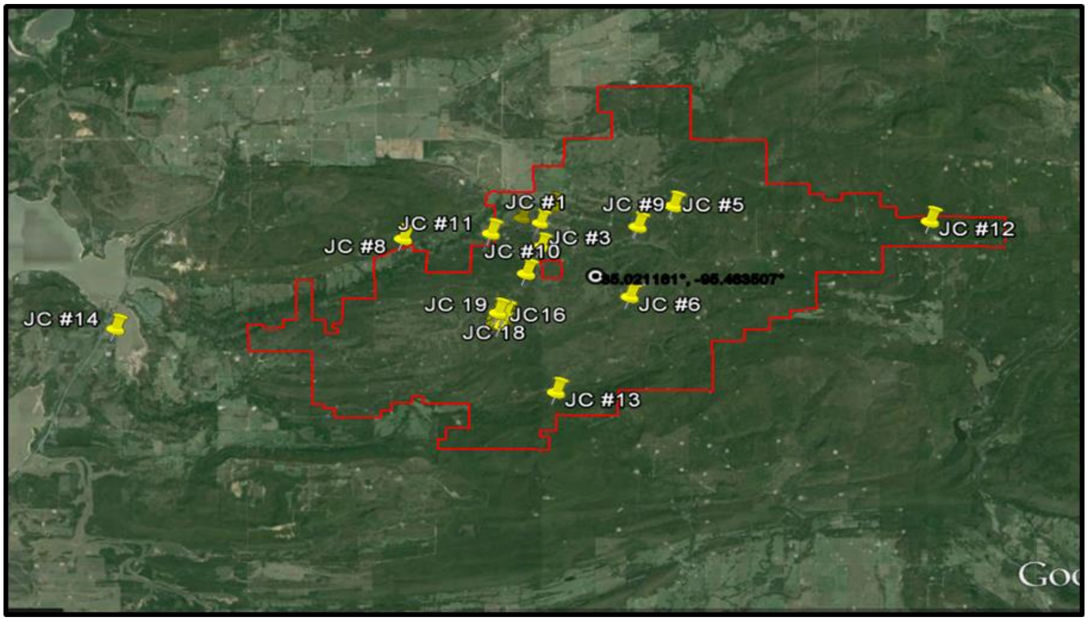


Figure 6. Single ABB Trap Locations at JCWMA in Blocker, OK Sampled in 2013, 2014, and 2015.

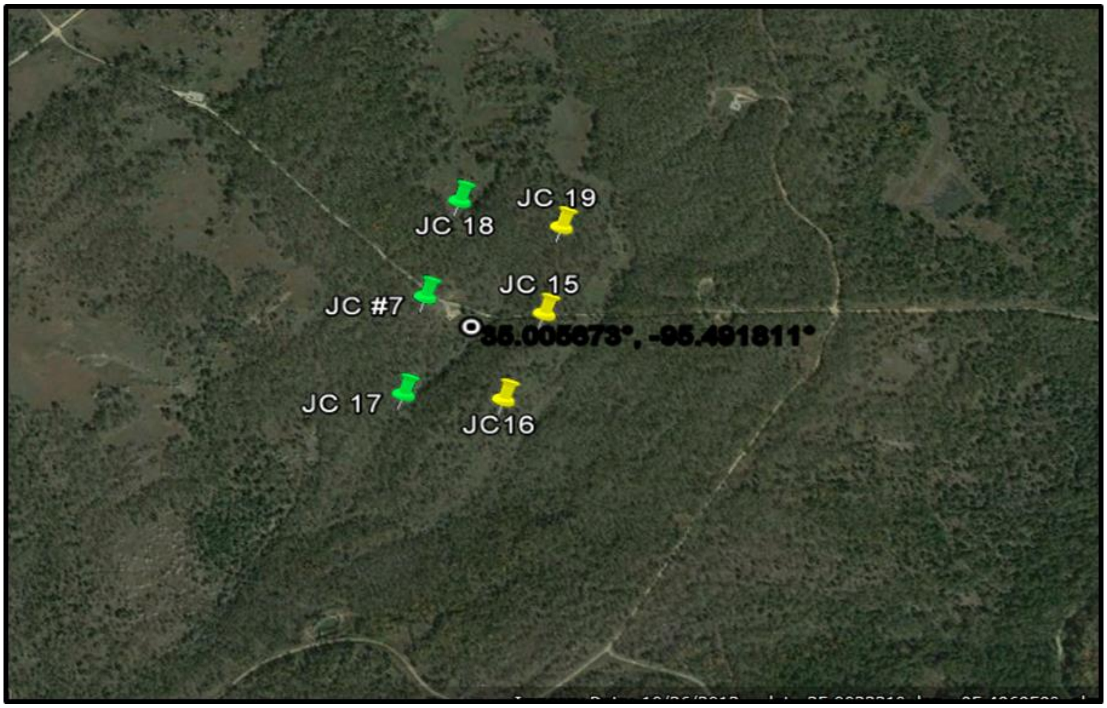


Figure 7. Single ABB Trap Locations Around Release Site at JCWMA in Blocker, OK Sampled in 2013, 2014, and 2015.

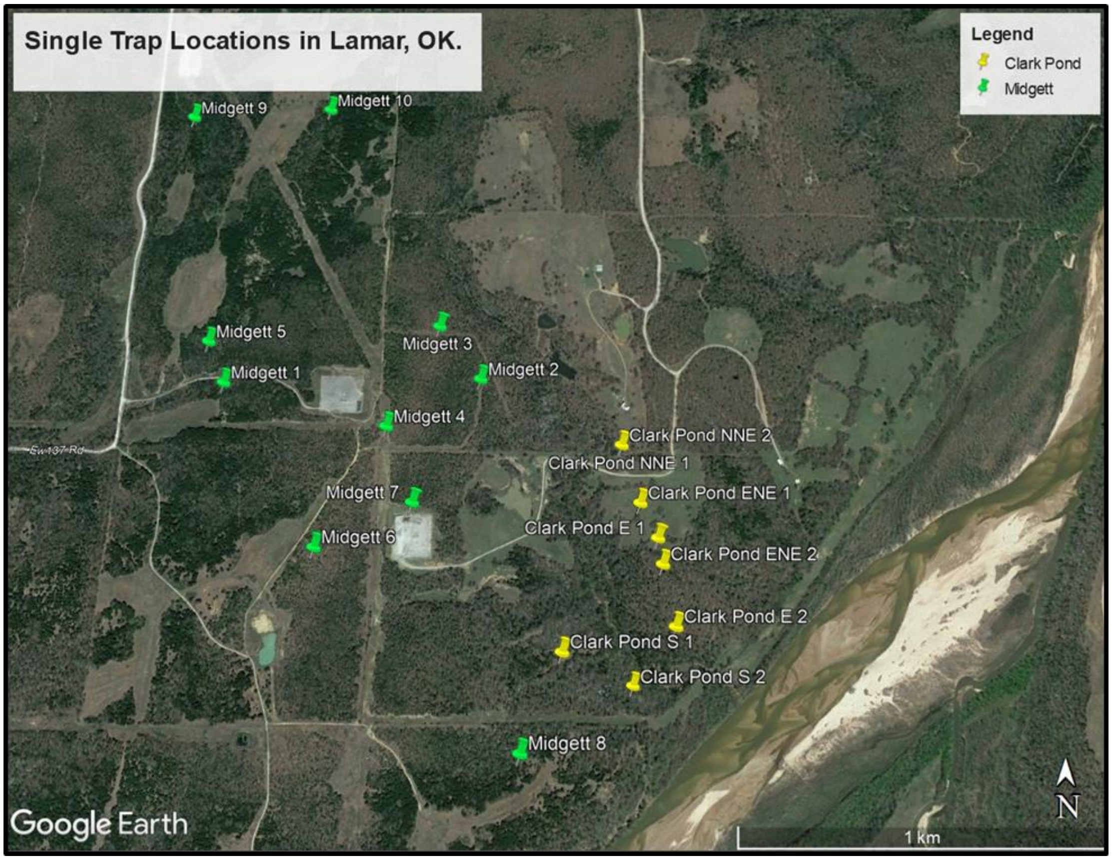


Figure 8. Single ABB Trap Locations on Clark Pond and Midgett Properties in Lamar, OK Sampled in 2013 and 2014.

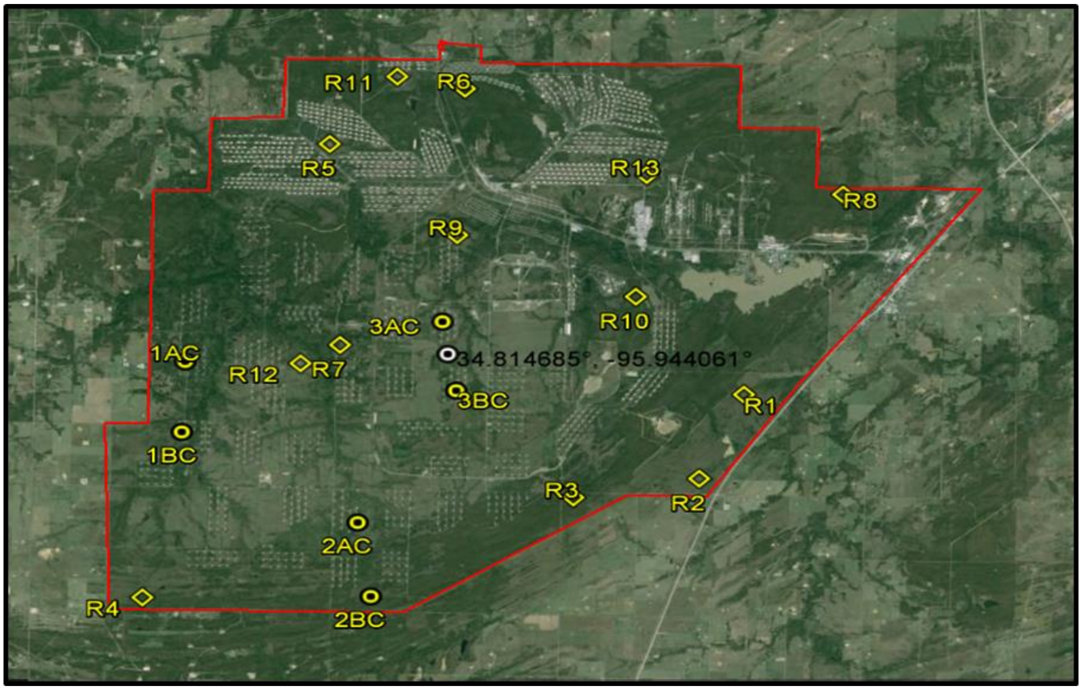


Figure 9. Single ABB Trap Locations at McAAP McAlester, OK.

CHAPTER IV

RESULTS AND DISCUSSION

Objective 1: Evaluation of Sampling Grids for Estimating ABB Densities.

Primarily because of available labor, trapping effort increased each year within our grids on McAAP: there were 10 three-day trapping events in 2013, 18 three-day trapping events in 2014 (a 55% increase from 2013), and 30 three-day trapping events in 2015 (60% increase from 2014). The increases in trapping effort appeared to relate to increasing capture rates as well (Table 3). This was most likely an artifact of being able to sample more traps during the peak of ABB activity in 2014 and 2015.

McAAP ABB Population Metrics

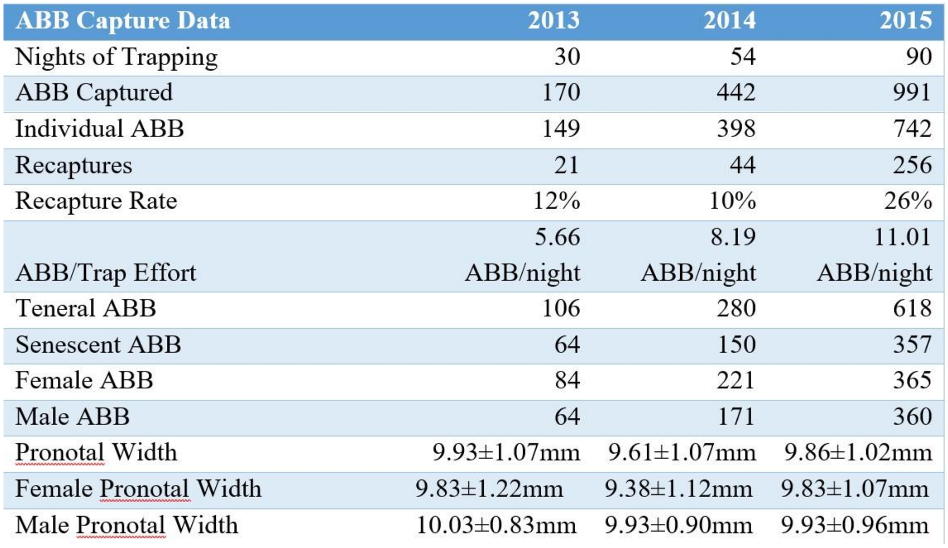


ABB Capture Data	2013	2014	2015
Nights of Trapping	30	54	90
ABB Captured	170	442	991
Individual ABB	149	398	742
Recaptures	21	44	256
Recapture Rate	12%	10%	26%
ABB/Trap Effort	5.66 ABB/night	8.19 ABB/night	11.01 ABB/night
Teneral ABB	106	280	618
Senescent ABB	64	150	357
Female ABB	84	221	365
Male ABB	64	171	360
Pronotal Width	9.93±1.07mm	9.61±1.07mm	9.86±1.02mm
Female Pronotal Width	9.83±1.22mm	9.38±1.12mm	9.83±1.07mm
Male Pronotal Width	10.03±0.83mm	9.93±0.90mm	9.93±0.96mm

Table 3. ABB Population Metrics from McAAP.

Distribution of ABB Captures in Sampling Grids

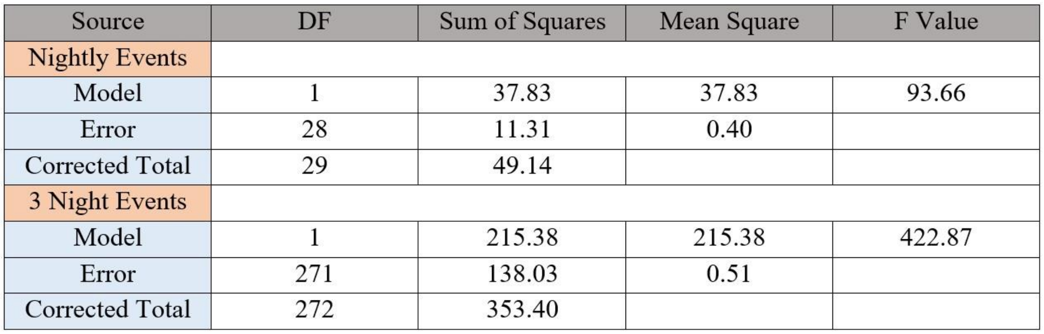
Results from Taylors Power Law regression for summed 3-night ABB captures reveals a moderately strong mean to variance relationship (R2= 0.777) and a b value of 1.14 for this data set (Tables 4 & 5, Figures 10 & 11). A t-test (P = 0.066) indicates a random distribution of ABB captures (Table 1) and this distribution indicates no edge effects of over-attracting nearby ABB and perhaps the grid is representative of populations within. However, some lepidopteran species captured in pheromone traps also show random distribution patterns and these patterns are considered reflective of environmental and demographic stochasticity rather than biological attributes of the species (Fitt et al. 1989). This 3-night summed data set does incorporate cumulative effects of slight environmental changes and likely larger-scale movement representative of ABB biology and behavior over time, and it is possible it is reflective of spatial distribution.

Interestingly, results from Taylors Power Law regression for nightly ABB captures reveals a weaker mean to variance relationship (R2= 0.609) and a slightly higher b value of 1.17 for this data set (Tables 4 & 5, Figures 10 & 11). Indeed, a t-test (P = 0.031) indicates a distribution of ABB nightly captures approaching aggregated, but well below that of species considered more highly aggregated (Table 5). For example, pheromone-based trap capture of a palm weevil (Rhynchophorus palmarum) indicated high levels of aggregation (b value of 1.33) within a trap network (Oehlschlager et al. 1995). This robust data set does not incorporate cumulative effects of environmental changes and likely larger-scale movement, and it is possible it is not as reflective of spatial distribution.

While ABB congregate at carrion to feed, based on the robust multi-year capture data their overall dispersion pattern appears random within the grids. To say a species is randomly distributed is to make the assertion that every point in the environment is equally likely to have a positive sample of the same capture number during trapping (Kao 1984). When sampling a population with a truly random distribution, each sample will have the same probability of having an individual in it, resulting in a Poisson distribution of positive samples. But trap data is dependent on ABB presence and activity on locally available vertebrate hosts that must also be randomly distributed (Hoops 2017).

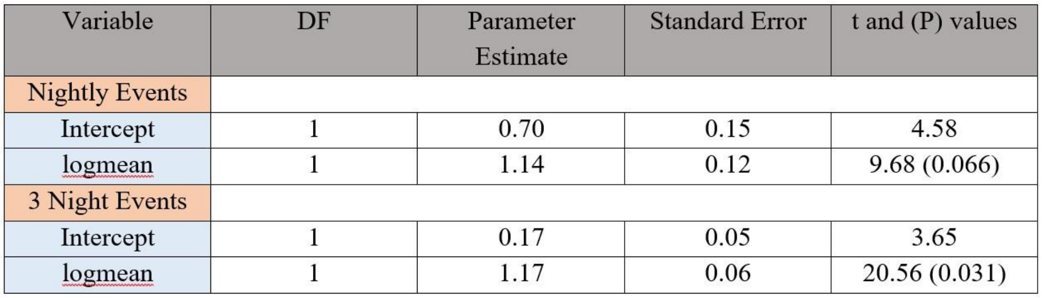
While the ABB captures appeared to be randomly distributed in the environment, we must take into account that they are being lured a baited trap. While idle, the beetles may be randomly distributed but they congregate at carrion sources to feed and mate. Consistent habitat is also therefore likely to support a random distribution. The majority of the land on McAAP is managed as either hayfields or forest, both for hunting. When a pair of beetles secure a suitable carrion source, the soil underneath the carcass must be an appropriate composition in order to bury it successfully. This may require the beetles to move the carcass considerable distance before burying it. With Taylor Power Law showing that only behavior has an impact on b, the soil type could impact ABB dispersion in the environment (Taylor et al. 1998). Interestingly, soil types on McAAP are predominately loam with some variations. The first variation is loamy, rocky, and well-drained soil. The second is clayey, silty, and hummus-rich soil. The final common soil type on McAAP is deep loamy soil (Carter and Gregory 2008). This minor variation in soil type would likely have negligible impact on ABB dispersion at McAAP bout could potentially affect reproduction.

Increasing efficiency of a sampling program allows researchers to sample larger areas and more populations with the same amount of personnel and resources. Using Green's formula of Fixed Precision (Green 1970), the minimum number of traps and trap nights needed to reach a precision level of 0.1 was calculated with m = 5 and b = 1.14. Results indicate that 5.092 traps (final traps) deployed and 2 nights (final stops) sampled within 72 hours are required for a precision level of 0.1 when sampling a 13 km² area (Table 6). If grids are desired for an ABB sampling project, these results will allow researchers to sample three times the area with the same number of traps that were used for this study, or the same area with 1/3rd the labor, allowing for more area being able to be sampled or less labor and time required to do the sampling.



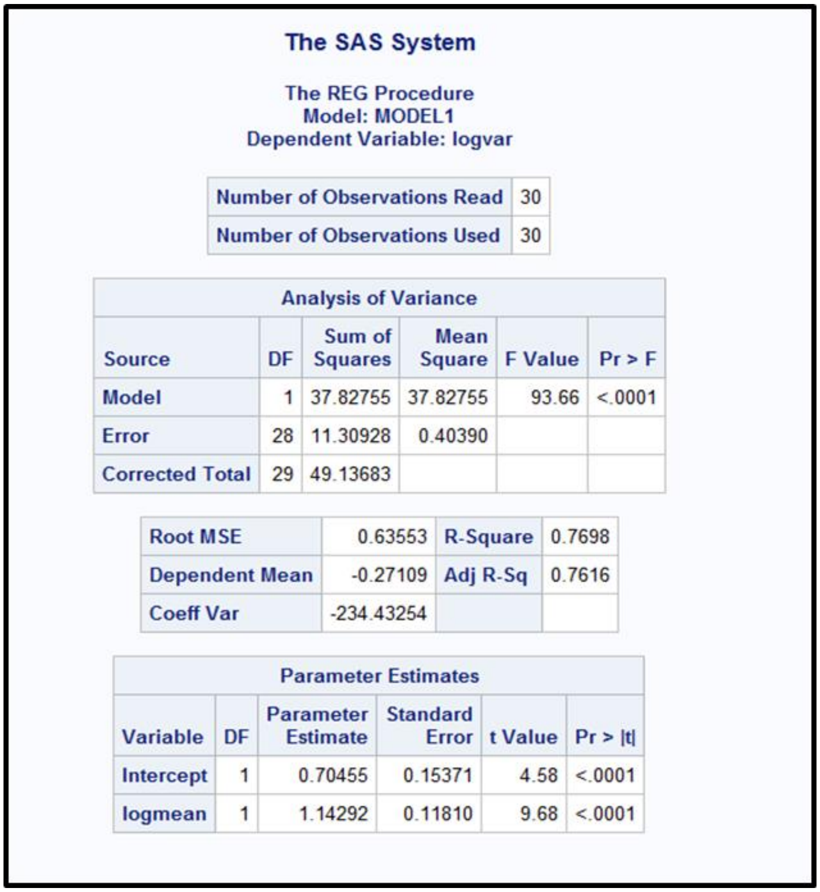
Source	DF	Sum of Squares	Mean Square	F Value
Nightly Events				
Model	1	37.83	37.83	93.66
Error	28	11.31	0.40	
Corrected Total	29	49.14		
3 Night Events				
Model	1	215.38	215.38	422.87
Error	271	138.03	0.51	
Corrected Total	272	353.40		

Table 4. Analysis of Variance Results for Taylor's Power Law Regressions.



Variable	DF	Parameter Estimate	Standard Error	t and (P) values
Nightly Events				
Intercept	1	0.70	0.15	4.58
logmean	1	1.14	0.12	9.68 (0.066)
3 Night Events				
Intercept	1	0.17	0.05	3.65
logmean	1	1.17	0.06	20.56 (0.031)

Table 5. Parameter Estimates Results for Taylor's Power Law Regressions.



```
                         The SAS System

                        The REG Procedure
                          Model: MODEL1
                    Dependent Variable: logvar

              Number of Observations Read   30
              Number of Observations Used   30

                      Analysis of Variance

                              Sum of       Mean
Source            DF        Squares     Square   F Value   Pr > F
Model              1       37.82755   37.82755     93.66   <.0001
Error             28       11.30928    0.40390
Corrected Total   29       49.13683

        Root MSE              0.63553   R-Square   0.7698
        Dependent Mean       -0.27109   Adj R-Sq   0.7616
        Coeff Var          -234.43254

                      Parameter Estimates

                    Parameter   Standard
Variable    DF       Estimate      Error   t Value   Pr > |t|
Intercept    1        0.70455    0.15371      4.58     <.0001
logmean      1        1.14292    0.11810      9.68     <.0001
```

Figure 10. Taylor’s Power Law Output for 3-night Sampling Events.

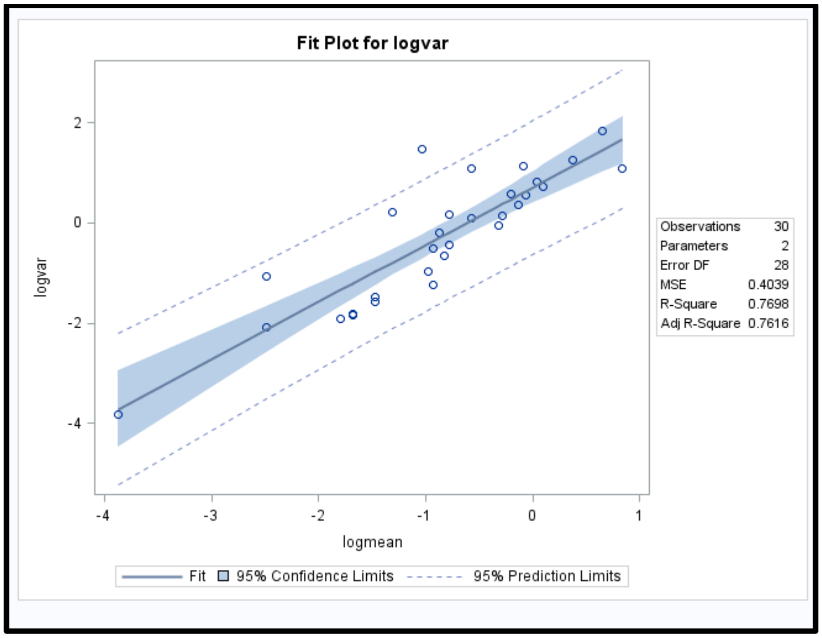
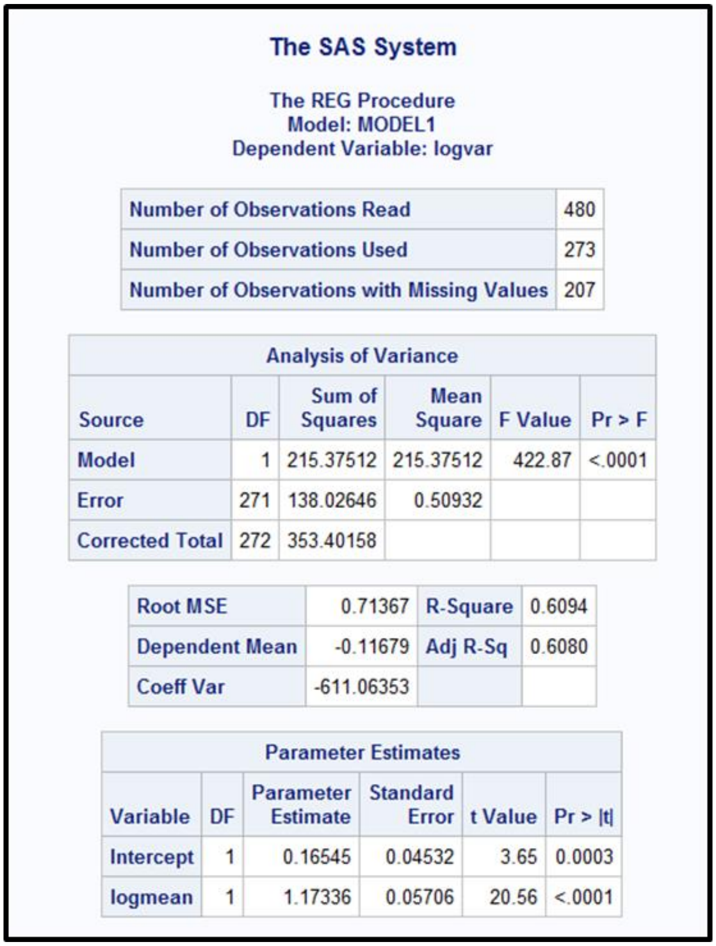


Figure 11. Fit Plot for Taylor's Power Law for 3-night Sampling Events. $R^2 = 0.77$.



The SAS System

The REG Procedure
Model: MODEL1
Dependent Variable: logvar

Number of Observations Read	480
Number of Observations Used	273
Number of Observations with Missing Values	207

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	215.37512	215.37512	422.87	<.0001
Error	271	138.02646	0.50932		
Corrected Total	272	353.40158			

Root MSE	0.71367	R-Square	0.6094
Dependent Mean	-0.11679	Adj R-Sq	0.6080
Coeff Var	-611.06353		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.16545	0.04532	3.65	0.0003
logmean	1	1.17336	0.05706	20.56	<.0001

Figure 12. Taylor’s Power Law Output for Total Nights Sampled.

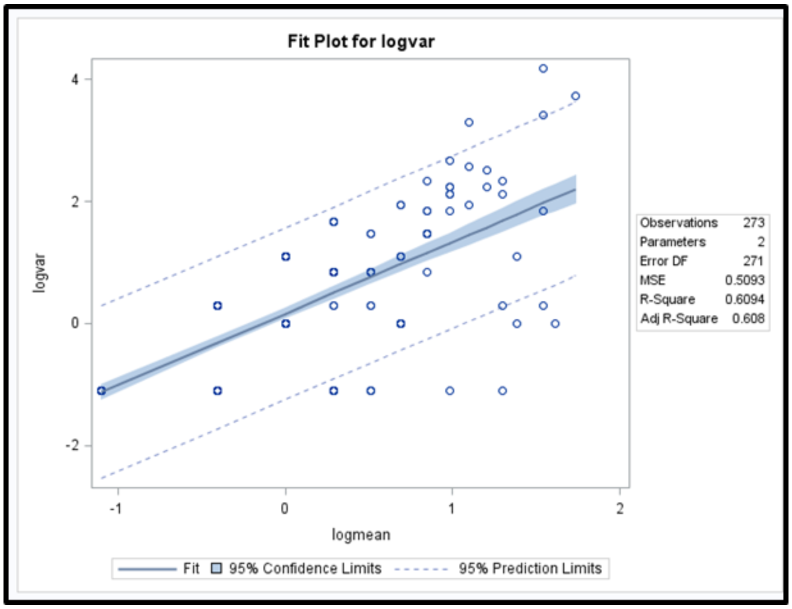


Figure 13. Fit Plot for Taylor's Power Law for Total Nights Sampled. $R^2 = 0.61$.

Variable		Formula	Final
a	2.023	Traps	Traps
m	5	a*[(m^(b-2))/d^2]	5.092
b	1.143	Stops	Stops
d^2	0.1	#Traps/3	1.697

Table 6. Taylor's Power Law Variables Results. A slope (b) of 1.143 shows that ABB are randomly distributed in the environment. Total traps needed for a grid are 5 (Final, Traps). Total nights sampled each primary occasion are 2 (Final, Stops). Requirements in grids for precision of 0.1 using Green's formula.

Relationship Between ABB Captures in Sampling Grids and Paired Single Traps

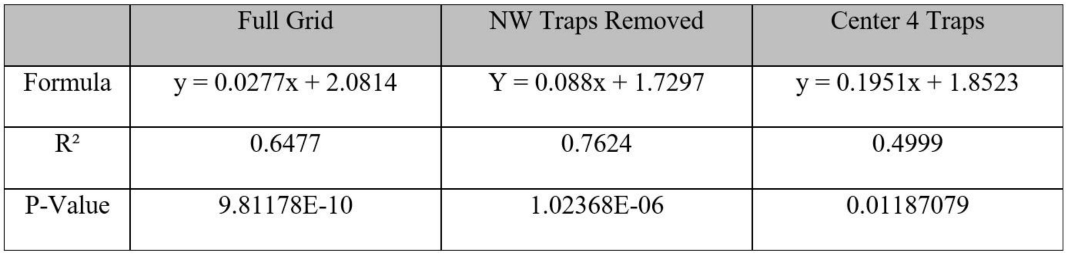
Many studies have demonstrated how baited or pheromone trap placement (locations and numbers) can increase the accuracy of activity-density estimates (Bedick et al. 2004, Leather and

Watt 2005, Southwood and Henderson 2009). In fact, increasing the multi-directional plumes in an area with grids of traps often optimizes trapping of local populations (Larsson et al. 2009), and the McAAP grids were designed in concept to have regularly overlapping strong bait plumes. So hypothetically, on a per km² basis, the 16-trap grid with an attraction area estimated at 13km², should be more efficient at capturing local ABB populations than nearby paired single traps with attraction area estimated at 2km².

Assuming that the grid more accurately assessed ABB activity-density, a goal of this objective was to assess the relationship between single and grid capture counts to determine if captures from single trap counts reflect grid captures. If there is a predictable relationship, single traps could continue to be used to estimate ABB populations. The analysis was exploratory and included regressions between weekly single traps counts and counts for whole 16 trap grids, counts for the center 4 traps and counts from 9 traps following removal of the data from the North and West sides of grids. These reduced trap counts were explored to examine potential for the grid over-attracting ABB from the surrounding habitat because spatial distribution for grid counts approached aggregated (see above).

The concept of over attraction in this study relies on the assumption that more carrion is being added to the environment then would naturally be encountered by the beetles. Each trap was baited with single rats each week, resulting in 480 rats placed through the entirety of the trapping season in 2015, the season with the most traps deployed. In 2014 a rodent study was performed on McAAP simultaneous to the ABB sampling done that year, 427 rats (Sigmodon hispidus and Neotoma floridana) and 1157 mice (Peromyscus leucopus, P. maniculatus, P. attwaterii, and Reithrodontomys fulvescens) were captured during that season alone (Hoops 2017). This is not taking into account all of the other small mammals, birds, and reptiles on McAAP that provide carrion throughout the summer months. In this context, there is likely no over attraction occurring from the grids, which was tentatively concluded from spatial analyses. If the amount of carrion were limiting and ABB were being over attracted into the grids, this would result in non-representative counts in the grid. In an abundance of caution, potential oversaturation was addressed in the analysis to strengthen our conclusions.

Regression outputs from 2013, 2014 and 2015 (Figs 14, 15, 16) indicate moderate to relatively strong relationships between single and grid trap counts (Table 7) indicating that counts from a single traps may allow for acceptable estimation of grid-trap counts. Relationships between single and reduced grid trap counts were variable and overall similar to full grid regressions indicating value at reducing the number of traps in the grid, as was previously concluded for calculation of optimal trap number (see above).



	Full Grid	NW Traps Removed	Center 4 Traps
Formula	$y = 0.0277x + 2.0814$	$Y = 0.088x + 1.7297$	$y = 0.1951x + 1.8523$
R^2	0.6477	0.7624	0.4999
P-Value	9.81178E-10	1.02368E-06	0.01187079

Table 7. Comparisons of Grid Captures with Portions of the Grids Removed to Compensate for Potential Over Attraction of ABB into the Grid Area.

More interesting was the relationship between single and grid trap counts per km^2. If indeed the full grid reflected true local activity-density, then the counts would be significantly more than 6.5 times higher than single trap counts (13 vs $2km^2$ area) as reflected by the slope and formula.

However, it is quite clear that single traps are just as efficient at capturing local ABB as the grid, and with regards to labor, single traps are more efficient and should remain the standard approach for estimating activity-density. With this conclusion, regional population estimates for ABB were calculated for Objective 3.

It is possible to reduce grid size and in the future, based on results from Green's formula above, researchers sampling ABB will be able to use a comparable amount of labor to that was used for our intensive sampling program, but sample three times the area, or even other populations. Grids can be useful for alternative density estimation approaches like MARK. Using newly developed traps and increasing the area that can be sampled with the available labor, a more efficient program that minimizes any harm caused by marking techniques can be developed for future sampling of ABB.

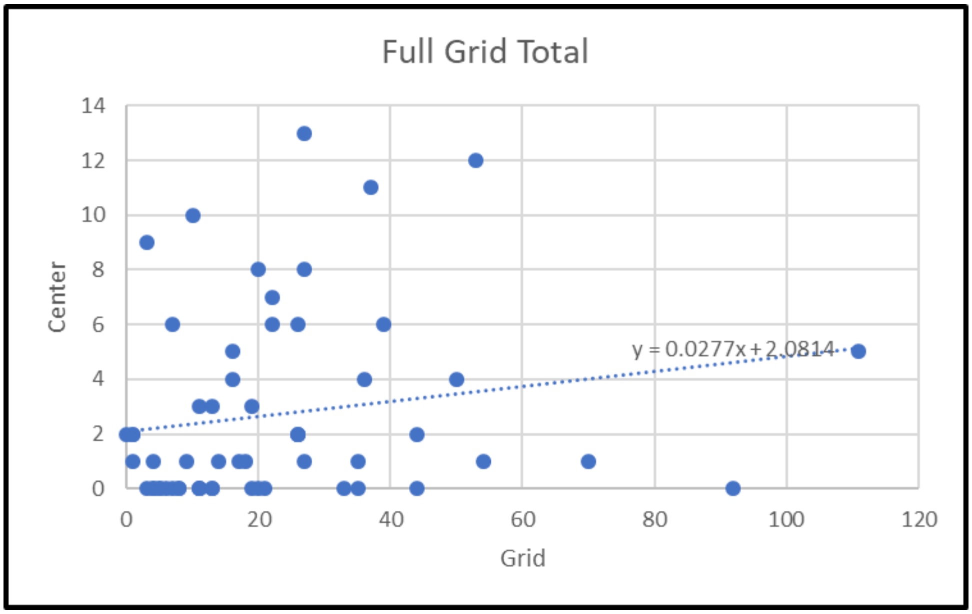


Figure 14. Population Estimates Using Full Grid Captures Grids, Plotted by Weekly Sampling Event. R² = 0.03, r = 0.17.

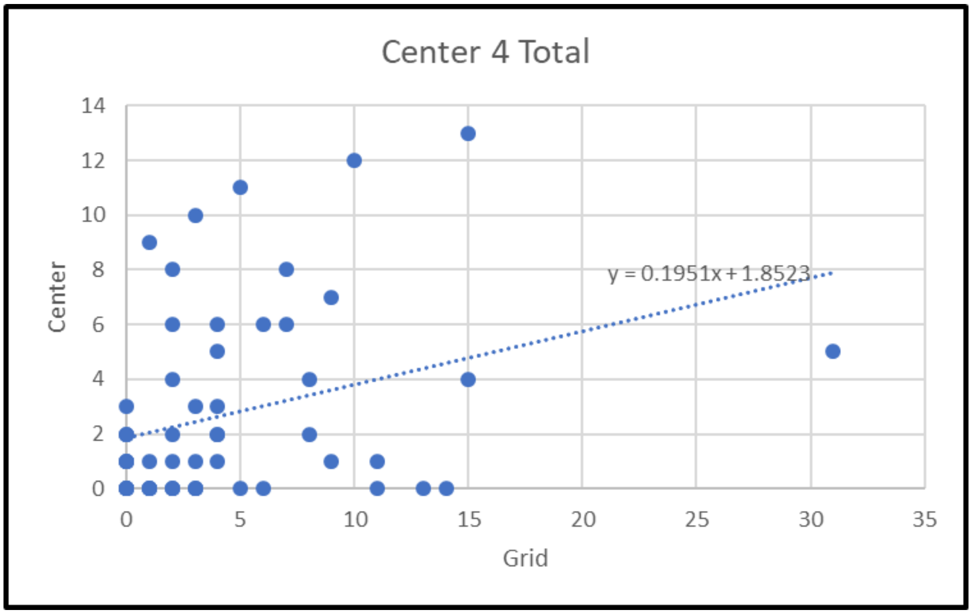


Figure 15. Population Estimates Using Only the Center 4 traps of Each Grid, Plotted by Weekly Sampling Event. R² = 0.096, r = 0.31.

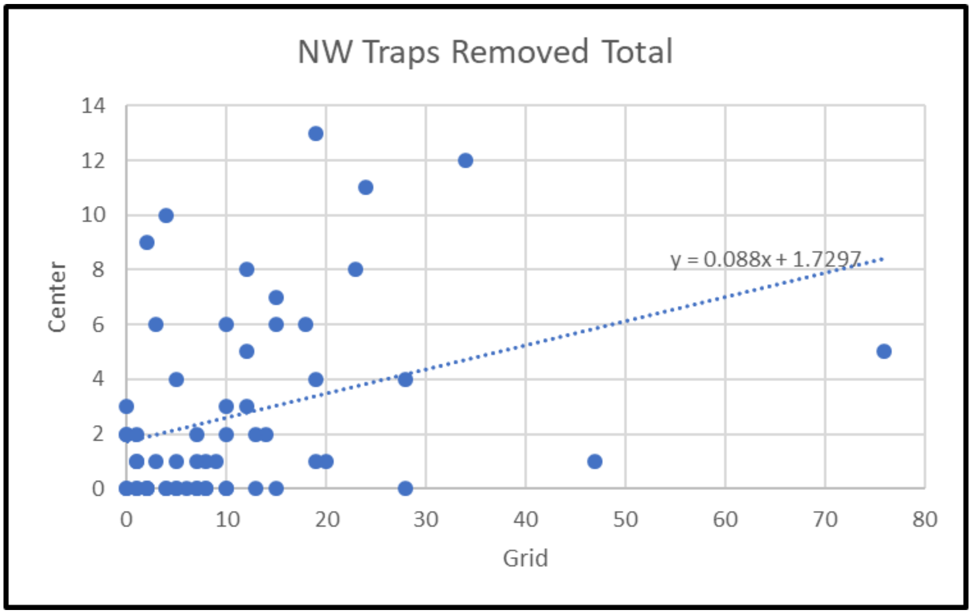


Figure 16. Population Estimates with North and West Sides of Each Grid Removed, Plotted by Weekly Sampling Event. $R^2 = 0.107$, $r = 0.33$.

Objective 2: Comparing MARK vs. Schnabel Estimates of ABB Density

Using grid data from 2015, I compared a commonly used ABB population estimation method, the Schnabel Index, with a more recent alternative, MARK: Robust Design (Kendall and Pollock 1992), which has not been previously used for ABB. The analysis was exploratory and included investigating correlations between estimates from Schnabel and MARK for whole 16 trap grids, counts for the center 4 traps and counts from 9 traps following removal of the data from the North and West sides of grids. Reducing traps does reduce detection of re-captures needed for calculations, but as previously stated these reduced trap counts were explored to remove any potential for the grid over-attracting ABB from the surrounding habitat because spatial distribution for grid counts approached aggregated (see above).

In 2015 ABB counts were relatively high at McAAP and the three full grids had weekly capture averages of 40.6±30.54 (Grid 1), 19.1±16.75(Grid 2), 40.9±31.72 (Grid 3). The center four traps had weekly capture averages of 7.6±6.69 (Grid 1), 2.6±2.59 (Grid 2), 7.7±10.03 (Grid 3). When only removing the North and West sides of the grid there were weekly capture averages of 21.8±18.20 (Grid 1), 8.00±6.16 (Grid 2), 20.00±19.14 (Grid 3) (Table 7). All 6 grids were sampled 5 times during the 2015 sampling season.

ABB Population Density Estimates During 2015 Season.

		Full Grid		NW Sides Removed		Center 4 Traps	
Date	Grid	Schnabel	MARK	Schnabel	MARK	Schnabel	MARK
6/23 - 6/25	1A	87	31	55	30	11	25
7/14 - 7/16	1A	79	49	42	32	12	11
7/28 - 7/30	1A	88	79	64	49	13	9
8/21 - 8/23	1A	62	38	34	24	10	15
9/18 - 9/20	1A	14	7	25	3	1	1
6/30 - 7/2	1B	14	11	5	4	1	2
7/21 - 7/23	1B	70	16	12	7	8	5
8/4 - 8/6	1B	46	32	34	19	4	4
8/28 - 8/30	1B	33	23	21	9	n/a	4
9/25 - 9/27	1B	12	6	n/a	6	n/a	1
6/8 - 6/10	2A	36	10	10	6	n/a	1
7/8 - 7/10	2A	n/a	3	n/a	11	n/a	5
8/4 - 8/6	2A	46	26	22	17	5	4
8/21 - 8/23	2A	53	10	2	5	1	1
9/4 - 9/6	2A	30	17	n/a	6	n/a	6
6/17 - 6/19	2B	n/a	5	n/a	11	n/a	308
7/14 - 7/16	2B	73	12	14	8	n/a	2
8/11 - 8/13	2B	38	27	11	9	1	2
8/28 - 8/30	2B	33	3	2	2	0	1
9/11 - 9/13	2B	7	8	5	7	n/a	2
5/26 - 5/28	3A	n/a	1	n/a	10	n/a	253
6/23 - 6/25	3A	41	23	n/a	9	n/a	3
7/23 - 7/23	3A	79	33	22	20	7	8
9/4 - 9/6	3A	45	29	14	12	9	3
9/18 - 9/20	3A	6	14	3	8	1	3
6/2 - 6/4	3B	n/a	15	n/a	15	n/a	2
6/30 - 7/2	3B	23	16	6	6	n/a	1
7/28 - 7/30	3B	96	65	68	49	28	19
9/11 - 9/13	3B	37	n/a	18	n/a	7	n/a
9/25 - 9/27	3B	17	n/a	9	n/a	0	n/a
Average		45	22	22	14	7	24

Table 8. ABB Population Density Estimates from Captures in 16 Trap Grids on McAAP During 2015 Season sampling 181.96 km². Estimates from grids with North and West sides removed and only the center four traps were calculated in case it was determined that the 16 trap grids were over attracting ABB into the grid area.

While MARK does occasionally produce an estimate that is improbable, most likely due to our heavily zero laden data, it is able to produce a population estimate for every sampling event, even if there are no recaptures since it incorporates time between captures into the model. This is of particular importance when applying real-world situations to population estimates. The Schnabel index falls short in this, as it must rely on recaptures. Additionally, the Schnabel index regularly reports higher population estimates than MARK. As these estimates are going to be used by a government agency to make critical management decisions regarding ABB legislation, overestimating the density could wrongly jeopardize ABB protections. MARK is a more forgiving and conservative option when producing population density estimates and can be a useful tool when calculating population densities for conservation purposes of low density and highly mobile populations.

The Schnabel index is a commonly used method, but has some shortcomings in that it cannot calculate a population estimate without recaptures. This limits its ability to calculate population densities for mobile or low density populations. With that said, the Schnabel Index is easy to use and as long as capture rates are sufficient, it produces reliable results. MARK is a more modern technique that can calculate a population density regardless of recapture rates. It is a more involved population modeling technique but individual capture history is required for every member of the population encountered. This is not a problem for most animals, but when working with small endangered insects, there are no reliable individual marking techniques that persist over extended periods of time (Butler 2011, Hall et al. 2015, Jenkins et al. 2016).

The Schnabel Index is simpler to use and can be calculated quickly using a simple spreadsheet in Excel. MARK is a more involved calculation and produced consistently more conservative estimates in this study. When a species is listed as endangered and recovery plans are developed, a target number of populations and population densities is determined for recovery. It would be in the best interest of the species being assessed to use a more conservative estimate when potentially relaxing their protection. The Schnabel index requires recaptures for any time period in order to calculate a population estimate. This can make it difficult to use when working with very mobile species or low population densities. MARK has the ability to take into account recaptures from previous and later sampling events as well as the time between samples in order to calculate population densities even when a particular sampling event does not accrue any recaptures. However, MARK requires more data resolution, that is knowing when a recapture was last encountered to successfully calculate population estimates. This requires marking each captured individual with unique identifiers, which can be a challenge when working with a small endangered species (Butler 2011, Hall et al. 2015, Jenkins et al. 2016).

The reduction in Schnabel index estimates when removing traps can limit its ability to reliably produce population estimates throughout a season. The MARK Robust design program has no such limitations and even incorporates previous recaptures into calculations. However, the Schnabel index does not require individual capture histories. MARK is a more reliable option when calculating population estimations with low recapture rates but the necessity of including individual recaptures makes using it a challenge for ABB.

McAAP is managed for hunting Wild turkey (Meleagris gallopavo) and White-tailed deer (Odocoileus virginianus), both of which produce offspring that become appropriately sized carcasses for ABB to utilize during reproduction. The potential sources of carrion should minimize any concerns when addressing over attraction of our 16 trap grids and estimates of density. Based on recaptures during this study, ABB moved an average of 0.8km ±0.13km with the farthest distance moved being 7.3km in a single night by a male in 2013. It is obvious that the beetles are mobile within the grids and even between habitats. As mentioned, high numbers of naturally occurring carrion are found at McAAP, otherwise much higher rates of recaptures would be expected in a carrion saturated grid. If the traps were causing over attraction within the grids, it would manifest as a high recapture rate. Since this is not the case, there are likely other resources in the environment that are influencing the beetle's behavior. The population fluctuations observed on McAAP are in line with expected seasonal fluctuations (Ferrari 2014). Based on these observations it can be inferred that immigration and emigration for this population are relatively stable and not creating large population fluctuations throughout the season and our estimates of ABB density are likely reliable.

Correlation comparisons were calculated between counts for the two methods and overall relationships are relatively strong, but not always significant. Correlations would be expected based on overlap for some procedures and calculations, and this comparison validates the use of MARK for ABB particularly when grids or multiple traps are used at a location. Perhaps the best sampling method for calculating reliable population density estimates of ABB when populations are low is to utilize a multi grid trap system and MARK. However, efficiency is lost using this approach compared with single trap deployment, especially when considering that trap captures per km2 are not more accurate than trap grids (see above).

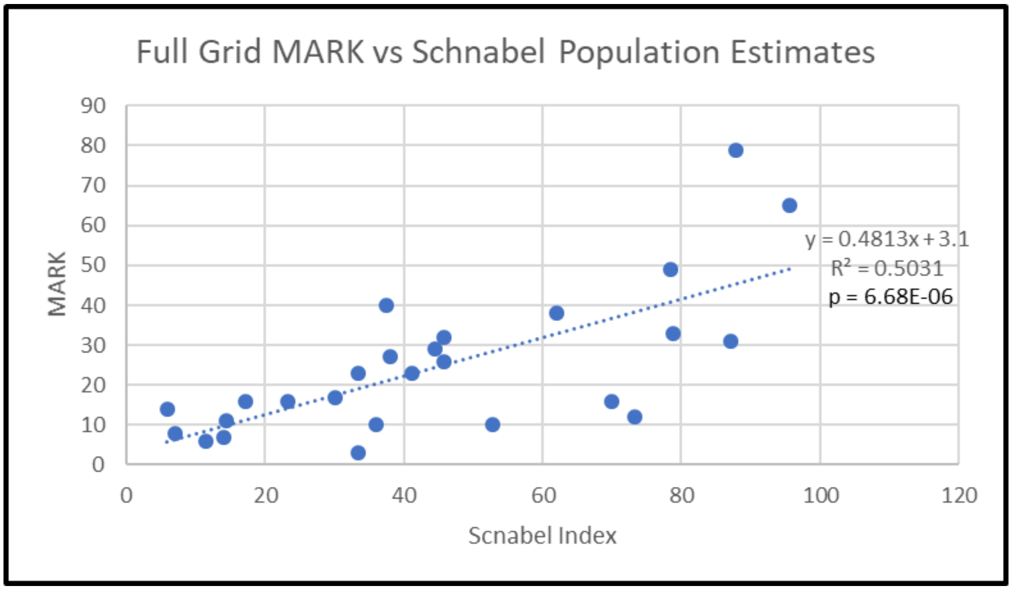


Figure 17. Full Grid Population Density Estimates Comparing MARK and the Schanbel Index. Correlation Analysis r-value = 0.74, $R^2 = 0.503$, $p = 0.000006$.

The reduction in recaptures from only using the center four traps greatly reduces the number of comparisons that can be made between the Schnabel index and MARK estimates. In an attempt to mitigate both over attraction edge effects and the loss of ABB recaptures when using only the center 4 traps, a solution was to only remove trap data associated predominant wind direction and edge effects. The predominant wind directions for Southeastern Oklahoma are South and Southeast and removing the North and West sides of the grid resulted in 23 comparisons, only an 11% drop in the total number of comparisons (Fig 14). Using this data, the correlation between methods indicates sensitivity of the methods to within-grid data distribution. These relationships require further exploration with particular focus on recapture rates at grid edges that could significantly alter density estimates.

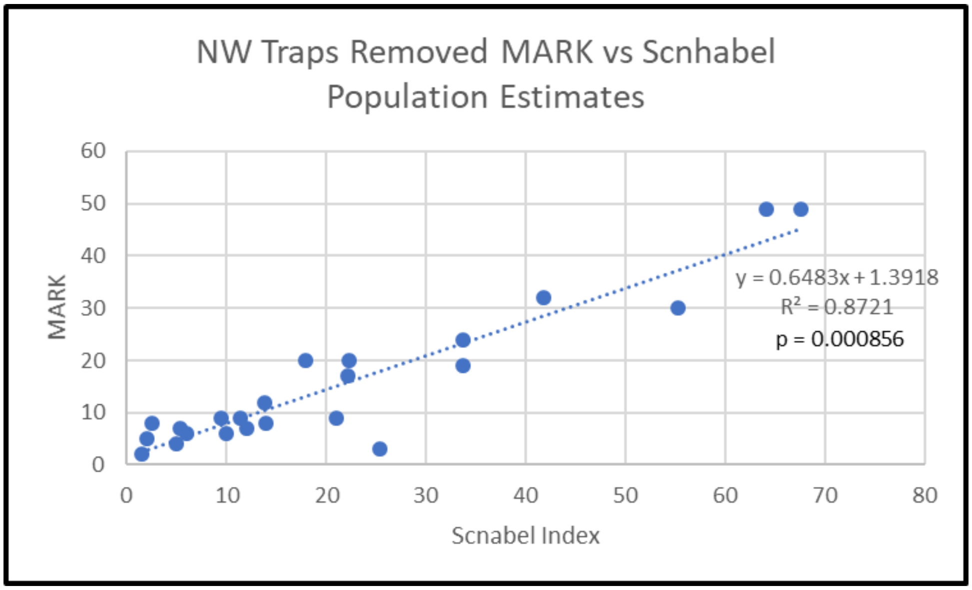


Figure 18. Population Density Estimates Comparing MARK and the Schnabel Index Excluding the North and West Sides of the Grids. Correlation Analysis r-value = 0.98, $R^2 = 0.872$, p = 0.0009

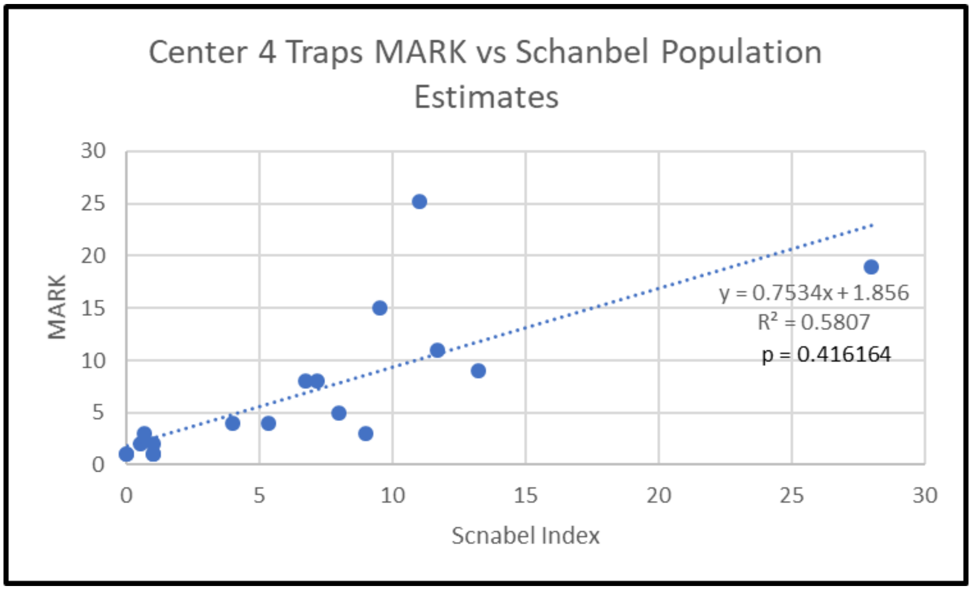


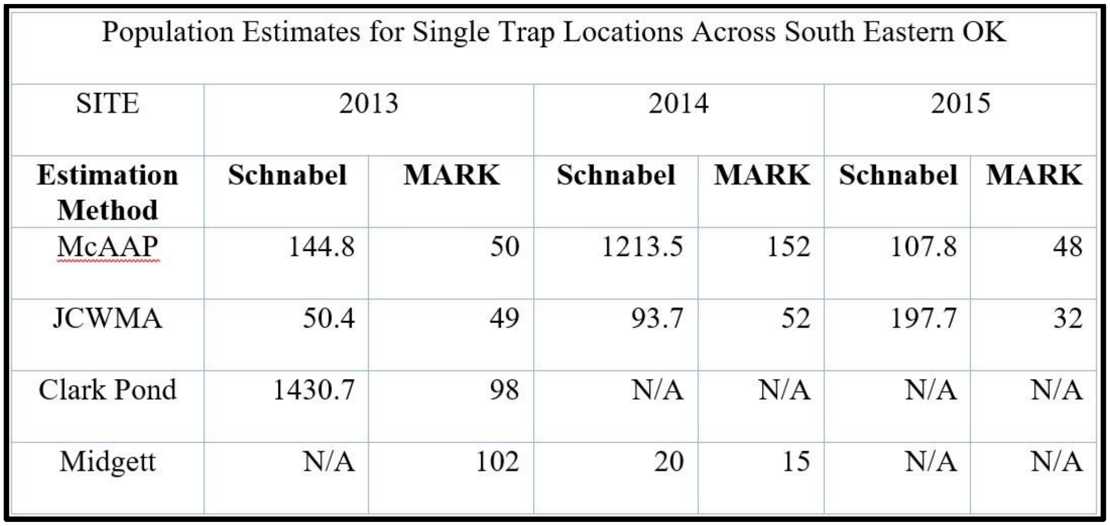
Figure 19. Population Density Estimates Comparing MARK and the Schanbel Index Using Only the Center 4 traps. Correlation Analysis r-value = 0.70, R^2 = 0.581, p = 0.42.

Objective 3: Regional Population Estimates for ABB Using Single Trap Data.

Using methods previously described and data points from multiple single traps for every location (traps 2 km apart) over the duration of this study, population estimates using the Schnabel Index and MARK were calculated for each year that had sufficient recapture data (Fig. 20). A major limiting factor for this data set is the low amount of recaptures in the single traps. With mark-recapture population estimations in general, the lower the recapture rate the higher the error for estimates. So issues of calculating population size for low populations remains a concern. Previous ABB population estimates from South Dakota range from 333 to 1177 individuals within 220km²: Population estimates from Nebraska range from 1338 ABB in Blaine county to

157 ABB in Rock County. Our population estimates are plausible and within ranges previously recorded (Peyton 2003, Snethen et al. 2004, Backlund et al. 2008).

In this study, MARK continued to produced more conservative estimates for ABB density and allowed for calculation of population estimates for periods of time when there are no recaptures found (Table 8, e.g. Midgett 2013). Midgett traps did not have a recapture in 2013, so the population estimates can be calculated by MARK but not the Schnabel index (Fig. 20). The estimate from Midgett for 2013 is most likely an outlier due to the heavily zero laden data and lack of recaptures. The Clark Pond location was developed after the 2013 season, so it was not sampled in 2014 or 2015. For all other years a location was sampled, there were sufficient recaptures to allow population estimates from both MARK and the Schanbel Index. Combining all data, a simple correlation revealed as with objective 2 that estimates between MARK and the Schanbel Index are positively correlated (Fig. 21) and that researchers using either method can make relatively reliable comparisons.



Population Estimates for Single Trap Locations Across South Eastern OK

SITE	2013		2014		2015	
Estimation Method	**Schnabel**	**MARK**	**Schnabel**	**MARK**	**Schnabel**	**MARK**
McAAP	144.8	50	1213.5	152	107.8	48
JCWMA	50.4	49	93.7	52	197.7	32
Clark Pond	1430.7	98	N/A	N/A	N/A	N/A
Midgett	N/A	102	20	15	N/A	N/A

Table 9. Comparison of Schnabel and MARK Population Density Estimates for 2013, 2014, and 2015 Single Trap Locations. Clark Pond and Midgett Locations Were not Sampled in 2015.

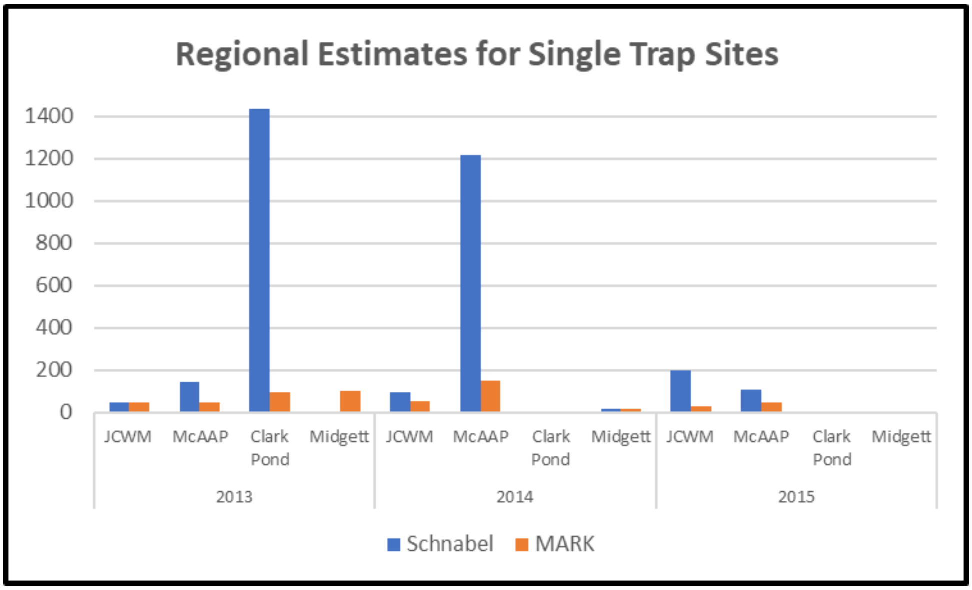


Fig 20. Comparison of Schnabel and MARK Population Density Estimates for Every Year That Single Trap Locations were Sampled.

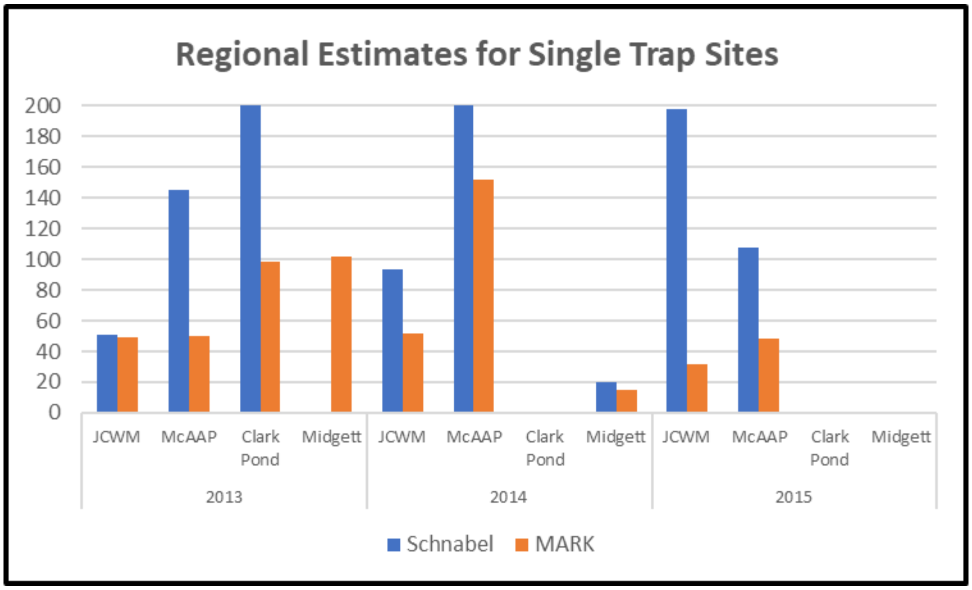


Fig 21. Comparison of Schnabel and MARK Population Density Estimates for Every Year That Single Trap Locations Were Sampled with the Vertical Axis Adjusted to Show Comparisons Between Locations Clearer.

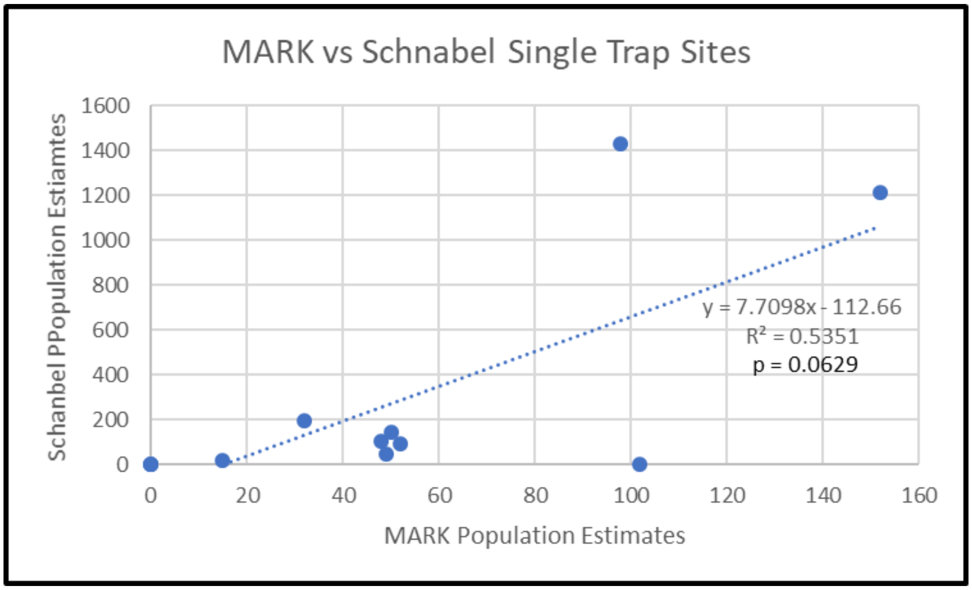


Fig 22. Comparison of Locations Where both the Schnabel index and MARK were able to calculate population density estimates. $R^2 = 0.54$, $p = 0.063$.

For McAAP data, because recaptures in single traps can be from a previous capture in a grid, results must be interpreted with caution. The original capture may not be included in the capture history if the ABB was captured in a previous grid of single trap during a previous sampling event. When this scenario arose, the captures were still included since we still have a previous capture date and can build an accurate individual capture history.

The Schnabel index requires recaptures to estimate populations but it does not take into account time since last capture. MARK needs to know when the recaptures were previously encountered, requiring a marking method that allows for individual identification. This is hard to accomplish safely with ABB. Based on observations during sampling, the best method we discovered for individual identification was gluing bee tags to an elytron during marking. Bee tags have since been shown to be an unsafe method for identification of ABB because the bee tags can build up soil causing the beetle to carry a pile of dirt potentially weighing as much as the beetle (Butler et al. 2012). Distinct patterns of branding may be an option for future researchers for multi-trap temporal studies. ABB have 4 distinct maculations on their elytra, each maculation could be branded and different directions of brands could be applied. This would easily give 256 different marking patterns usable for each sampling season. Ultimately, these approaches allow for MARK as a second standard method for estimating ABB densities.

CHAPTER V

CONCLUSIONS

The ABB was trapped from four locations, the McAllester Army Ammunition Plant (McAAP), James Collins Wildlife Management Area (JCWMA), Clark Pond, and Midgett in Lamar, OK, during three consecutive summers (2013, 2014, and 2015). The traps used were USFWS approved, custom built, above ground pitfall traps using a similar trapping approach as the one developed by Kozol and redesigned by Leasure (Kozol 1989, Leasure et al. 2012). Habitats varied among locations and traps but were primarily in Oak-Hickory forest and un-grazed grasslands with loamy soils. Specific trap locations were selected for beetle safety and ease of access due to time constraints.

Historically, single traps have been used for ABB monitoring and population estimation. Mark-recapture sampling is labor, time, and resource intensive, but increased effort would be justified if population estimates are more accurate and precise. Based on comparisons to 16-trap grids, it appears that single traps remain as the most efficient approach. Grids of multiple traps did not proportionally increase capture efficiency and thus density estimates. However, trap grids offer greater flexibility depending on sampling goals and data can be more appropriately used for alternative density estimation methods.

ABB have unique biology and life history, making them difficult to study and trap. Once an adult pair secures a carcass they disappear underground for weeks to raise their brood. This makes them unavailable for recapture for large stretches of the season. Population estimates using mark-recapture techniques require high recapture rates to produce the most precise estimates. With a species' behavior regularly removing it from the sampling population for a long period each season, the recapture data are sparser than for most species. This results in higher error rates in any analysis done.

Finding a reliable, consistent, and conservative population estimation method is crucial for monitoring an endangered species and with the unique biology of this species, the method used becomes even more important. The two population density estimation methods that we compared during this study were the Schnabel Index and MARK: Robust Design. The limiting factor for the Schnabel Index is that it requires recaptures during the time period for which the population density is being estimated. If the population being sampled is small or very mobile, that can reduce the recaptures and thereby reduce the Index's ability to calculate a population density estimate. The main drawback of MARK is that it requires an individual capture history to determine population density. Each individual must have a unique identifying mark so that their locations and times of captures can be tracked. Each year violated this to some extent, having a stable harmless mark is hard with small beetles. We updated marking techniques through the study as more research was done regarding the impact on the beetles of the different marking techniques. Individual marks can be difficult to achieve with a small, burrowing, endangered species. Any mark applied to ABB must be harmless and pose no risk to their survival. Elytral clipping has been shown to impact stridulation (Hall et al. 2015) and bee tags have been shown to build up soil and make normal movement difficult for the beetles (Butler 2011). Branding has been shown to be safe and harmless when done correctly, but it does not allow for unique individual identifying marks (Jenkins et al. 2016).

Data from this study indicate that MARK estimates are regularly lower than the estimates from the same data using the Schnabel Index. Using a more conservative population density estimator may be appropriate when the population density estimates are being used to make regulatory decisions about endangered species protections. Theoretically, MARK would be the preferred population density estimation tool due to its ability to calculate a density estimate without recaptures for every sampling occasion and its more conservative estimates. With a strategic branding system, it would be possible to use MARK to develop population estimates.

There are no current ABB population density estimates out of OK to compare our results to, but if we compare capture rates, they show that ABB populations seem steady, if not increasing, since 1996 (Ferrari 2014). Stability in these populations could be a result of implemented OKFWS protections. ABB population estimations from Nebraska and South Dakota suggest that our population estimates are within expected ranges given habitat resources. It is common for large populations to have high stochasticity, resulting in large swings in density year to year compared with smaller populations (Lande 1993).

Based on my research, single trap regional estimates of ABB throughout South Eastern Oklahoma are comparable to other populations studied in Nebraska and South Dakota (Peyton 2003, Snethen et al. 2004, Backlund et al. 2008). The population density in OK being relatively stable since the 90s is likely because of OKFWS conservation measures (Ferrari 2014).

ABB are important decomposers in the OK prairie and forest ecosystems, greatly reducing fly numbers and increasing soil fertility (Kuusela and Hanski 1982, Hoback et al. 2020). These large charismatic beetles are a great species for outreach and conservation education as well, thanks to their large size and distinct markings. The goal of this research was to progress towards ABB population density estimate methods that can be calculated while making better use of available labor. With the incorporation of the results reported herein, ABB sampling in Oklahoma has potential to become more efficient and population estimates more accurate and reliable. Using a 5 trap grid and trapping for 3 nights is an efficient way to get closer to an absolute density while still being efficient with time a labor. Hopefully this knowledge can support future work with this charismatic and unique endangered species.

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APPENDICES

2013 Intensive Sampling on McAAP

Date	**Trap #**	***ABB***	**Recap ?**
6/18/2013	1A-1	0	n/a
6/18/2013	1A-10	0	n/a
6/18/2013	1A-11	0	n/a
6/18/2013	1A-12	0	n/a
6/18/2013	1A-13	1	no
6/18/2013	1A-13	1	no
6/18/2013	1A-14	0	n/a
6/18/2013	1A-15	0	n/a
6/18/2013	1A-16	0	n/a
6/18/2013	1A-2	1	no
6/18/2013	1A-2	1	no
6/18/2013	1A-2	1	no
6/18/2013	1A-2	1	no
6/18/2013	1A-2	1	no
6/18/2013	1A-2	1	no
6/18/2013	1A-2	1	no
6/18/2013	1A-2	1	no
6/18/2013	1A-3	0	n/a
6/18/2013	1A-4	0	n/a
6/18/2013	1A-5	0	n/a
6/18/2013	1A-6	0	n/a
6/18/2013	1A-7	0	n/a
6/18/2013	1A-8	0	n/a
6/18/2013	1A-9	0	n/a
6/18/2013	1B Center	0	n/a
6/18/2013	3A Center	0	n/a
6/18/2013	3B-1	0	n/a
6/18/2013	3B-10	0	n/a
6/18/2013	3B-11	0	n/a
6/18/2013	3B-12	0	n/a

6/18/2013	3B-13	1	no
6/18/2013	3B-13	1	no
6/18/2013	3B-14	1	no
6/18/2013	3B-15	1	no
6/18/2013	3B-16	0	n/a
6/18/2013	3B-2	0	n/a
6/18/2013	3B-3	0	n/a
6/18/2013	3B-4	0	n/a
6/18/2013	3B-5	0	n/a
6/18/2013	3B-6	0	n/a
6/18/2013	3B-7	0	n/a
6/18/2013	3B-8	0	n/a
6/18/2013	3B-9	0	n/a
6/19/2013	1A-1	0	n/a
6/19/2013	1A-10	0	n/a
6/19/2013	1A-11	0	n/a
6/19/2013	1A-12	0	n/a
6/19/2013	1A-13	0	n/a
6/19/2013	1A-14	1	no
6/19/2013	1A-15	0	n/a
6/19/2013	1A-16	0	n/a
6/19/2013	1A-2	0	n/a
6/19/2013	1A-3	0	n/a
6/19/2013	1A-4	0	n/a
6/19/2013	1A-5	0	n/a
6/19/2013	1A-6	0	n/a
6/19/2013	1A-7	0	n/a
6/19/2013	1A-8	0	n/a
6/19/2013	1A-9	0	n/a
6/19/2013	1B Center	0	n/a
6/19/2013	3A Center	0	n/a
6/19/2013	3B-1	0	n/a
6/19/2013	3B-10	0	n/a
6/19/2013	3B-11	0	n/a
6/19/2013	3B-12	1	no
6/19/2013	3B-12	1	no
6/19/2013	3B-13	0	n/a

6/19/2013	3B-14	0	n/a
6/19/2013	3B-15	0	n/a
6/19/2013	3B-16	1	no
6/19/2013	3B-2	0	n/a
6/19/2013	3B-3	0	n/a
6/19/2013	3B-4	0	n/a
6/19/2013	3B-5	0	n/a
6/19/2013	3B-6	0	n/a
6/19/2013	3B-7	0	n/a
6/19/2013	3B-8	0	n/a
6/19/2013	3B-9	1	no
6/20/2013	1A-1	0	n/a
6/20/2013	1A-10	0	n/a
6/20/2013	1A-11	0	n/a
6/20/2013	1A-12	0	n/a
6/20/2013	1A-13	0	n/a
6/20/2013	1A-14	0	n/a
6/20/2013	1A-15	0	n/a
6/20/2013	1A-16	0	n/a
6/20/2013	1A-2	0	n/a
6/20/2013	1A-3	0	n/a
6/20/2013	1A-4	0	n/a
6/20/2013	1A-5	0	n/a
6/20/2013	1A-6	0	n/a
6/20/2013	1A-7	0	n/a
6/20/2013	1A-8	0	n/a
6/20/2013	1A-9	0	n/a
6/20/2013	1B Center	0	n/a
6/20/2013	3A Center	0	n/a
6/20/2013	3B-1	0	n/a
6/20/2013	3B-10	0	n/a
6/20/2013	3B-11	0	n/a
6/20/2013	3B-12	1	no
6/20/2013	3B-13	0	n/a
6/20/2013	3B-14	0	n/a
6/20/2013	3B-15	1	no
6/20/2013	3B-15	1	no

6/20/2013	3B-16	0	n/a
6/20/2013	3B-2	0	n/a
6/20/2013	3B-3	0	n/a
6/20/2013	3B-4	0	n/a
6/20/2013	3B-5	0	n/a
6/20/2013	3B-6	0	n/a
6/20/2013	3B-7	0	n/a
6/20/2013	3B-8	0	n/a
6/20/2013	3B-9	0	n/a
6/25/2013	1A Center	1	no
6/25/2013	1A Center	1	no
6/25/2013	1A Center	1	no
6/25/2013	1A Center	1	no
6/25/2013	1B-1	1	no
6/25/2013	1B-10	0	n/a
6/25/2013	1B-11	0	n/a
6/25/2013	1B-12	0	n/a
6/25/2013	1B-13	0	n/a
6/25/2013	1B-14	0	n/a
6/25/2013	1B-15	0	n/a
6/25/2013	1B-16	0	n/a
6/25/2013	1B-2	0	n/a
6/25/2013	1B-3	0	n/a
6/25/2013	1B-4	1	no
6/25/2013	1B-5	0	n/a
6/25/2013	1B-6	0	n/a
6/25/2013	1B-7	0	n/a
6/25/2013	1B-8	0	n/a
6/25/2013	1B-9	0	n/a
6/25/2013	3A-1	0	n/a
6/25/2013	3A-10	0	n/a
6/25/2013	3A-11	0	n/a
6/25/2013	3A-12	0	n/a
6/25/2013	3A-13	0	n/a
6/25/2013	3A-14	0	n/a
6/25/2013	3A-15	0	n/a
6/25/2013	3A-16	0	n/a

6/25/2013	3A-2	1	no
6/25/2013	3A-3	1	no
6/25/2013	3A-4	0	n/a
6/25/2013	3A-5	0	n/a
6/25/2013	3A-6	0	n/a
6/25/2013	3A-7	0	n/a
6/25/2013	3A-8	1	no
6/25/2013	3A-9	0	n/a
6/25/2013	3B Center	1	no
6/26/2013	1A Center	1	no
6/26/2013	1A Center	1	no
6/26/2013	1B-1	0	n/a
6/26/2013	1B-10	0	n/a
6/26/2013	1B-11	0	n/a
6/26/2013	1B-12	0	n/a
6/26/2013	1B-13	1	no
6/26/2013	1B-14	0	n/a
6/26/2013	1B-15	1	no
6/26/2013	1B-16	0	n/a
6/26/2013	1B-2	0	n/a
6/26/2013	1B-3	0	n/a
6/26/2013	1B-4	0	n/a
6/26/2013	1B-5	0	n/a
6/26/2013	1B-6	0	n/a
6/26/2013	1B-7	1	no
6/26/2013	1B-7	1	no
6/26/2013	1B-8	0	n/a
6/26/2013	1B-9	0	n/a
6/26/2013	3A-1	0	n/a
6/26/2013	3A-10	0	n/a
6/26/2013	3A-11	0	n/a
6/26/2013	3A-12	0	n/a
6/26/2013	3A-13	0	n/a
6/26/2013	3A-14	0	n/a
6/26/2013	3A-15	0	n/a
6/26/2013	3A-16	0	n/a
6/26/2013	3A-2	0	n/a

6/26/2013	3A-3	0	n/a
6/26/2013	3A-4	0	n/a
6/26/2013	3A-5	1	no
6/26/2013	3A-6	0	n/a
6/26/2013	3A-7	0	n/a
6/26/2013	3A-8	0	n/a
6/26/2013	3A-9	0	n/a
6/26/2013	3B Center	0	n/a
6/27/2013	1A Center	0	n/a
6/27/2013	1B-1	0	n/a
6/27/2013	1B-10	0	n/a
6/27/2013	1B-11	0	n/a
6/27/2013	1B-12	0	n/a
6/27/2013	1B-13	1	no
6/27/2013	1B-14	0	n/a
6/27/2013	1B-15	0	n/a
6/27/2013	1B-16	0	n/a
6/27/2013	1B-2	0	n/a
6/27/2013	1B-3	0	n/a
6/27/2013	1B-4	0	n/a
6/27/2013	1B-5	0	n/a
6/27/2013	1B-6	0	n/a
6/27/2013	1B-7	0	n/a
6/27/2013	1B-8	0	n/a
6/27/2013	1B-9	0	n/a
6/27/2013	3A-1	0	n/a
6/27/2013	3A-10	0	n/a
6/27/2013	3A-11	0	n/a
6/27/2013	3A-12	0	n/a
6/27/2013	3A-13	0	n/a
6/27/2013	3A-14	0	n/a
6/27/2013	3A-15	0	n/a
6/27/2013	3A-16	0	n/a
6/27/2013	3A-2	0	n/a
6/27/2013	3A-3	0	n/a
6/27/2013	3A-4	0	n/a
6/27/2013	3A-5	0	n/a

6/27/2013	3A-6	0	n/a
6/27/2013	3A-7	0	n/a
6/27/2013	3A-8	0	n/a
6/27/2013	3A-9	0	n/a
6/27/2013	3B Center	0	n/a
7/1/2013	1A-1	0	n/a
7/1/2013	1A-10	1	no
7/1/2013	1A-10	1	no
7/1/2013	1A-11	0	n/a
7/1/2013	1A-12	0	n/a
7/1/2013	1A-13	1	no
7/1/2013	1A-13	1	no
7/1/2013	1A-13	1	no
7/1/2013	1A-14	0	n/a
7/1/2013	1A-15	0	n/a
7/1/2013	1A-16	0	n/a
7/1/2013	1A-2	0	n/a
7/1/2013	1A-3	0	n/a
7/1/2013	1A-4	0	n/a
7/1/2013	1A-5	0	n/a
7/1/2013	1A-6	1	no
7/1/2013	1A-7	1	no
7/1/2013	1A-8	0	n/a
7/1/2013	1A-9	0	n/a
7/1/2013	1B Center	0	n/a
7/1/2013	3A Center	0	n/a
7/1/2013	3B-1	1	no
7/1/2013	3B-10	1	no
7/1/2013	3B-10	1	no
7/1/2013	3B-10	1	yes
7/1/2013	3B-11	0	n/a
7/1/2013	3B-12	0	n/a
7/1/2013	3B-13	0	n/a
7/1/2013	3B-14	1	no
7/1/2013	3B-15	1	no
7/1/2013	3B-15	1	no
7/1/2013	3B-16	0	n/a

7/1/2013	3B-2	1	no
7/1/2013	3B-2	1	no
7/1/2013	3B-3	0	n/a
7/1/2013	3B-4	0	n/a
7/1/2013	3B-5	1	no
7/1/2013	3B-6	0	n/a
7/1/2013	3B-7	0	n/a
7/1/2013	3B-8	0	n/a
7/1/2013	3B-9	0	n/a
7/2/2013	1A-1	0	n/a
7/2/2013	1A-10	0	n/a
7/2/2013	1A-11	0	n/a
7/2/2013	1A-12	0	n/a
7/2/2013	1A-13	0	n/a
7/2/2013	1A-14	1	yes
7/2/2013	1A-14	1	no
7/2/2013	1A-15	0	n/a
7/2/2013	1A-16	1	no
7/2/2013	1A-2	1	yes
7/2/2013	1A-3	0	n/a
7/2/2013	1A-4	0	n/a
7/2/2013	1A-5	1	no
7/2/2013	1A-6	0	n/a
7/2/2013	1A-7	1	yes
7/2/2013	1A-8	0	n/a
7/2/2013	1A-9	0	n/a
7/2/2013	1B Center	0	n/a
7/2/2013	3A Center	0	n/a
7/2/2013	3B-1	0	n/a
7/2/2013	3B-10	0	n/a
7/2/2013	3B-11	0	n/a
7/2/2013	3B-12	0	n/a
7/2/2013	3B-13	1	yes
7/2/2013	3B-14	0	n/a
7/2/2013	3B-15	0	n/a
7/2/2013	3B-16	0	n/a
7/2/2013	3B-2	0	n/a

7/2/2013	3B-3	0	n/a
7/2/2013	3B-4	0	n/a
7/2/2013	3B-5	0	n/a
7/2/2013	3B-6	0	n/a
7/2/2013	3B-7	0	n/a
7/2/2013	3B-8	0	n/a
7/2/2013	3B-9	0	n/a
7/3/2013	1A-1	1	yes
7/3/2013	1A-1	1	yes
7/3/2013	1A-10	0	n/a
7/3/2013	1A-11	0	n/a
7/3/2013	1A-12	0	n/a
7/3/2013	1A-13	1	yes
7/3/2013	1A-14	1	yes
7/3/2013	1A-14	1	no
7/3/2013	1A-15	0	n/a
7/3/2013	1A-16	0	n/a
7/3/2013	1A-2	1	no
7/3/2013	1A-3	0	n/a
7/3/2013	1A-4	0	n/a
7/3/2013	1A-5	1	no
7/3/2013	1A-5	1	yes
7/3/2013	1A-5	1	no
7/3/2013	1A-6	0	n/a
7/3/2013	1A-7	0	n/a
7/3/2013	1A-8	0	n/a
7/3/2013	1A-9	0	n/a
7/3/2013	1B Center	0	n/a
7/3/2013	3A Center	1	no
7/3/2013	3B-1	0	n/a
7/3/2013	3B-10	0	n/a
7/3/2013	3B-11	0	n/a
7/3/2013	3B-12	1	yes
7/3/2013	3B-13	0	n/a
7/3/2013	3B-14	0	n/a
7/3/2013	3B-15	0	n/a
7/3/2013	3B-16	0	n/a

7/3/2013	3B-2	0	n/a
7/3/2013	3B-3	0	n/a
7/3/2013	3B-4	0	n/a
7/3/2013	3B-5	1	yes
7/3/2013	3B-6	0	n/a
7/3/2013	3B-7	1	no
7/3/2013	3B-8	0	n/a
7/3/2013	3B-9	0	n/a
7/9/2013	1A Center	0	n/a
7/9/2013	1B-1	1	no
7/9/2013	1B-1	1	no
7/9/2013	1B-1	1	no
7/9/2013	1B-1	1	no
7/9/2013	1B-10	0	n/a
7/9/2013	1B-11	0	n/a
7/9/2013	1B-12	1	no
7/9/2013	1B-13	0	n/a
7/9/2013	1B-14	0	n/a
7/9/2013	1B-15	1	no
7/9/2013	1B-16	0	n/a
7/9/2013	1B-2	0	n/a
7/9/2013	1B-3	0	n/a
7/9/2013	1B-4	0	n/a
7/9/2013	1B-5	1	no
7/9/2013	1B-5	1	no
7/9/2013	1B-5	1	no
7/9/2013	1B-6	1	no
7/9/2013	1B-7	0	n/a
7/9/2013	1B-8	0	n/a
7/9/2013	1B-9	0	n/a
7/10/2013	1A Center	1	no
7/10/2013	1A Center	1	no
7/10/2013	1B-1	1	yes
7/10/2013	1B-10	1	no
7/10/2013	1B-11	0	n/a
7/10/2013	1B-12	0	n/a
7/10/2013	1B-13	0	n/a

7/10/2013	1B-14	0	n/a
7/10/2013	1B-15	1	no
7/10/2013	1B-16	0	n/a
7/10/2013	1B-2	0	n/a
7/10/2013	1B-3	0	n/a
7/10/2013	1B-4	1	no
7/10/2013	1B-5	0	n/a
7/10/2013	1B-6	0	n/a
7/10/2013	1B-7	0	n/a
7/10/2013	1B-8	0	n/a
7/10/2013	1B-9	0	n/a
7/11/2013	1A Center	1	no
7/11/2013	1A Center	1	no
7/11/2013	1B-1	0	n/a
7/11/2013	1B-10	0	n/a
7/11/2013	1B-11	0	n/a
7/11/2013	1B-12	0	n/a
7/11/2013	1B-13	0	n/a
7/11/2013	1B-14	0	n/a
7/11/2013	1B-15	0	n/a
7/11/2013	1B-16	0	n/a
7/11/2013	1B-2	0	n/a
7/11/2013	1B-3	0	n/a
7/11/2013	1B-4	0	n/a
7/11/2013	1B-5	1	n/a
7/11/2013	1B-6	0	n/a
7/11/2013	1B-7	0	n/a
7/11/2013	1B-8	0	n/a
7/11/2013	1B-9	1	yes
7/15/2013	3B Center	1	no
7/15/2013	3A-1	0	n/a
7/15/2013	3A-2	0	n/a
7/15/2013	3A-3	0	n/a
7/15/2013	3A-4	0	n/a
7/15/2013	3A-5	0	n/a
7/15/2013	3A-6	0	n/a
7/15/2013	3A-7	0	n/a

7/15/2013	3A-8	0	n/a
7/15/2013	3A-9	0	n/a
7/15/2013	3A-10	0	n/a
7/15/2013	3A-11	0	n/a
7/15/2013	3A-12	0	n/a
7/15/2013	3A-13	0	n/a
7/15/2013	3A-14	0	n/a
7/15/2013	3A-15	0	n/a
7/15/2013	3A-16	0	n/a
7/16/2013	3B Center	1	no
7/16/2013	3B Center	1	no
7/16/2013	3B Center	1	no
7/16/2013	3B Center	1	no
7/16/2013	3B Center	1	no
7/16/2013	3B Center	1	no
7/16/2013	3B Center	1	no
7/16/2013	3A-1	0	n/a
7/16/2013	3A-2	0	n/a
7/16/2013	3A-3	0	n/a
7/16/2013	3A-4	0	n/a
7/16/2013	3A-5	0	n/a
7/16/2013	3A-6	1	no
7/16/2013	3A-7	0	n/a
7/16/2013	3A-8	1	no
7/16/2013	3A-9	0	n/a
7/16/2013	3A-10	0	n/a
7/16/2013	3A-11	0	n/a
7/16/2013	3A-12	0	n/a
7/16/2013	3A-13	0	n/a
7/16/2013	3A-14	0	n/a
7/16/2013	3A-15	0	n/a
7/16/2013	3A-16	0	n/a
7/17/2013	3B Center	1	no
7/17/2013	3A-1	0	n/a
7/17/2013	3A-2	1	no
7/17/2013	3A-3	0	n/a
7/17/2013	3A-4	0	n/a

7/17/2013	3A-5	0	n/a
7/17/2013	3A-6	0	n/a
7/17/2013	3A-7	0	n/a
7/17/2013	3A-8	0	n/a
7/17/2013	3A-9	0	n/a
7/17/2013	3A-10	0	n/a
7/17/2013	3A-11	0	n/a
7/17/2013	3A-12	0	n/a
7/17/2013	3A-13	0	n/a
7/17/2013	3A-14	0	n/a
7/17/2013	3A-15	0	n/a
7/17/2013	3A-16	0	n/a
7/30/2013	2A-1	1	no
7/30/2013	2A-2	0	n/a
7/30/2013	2A-3	0	n/a
7/30/2013	2A-4	1	no
7/30/2013	2A-4	1	no
7/30/2013	2A-4	1	no
7/30/2013	2A-5	0	n/a
7/30/2013	2A-6	1	no
7/30/2013	2A-6	1	no
7/30/2013	2A-7	1	no
7/30/2013	2A-8	0	n/a
7/30/2013	2A-9	0	n/a
7/30/2013	2A-10	0	n/a
7/30/2013	2A-11	0	n/a
7/30/2013	2A-12	1	no
7/30/2013	2A-13	0	n/a
7/30/2013	2A-14	0	n/a
7/30/2013	2A-15	1	no
7/30/2013	2A-15	1	no
7/30/2013	2A-16	1	no
7/30/2013	2A-16	1	no
7/30/2013	2B Center	1	no
7/30/2013	2B Center	1	no
7/30/2013	2B Center	1	no
7/30/2013	2B Center	1	no

7/30/2013	2B Center	1	no
7/31/2013	2A-1	1	no
7/31/2013	2A-1	1	no
7/31/2013	2A-2	0	n/a
7/31/2013	2A-3	0	n/a
7/31/2013	2A-4	1	no
7/31/2013	2A-4	1	no
7/31/2013	2A-5	0	n/a
7/31/2013	2A-6	1	no
7/31/2013	2A-7	1	no
7/31/2013	2A-7	1	no
7/31/2013	2A-8	1	no
7/31/2013	2A-8	1	no
7/31/2013	2A-8	1	no
7/31/2013	2A-8	1	no
7/31/2013	2A-9	0	n/a
7/31/2013	2A-10	0	n/a
7/31/2013	2A-11	0	n/a
7/31/2013	2A-12	1	no
7/31/2013	2A-13	0	n/a
7/31/2013	2A-14	0	n/a
7/31/2013	2A-15	0	n/a
7/31/2013	2A-16	0	n/a
7/31/2013	2B Center	1	yes
8/1/2013	2A-1	0	n/a
8/1/2013	2A-2	0	n/a
8/1/2013	2A-3	0	n/a
8/1/2013	2A-4	0	n/a
8/1/2013	2A-5	0	n/a
8/1/2013	2A-6	1	no
8/1/2013	2A-7	0	n/a
8/1/2013	2A-8	1	no
8/1/2013	2A-9	0	n/a
8/1/2013	2A-10	0	n/a
8/1/2013	2A-11	0	n/a
8/1/2013	2A-12	0	n/a
8/1/2013	2A-13	0	n/a

8/1/2013	2A-14	0	n/a
8/1/2013	2A-15	0	n/a
8/1/2013	2A-16	0	n/a
8/1/2013	2B Center	0	n/a
8/2/2013	2B-1	1	no
8/2/2013	2B-2	0	n/a
8/2/2013	2B-3	1	no
8/2/2013	2B-4	1	no
8/2/2013	2B-5	0	n/a
8/2/2013	2B-6	0	n/a
8/2/2013	2B-7	1	no
8/2/2013	2B-7	1	no
8/2/2013	2B-7	1	no
8/2/2013	2B-7	1	no
8/2/2013	2B-7	1	no
8/2/2013	2B-7	1	no
8/2/2013	2B-7	1	no
8/2/2013	2B-7	1	yes
8/2/2013	2B-8	0	n/a
8/2/2013	2B-9	0	n/a
8/2/2013	2B-10	0	n/a
8/2/2013	2B-11	0	n/a
8/2/2013	2B-12	1	yes
8/2/2013	2B-12	1	no
8/2/2013	2B-13	0	n/a
8/2/2013	2B-14	0	n/a
8/2/2013	2B-15	0	n/a
8/2/2013	2B-16	1	no
8/2/2013	2B-16	1	no
8/2/2013	2A Center	1	yes
8/2/2013	2A Center	1	no
8/3/2013	2B-1	0	n/a
8/3/2013	2B-2	1	no
8/3/2013	2B-2	1	no
8/3/2013	2B-3	0	n/a
8/3/2013	2B-4	0	n/a
8/3/2013	2B-5	0	n/a

8/3/2013	2B-6	0	n/a
8/3/2013	2B-7	0	n/a
8/3/2013	2B-8	0	n/a
8/3/2013	2B-9	0	n/a
8/3/2013	2B-10	1	no
8/3/2013	2B-11	0	n/a
8/3/2013	2B-12	0	n/a
8/3/2013	2B-13	0	n/a
8/3/2013	2B-14	0	n/a
8/3/2013	2B-15	0	n/a
8/3/2013	2B-16	1	no
8/3/2013	2A Center	1	yes
8/3/2013	2A Center	1	no
8/4/2013	2B-1	0	n/a
8/4/2013	2B-2	0	n/a
8/4/2013	2B-3	0	n/a
8/4/2013	2B-4	0	n/a
8/4/2013	2B-5	0	n/a
8/4/2013	2B-6	0	n/a
8/4/2013	2B-7	0	n/a
8/4/2013	2B-8	0	n/a
8/4/2013	2B-9	0	n/a
8/4/2013	2B-10	0	n/a
8/4/2013	2B-11	0	n/a
8/4/2013	2B-12	0	n/a
8/4/2013	2B-13	1	no
8/4/2013	2B-13	1	no
8/4/2013	2B-14	1	yes
8/4/2013	2B-15	0	n/a
8/4/2013	2B-16	0	n/a
8/4/2013	2A Center	1	no
8/4/2013	2A Center	1	yes
8/4/2013	2A Center	1	no

2013 Single Trap Sites

Date	**Site**	**Trap #**	**ABB**
4/5/2013	Atoka	1	0
4/5/2013	Atoka	2	0
4/5/2013	Atoka	3	0
4/5/2013	Atoka	4	0
4/5/2013	Midgett	1	0
4/5/2013	Midgett	2	0
4/5/2013	Midgett	3	0
4/5/2013	Midgett	4	0
4/6/2013	Atoka	1	0
4/6/2013	Atoka	2	0
4/6/2013	Atoka	3	0
4/6/2013	Atoka	4	0
4/6/2013	James Collins	1	0
4/6/2013	James Collins	2	0
4/6/2013	James Collins	3	0
4/6/2013	James Collins	4	0
4/6/2013	Midgett	1	0
4/6/2013	Midgett	2	0
4/6/2013	Midgett	3	0
4/6/2013	Midgett	4	0
4/20/2013	James Collins	1	0
4/20/2013	James Collins	2	0
4/20/2013	James Collins	3	0
4/20/2013	James Collins	4	0
4/20/2013	Midgett	1	0
4/20/2013	Midgett	2	0
4/20/2013	Midgett	3	0
4/20/2013	Midgett	4	0
4/21/2013	Atoka	1	0
4/21/2013	Atoka	2	0
4/21/2013	Atoka	3	0
4/21/2013	Atoka	4	0
4/21/2013	James Collins	1	0
4/21/2013	James Collins	2	0
4/21/2013	James Collins	3	0
4/21/2013	James Collins	4	0

4/21/2013	Midgett	1	0
4/21/2013	Midgett	2	0
4/21/2013	Midgett	3	0
4/21/2013	Midgett	4	0
4/22/2013	Atoka	1	0
4/22/2013	Atoka	2	0
4/22/2013	Atoka	3	0
4/22/2013	Atoka	4	0
4/22/2013	James Collins	1	0
4/22/2013	James Collins	2	0
4/22/2013	James Collins	3	0
4/22/2013	James Collins	4	0
4/22/2013	Midgett	1	0
4/22/2013	Midgett	2	0
4/22/2013	Midgett	3	0
4/22/2013	Midgett	4	0
4/27/2013	Atoka	1	0
4/27/2013	Atoka	2	0
4/27/2013	Atoka	3	0
4/27/2013	Atoka	4	0
4/27/2013	James Collins	1	0
4/27/2013	James Collins	2	0
4/27/2013	James Collins	3	0
4/27/2013	James Collins	4	0
4/27/2013	Midgett	1	0
4/27/2013	Midgett	2	0
4/27/2013	Midgett	3	0
4/27/2013	Midgett	4	0
4/28/2013	Atoka	1	0
4/28/2013	Atoka	2	0
4/28/2013	Atoka	3	0
4/28/2013	Atoka	4	0
4/28/2013	James Collins	1	0
4/28/2013	James Collins	2	0
4/28/2013	James Collins	3	0
4/28/2013	James Collins	4	0
4/28/2013	Midgett	1	0

4/28/2013	Midgett	2	0
4/28/2013	Midgett	3	0
4/28/2013	Midgett	4	0
4/29/2013	Atoka	1	0
4/29/2013	Atoka	2	0
4/29/2013	Atoka	3	0
4/29/2013	Atoka	4	0
4/29/2013	James Collins	1	0
4/29/2013	James Collins	2	0
4/29/2013	James Collins	3	0
4/29/2013	James Collins	4	0
4/29/2013	James Collins	14	0
4/29/2013	Midgett	1	0
4/29/2013	Midgett	2	0
4/29/2013	Midgett	3	0
4/29/2013	Midgett	4	0
5/6/2013	Midgett	3	1
5/7/2013	Atoka	1	0
5/7/2013	Atoka	2	0
5/7/2013	Atoka	3	0
5/7/2013	Atoka	4	0
5/7/2013	James Collins	1	0
5/7/2013	James Collins	2	0
5/7/2013	James Collins	3	0
5/7/2013	James Collins	4	0
5/7/2013	James Collins	14	0
5/7/2013	Midgett	1	0
5/7/2013	Midgett	2	0
5/7/2013	Midgett	3	0
5/7/2013	Midgett	4	0
5/8/2013	Atoka	1	0
5/8/2013	Atoka	2	0
5/8/2013	Atoka	3	0
5/8/2013	Atoka	4	0
5/8/2013	James Collins	1	0
5/8/2013	James Collins	2	0
5/8/2013	James Collins	3	0

5/8/2013	James Collins	4	0
5/8/2013	James Collins	14	0
5/8/2013	Midgett	1	0
5/8/2013	Midgett	2	0
5/8/2013	Midgett	3	0
5/8/2013	Midgett	4	0
5/9/2013	Atoka	1	0
5/9/2013	Atoka	2	0
5/9/2013	Atoka	3	0
5/9/2013	Atoka	4	0
5/9/2013	James Collins	1	0
5/9/2013	James Collins	2	0
5/9/2013	James Collins	3	0
5/9/2013	James Collins	4	0
5/9/2013	James Collins	14	0
5/9/2013	Midgett	1	0
5/9/2013	Midgett	2	0
5/9/2013	Midgett	3	0
5/9/2013	Midgett	4	0
5/14/2013	Atoka	1	0
5/14/2013	Atoka	2	0
5/14/2013	Atoka	3	0
5/14/2013	Atoka	4	0
5/14/2013	James Collins	1	0
5/14/2013	James Collins	2	0
5/14/2013	James Collins	3	0
5/14/2013	James Collins	4	0
5/14/2013	James Collins	7	0
5/14/2013	James Collins	8	0
5/14/2013	James Collins	14	0
5/14/2013	Midgett	1	0
5/14/2013	Midgett	2	0
5/14/2013	Midgett	3	0
5/14/2013	Midgett	4	0
5/15/2013	Midgett	1	1
5/15/2013	Midgett	3	1
5/15/2013	Midgett	4	1

5/15/2013	Atoka	1	0
5/15/2013	Atoka	2	0
5/15/2013	Atoka	3	0
5/15/2013	Atoka	4	0
5/15/2013	James Collins	1	0
5/15/2013	James Collins	2	0
5/15/2013	James Collins	3	0
5/15/2013	James Collins	4	0
5/15/2013	James Collins	7	0
5/15/2013	James Collins	8	0
5/15/2013	James Collins	14	0
5/15/2013	Midgett	2	0
5/16/2013	Atoka	1	0
5/16/2013	Atoka	2	0
5/16/2013	Atoka	3	0
5/16/2013	Atoka	4	0
5/16/2013	James Collins	1	0
5/16/2013	James Collins	2	0
5/16/2013	James Collins	3	0
5/16/2013	James Collins	4	0
5/16/2013	James Collins	7	0
5/16/2013	James Collins	8	0
5/16/2013	James Collins	14	0
5/16/2013	Midgett	1	0
5/16/2013	Midgett	2	0
5/16/2013	Midgett	3	0
5/16/2013	Midgett	4	0
5/23/2013	Atoka	1	0
5/23/2013	Atoka	5	0
5/23/2013	Atoka	6	0
5/23/2013	Atoka	7	0
5/23/2013	James Collins	1	0
5/23/2013	James Collins	2	0
5/23/2013	James Collins	3	0
5/23/2013	James Collins	4	0
5/23/2013	James Collins	5	0
5/23/2013	James Collins	6	0

5/23/2013	James Collins	7	0
5/23/2013	James Collins	8	0
5/23/2013	James Collins	9	0
5/23/2013	James Collins	10	0
5/23/2013	James Collins	11	0
5/23/2013	James Collins	12	0
5/23/2013	James Collins	14	0
5/23/2013	Midgett	5	0
5/23/2013	Midgett	6	0
5/23/2013	Midgett	7	0
5/23/2013	Midgett	8	0
5/23/2013	Midgett	9	0
5/23/2013	Midgett	10	0
5/23/2013	James Collins	13	1
5/24/2013	Atoka	1	0
5/24/2013	Atoka	5	0
5/24/2013	Atoka	6	0
5/24/2013	Atoka	7	0
5/24/2013	James Collins	1	0
5/24/2013	James Collins	2	0
5/24/2013	James Collins	3	0
5/24/2013	James Collins	4	0
5/24/2013	James Collins	5	0
5/24/2013	James Collins	6	0
5/24/2013	James Collins	7	0
5/24/2013	James Collins	8	0
5/24/2013	James Collins	9	0
5/24/2013	James Collins	10	0
5/24/2013	James Collins	11	0
5/24/2013	James Collins	12	0
5/24/2013	James Collins	13	0
5/24/2013	James Collins	14	0
5/24/2013	Midgett	5	0
5/24/2013	Midgett	6	0
5/24/2013	Midgett	7	0
5/24/2013	Midgett	9	0
5/24/2013	Midgett	10	0

5/24/2013	Midgett	8	1
5/25/2013	Atoka	1	0
5/25/2013	Atoka	5	0
5/25/2013	Atoka	6	0
5/25/2013	Atoka	7	0
5/25/2013	James Collins	1	0
5/25/2013	James Collins	2	0
5/25/2013	James Collins	3	0
5/25/2013	James Collins	4	0
5/25/2013	James Collins	5	0
5/25/2013	James Collins	6	0
5/25/2013	James Collins	7	0
5/25/2013	James Collins	8	0
5/25/2013	James Collins	9	0
5/25/2013	James Collins	10	0
5/25/2013	James Collins	11	0
5/25/2013	James Collins	12	0
5/25/2013	James Collins	13	0
5/25/2013	James Collins	14	0
5/25/2013	Midgett	5	0
5/25/2013	Midgett	6	0
5/25/2013	Midgett	7	0
5/25/2013	Midgett	8	0
5/25/2013	Midgett	9	0
5/25/2013	Midgett	10	0
5/29/2013	Atoka	1	0
5/29/2013	Atoka	5	0
5/29/2013	Atoka	6	0
5/29/2013	Atoka	7	0
5/29/2013	James Collins	1	0
5/29/2013	James Collins	2	0
5/29/2013	James Collins	3	0
5/29/2013	James Collins	4	0
5/29/2013	James Collins	5	0
5/29/2013	James Collins	6	0
5/29/2013	James Collins	7	0
5/29/2013	James Collins	8	0

5/29/2013	James Collins	9	0
5/29/2013	James Collins	10	0
5/29/2013	James Collins	11	0
5/29/2013	James Collins	12	0
5/29/2013	James Collins	13	0
5/29/2013	James Collins	14	0
5/29/2013	Midgett	5	0
5/29/2013	Midgett	7	0
5/29/2013	Midgett	9	0
5/29/2013	Midgett	10	0
5/29/2013	Midgett	6	1
5/29/2013	Midgett	8	1
5/30/2013	Atoka	1	0
5/30/2013	Atoka	5	0
5/30/2013	Atoka	6	0
5/30/2013	Atoka	7	0
5/30/2013	James Collins	1	0
5/30/2013	James Collins	2	0
5/30/2013	James Collins	3	0
5/30/2013	James Collins	4	0
5/30/2013	James Collins	5	0
5/30/2013	James Collins	6	0
5/30/2013	James Collins	7	0
5/30/2013	James Collins	8	0
5/30/2013	James Collins	9	0
5/30/2013	James Collins	10	0
5/30/2013	James Collins	11	0
5/30/2013	James Collins	12	0
5/30/2013	James Collins	13	0
5/30/2013	James Collins	14	0
5/30/2013	Midgett	5	0
5/30/2013	Midgett	6	0
5/30/2013	Midgett	7	0
5/30/2013	Midgett	8	0
5/30/2013	Midgett	9	0
5/30/2013	Midgett	10	0
5/31/2013	Atoka	1	0

5/31/2013	Atoka	5	0
5/31/2013	Atoka	6	0
5/31/2013	Atoka	7	0
5/31/2013	James Collins	1	0
5/31/2013	James Collins	2	0
5/31/2013	James Collins	3	0
5/31/2013	James Collins	4	0
5/31/2013	James Collins	5	0
5/31/2013	James Collins	6	0
5/31/2013	James Collins	8	0
5/31/2013	James Collins	9	0
5/31/2013	James Collins	10	0
5/31/2013	James Collins	11	0
5/31/2013	James Collins	12	0
5/31/2013	James Collins	13	0
5/31/2013	James Collins	14	0
5/31/2013	Midgett	5	0
5/31/2013	Midgett	7	0
5/31/2013	Midgett	8	0
5/31/2013	Midgett	9	0
5/31/2013	Midgett	10	0
5/31/2013	James Collins	7	1
5/31/2013	Midgett	6	1
6/5/2013	Atoka	1	0
6/5/2013	Atoka	5	0
6/5/2013	Atoka	6	0
6/5/2013	Atoka	7	0
6/5/2013	James Collins	1	0
6/5/2013	James Collins	2	0
6/5/2013	James Collins	3	0
6/5/2013	James Collins	4	0
6/5/2013	James Collins	5	0
6/5/2013	James Collins	6	0
6/5/2013	James Collins	7	0
6/5/2013	James Collins	8	0
6/5/2013	James Collins	9	0
6/5/2013	James Collins	10	0

6/5/2013	James Collins	11	0
6/5/2013	James Collins	12	0
6/5/2013	James Collins	13	0
6/5/2013	James Collins	14	0
6/5/2013	Midgett	5	0
6/5/2013	Midgett	6	0
6/5/2013	Midgett	7	0
6/5/2013	Midgett	8	0
6/5/2013	Midgett	9	0
6/5/2013	Midgett	10	0
6/6/2013	Atoka	1	0
6/6/2013	Atoka	5	0
6/6/2013	Atoka	6	0
6/6/2013	Atoka	7	0
6/6/2013	James Collins	1	0
6/6/2013	James Collins	2	0
6/6/2013	James Collins	3	0
6/6/2013	James Collins	4	0
6/6/2013	James Collins	5	0
6/6/2013	James Collins	6	0
6/6/2013	James Collins	7	0
6/6/2013	James Collins	8	0
6/6/2013	James Collins	9	0
6/6/2013	James Collins	10	0
6/6/2013	James Collins	11	0
6/6/2013	James Collins	12	0
6/6/2013	James Collins	13	0
6/6/2013	James Collins	14	0
6/6/2013	Midgett	5	0
6/6/2013	Midgett	6	0
6/6/2013	Midgett	7	0
6/6/2013	Midgett	8	0
6/6/2013	Midgett	9	0
6/6/2013	Midgett	10	0
6/7/2013	Atoka	1	0
6/7/2013	Atoka	5	0
6/7/2013	Atoka	6	0

6/7/2013	Atoka	7	0
6/7/2013	James Collins	1	0
6/7/2013	James Collins	2	0
6/7/2013	James Collins	3	0
6/7/2013	James Collins	4	0
6/7/2013	James Collins	5	0
6/7/2013	James Collins	6	0
6/7/2013	James Collins	7	0
6/7/2013	James Collins	8	0
6/7/2013	James Collins	9	0
6/7/2013	James Collins	10	0
6/7/2013	James Collins	11	0
6/7/2013	James Collins	12	0
6/7/2013	James Collins	13	0
6/7/2013	James Collins	14	0
6/7/2013	Midgett	5	0
6/7/2013	Midgett	6	0
6/7/2013	Midgett	7	0
6/7/2013	Midgett	8	0
6/7/2013	Midgett	9	0
6/7/2013	Midgett	10	0
6/11/2013	Atoka	1	0
6/11/2013	Atoka	5	0
6/11/2013	Atoka	6	0
6/11/2013	Atoka	7	0
6/11/2013	James Collins	1	0
6/11/2013	James Collins	2	0
6/11/2013	James Collins	3	0
6/11/2013	James Collins	4	0
6/11/2013	James Collins	5	0
6/11/2013	James Collins	6	0
6/11/2013	James Collins	8	0
6/11/2013	James Collins	9	0
6/11/2013	James Collins	10	0
6/11/2013	James Collins	11	0
6/11/2013	James Collins	12	0
6/11/2013	James Collins	13	0

6/11/2013	James Collins	14	0
6/11/2013	Midgett	5	0
6/11/2013	Midgett	6	0
6/11/2013	Midgett	8	0
6/11/2013	Midgett	9	0
6/11/2013	Midgett	10	0
6/11/2013	James Collins	7	1
6/11/2013	Midgett	7	1
6/12/2013	Atoka	1	0
6/12/2013	Atoka	5	0
6/12/2013	Atoka	6	0
6/12/2013	Atoka	7	0
6/12/2013	James Collins	1	0
6/12/2013	James Collins	2	0
6/12/2013	James Collins	3	0
6/12/2013	James Collins	4	0
6/12/2013	James Collins	5	0
6/12/2013	James Collins	6	0
6/12/2013	James Collins	8	0
6/12/2013	James Collins	9	0
6/12/2013	James Collins	10	0
6/12/2013	James Collins	11	0
6/12/2013	James Collins	12	0
6/12/2013	James Collins	14	0
6/12/2013	Midgett	5	0
6/12/2013	Midgett	6	0
6/12/2013	Midgett	7	0
6/12/2013	Midgett	9	0
6/12/2013	Midgett	10	0
6/12/2013	James Collins	7	1
6/12/2013	James Collins	7	1
6/12/2013	James Collins	13	1
6/12/2013	Midgett	8	1
6/12/2013	Midgett	8	1
6/13/2013	James Collins	1	0
6/13/2013	James Collins	2	0
6/13/2013	James Collins	3	0

6/13/2013	James Collins	4	0
6/13/2013	James Collins	5	0
6/13/2013	James Collins	6	0
6/13/2013	James Collins	7	0
6/13/2013	James Collins	8	0
6/13/2013	James Collins	9	0
6/13/2013	James Collins	10	0
6/13/2013	James Collins	11	0
6/13/2013	James Collins	12	0
6/13/2013	James Collins	13	0
6/13/2013	James Collins	14	0
6/13/2013	Midgett	5	0
6/13/2013	Midgett	6	0
6/13/2013	Midgett	7	0
6/13/2013	Midgett	8	0
6/13/2013	Midgett	9	0
6/13/2013	Midgett	10	0
6/28/2013	Midgett	5	0
6/28/2013	Midgett	7	0
6/28/2013	Midgett	8	0
6/28/2013	Midgett	9	0
6/28/2013	Midgett	10	0
6/28/2013	Midgett	6	1
6/29/2013	Midgett	5	0
6/29/2013	Midgett	7	0
6/29/2013	Midgett	8	0
6/29/2013	Midgett	9	0
6/29/2013	Midgett	10	0
6/29/2013	Midgett	6	1
6/30/2013	Midgett	5	0
6/30/2013	Midgett	6	0
6/30/2013	Midgett	7	0
6/30/2013	Midgett	8	0
6/30/2013	Midgett	9	0
6/30/2013	Midgett	10	0
7/1/2013	MCAAP	R1	0
7/1/2013	MCAAP	R3	0

7/1/2013	MCAAP	R4	0
7/1/2013	MCAAP	R6	0
7/1/2013	MCAAP	R5	1
7/1/2013	MCAAP	R5	1
7/1/2013	MCAAP	R2	1
7/2/2013	MCAAP	R1	0
7/2/2013	MCAAP	R2	0
7/2/2013	MCAAP	R3	0
7/2/2013	MCAAP	R4	0
7/2/2013	MCAAP	R6	0
7/2/2013	MCAAP	R5	1
7/2/2013	MCAAP	R5	1
7/3/2013	MCAAP	1B Center	0
7/3/2013	MCAAP	R1	0
7/3/2013	MCAAP	R2	0
7/3/2013	MCAAP	R3	0
7/3/2013	MCAAP	R4	0
7/3/2013	MCAAP	R5	0
7/3/2013	MCAAP	R6	0
7/3/2013	MCAAP	3A Center	1
7/8/2013	Clark Pond	S2	1
7/8/2013	Clark Pond	S2	1
7/8/2013	Clark Pond	S2	1
7/8/2013	Clark Pond	S2	1
7/8/2013	Clark Pond	S2	1
7/8/2013	Clark Pond	S2	1
7/8/2013	Clark Pond	S2	1
7/8/2013	Clark Pond	S2	1
7/8/2013	Clark Pond	S2	1
7/8/2013	Clark Pond	S1	1
7/8/2013	Clark Pond	S1	1
7/8/2013	Clark Pond	S1	1
7/8/2013	Clark Pond	S1	1
7/9/2013	Midgett	8	0
7/9/2013	Midgett	10	1
7/9/2013	Midgett	9	1
7/9/2013	Midgett	9	1

7/9/2013	Midgett	5	1
7/9/2013	Midgett	6	1
7/9/2013	Midgett	7	1
7/9/2013	Clark Pond	S1	1
7/9/2013	Clark Pond	S2	1
7/10/2013	Clark Pond	S1	0
7/10/2013	Clark Pond	S2	0
7/10/2013	Midgett	5	0
7/10/2013	Midgett	6	0
7/10/2013	Midgett	7	0
7/10/2013	Midgett	8	0
7/10/2013	Midgett	9	0
7/10/2013	Midgett	10	0
7/11/2013	MCAAP	1A Center	0
7/11/2013	Midgett	5	0
7/11/2013	Midgett	6	0
7/11/2013	Midgett	7	0
7/11/2013	Midgett	8	0
7/11/2013	Midgett	10	0
7/11/2013	Midgett	9	1
7/15/2013	Clark Pond	E1	0
7/15/2013	Clark Pond	E2	0
7/15/2013	James Collins	15	0
7/15/2013	James Collins	16	0
7/15/2013	MCAAP	R1	0
7/15/2013	MCAAP	R2	0
7/15/2013	MCAAP	R3	0
7/15/2013	MCAAP	R4	0
7/15/2013	MCAAP	R5	0
7/15/2013	MCAAP	R6	0
7/15/2013	MCAAP	3B Center	1
7/16/2013	Clark Pond	E1	0
7/16/2013	James Collins	15	0
7/16/2013	James Collins	16	0
7/16/2013	MCAAP	R1	0
7/16/2013	MCAAP	R2	0
7/16/2013	MCAAP	R3	0

7/16/2013	MCAAP	R4	0
7/16/2013	MCAAP	R6	0
7/16/2013	MCAAP	R5	1
7/16/2013	MCAAP	3B Center	1
7/16/2013	MCAAP	3B Center	1
7/16/2013	MCAAP	3B Center	1
7/16/2013	MCAAP	3B Center	1
7/16/2013	MCAAP	3B Center	1
7/16/2013	MCAAP	3B Center	1
7/16/2013	MCAAP	3B Center	1
7/16/2013	Clark Pond	E2	1
7/16/2013	Clark Pond	E2	1
7/17/2013	Clark Pond	E1	0
7/17/2013	Clark Pond	E2	0
7/17/2013	James Collins	15	0
7/17/2013	James Collins	16	0
7/17/2013	MCAAP	R1	0
7/17/2013	MCAAP	R2	0
7/17/2013	MCAAP	R4	0
7/17/2013	MCAAP	R5	0
7/17/2013	MCAAP	R6	0
7/17/2013	MCAAP	3B Center	1
7/17/2013	MCAAP	R3	1
7/23/2013	Clark Pond	S2	1
7/23/2013	Midgett	8	1
7/23/2013	Midgett	8	1
7/23/2013	Midgett	8	1
7/23/2013	Midgett	8	1
7/23/2013	Clark Pond	S2	1
7/23/2013	Clark Pond	S2	1
7/23/2013	Clark Pond	S2	1
7/23/2013	Clark Pond	S2	1
7/23/2013	Clark Pond	S2	1
7/23/2013	Clark Pond	S2	1
7/23/2013	Midgett	8	1
7/23/2013	Midgett	8	1
7/23/2013	Midgett	10	1

7/23/2013	Midgett	10	1
7/23/2013	Midgett	10	1
7/23/2013	Midgett	10	1
7/23/2013	Midgett	10	1
7/23/2013	Midgett	9	1
7/23/2013	Midgett	5	1
7/23/2013	Midgett	6	1
7/23/2013	Midgett	6	1
7/23/2013	Midgett	6	1
7/23/2013	Midgett	6	1
7/23/2013	Midgett	6	1
7/23/2013	Midgett	6	1
7/23/2013	Midgett	6	1
7/23/2013	Midgett	7	1
7/23/2013	Midgett	7	1
7/23/2013	Clark Pond	S1	1
7/23/2013	Clark Pond	S1	1
7/23/2013	Clark Pond	S1	1
7/23/2013	Clark Pond	S2	1
7/23/2013	Clark Pond	S2	1
7/24/2013	Midgett	8	1
7/24/2013	Midgett	9	1
7/24/2013	Midgett	9	1
7/24/2013	Clark Pond	S2	1
7/24/2013	Clark Pond	S2	1
7/24/2013	Clark Pond	S2	1
7/24/2013	Clark Pond	S1	0
7/24/2013	Midgett	5	0
7/24/2013	Midgett	6	0
7/24/2013	Midgett	7	0
7/24/2013	Midgett	10	0
7/25/2013	Midgett	8	1
7/25/2013	Midgett	7	1
7/25/2013	Midgett	10	1
7/25/2013	Midgett	10	1
7/25/2013	Midgett	10	1
7/25/2013	Midgett	10	1

7/25/2013	Clark Pond	E1	1
7/25/2013	Clark Pond	E2	0
7/25/2013	Midgett	5	0
7/25/2013	Midgett	6	0
7/25/2013	Midgett	9	0
7/30/2013	Clark Pond	S1	1
7/30/2013	Clark Pond	S1	1
7/30/2013	Clark Pond	S1	1
7/30/2013	Clark Pond	S1	1
7/30/2013	Clark Pond	S1	1
7/30/2013	Clark Pond	S1	1
7/30/2013	Clark Pond	S1	1
7/30/2013	Clark Pond	S2	1
7/30/2013	Clark Pond	S2	1
7/30/2013	James Collins	17	1
7/30/2013	James Collins	17	1
7/30/2013	James Collins	17	1
7/30/2013	James Collins	17	1
7/30/2013	James Collins	16	0
7/30/2013	MCAAP	R5	1
7/30/2013	MCAAP	R5	1
7/30/2013	MCAAP	R6	0
7/30/2013	MCAAP	2B Center	1
7/30/2013	MCAAP	2B Center	1
7/30/2013	MCAAP	2B Center	1
7/30/2013	MCAAP	2B Center	1
7/30/2013	MCAAP	R4	1
7/30/2013	MCAAP	R4	1
7/30/2013	MCAAP	R4	1
7/30/2013	MCAAP	R3	1
7/30/2013	MCAAP	R3	1
7/30/2013	MCAAP	R2	1
7/30/2013	MCAAP	R1	1
7/30/2013	MCAAP	R1	1
7/30/2013	MCAAP	R1	1
7/30/2013	MCAAP	R1	1
7/30/2013	MCAAP	R1	1

7/30/2013	MCAAP	R5	1
7/30/2013	MCAAP	R5	1
7/31/2013	Clark Pond	S2	1
7/31/2013	James Collins	16	0
7/31/2013	James Collins	17	0
7/31/2013	Clark Pond	S1	1
7/31/2013	MCAAP	2B Center	1
7/31/2013	MCAAP	R3	1
7/31/2013	MCAAP	R1	1
7/31/2013	MCAAP	R1	1
7/31/2013	MCAAP	R4	1
7/31/2013	MCAAP	R4	1
7/31/2013	MCAAP	R2	1
7/31/2013	MCAAP	R2	1
7/31/2013	MCAAP	R6	1
7/31/2013	MCAAP	R1	1
7/31/2013	MCAAP	R5	1
7/31/2013	MCAAP	R5	1
7/31/2013	MCAAP	R5	1
8/1/2013	Clark Pond	NNE 1	1
8/1/2013	Clark Pond	NNE 1	1
8/1/2013	Clark Pond	NNE 1	1
8/1/2013	James Collins	18	1
8/1/2013	James Collins	19	1
8/1/2013	Clark Pond	NNE 2	0
8/1/2013	MCAAP	2B Center	0
8/1/2013	MCAAP	R4	0
8/1/2013	MCAAP	R5	0
8/1/2013	MCAAP	R6	0
8/1/2013	MCAAP	R3	1
8/1/2013	MCAAP	R1	1
8/1/2013	MCAAP	R1	1
8/1/2013	MCAAP	R1	1
8/1/2013	MCAAP	R1	1
8/1/2013	MCAAP	R2	1
8/1/2013	MCAAP	R2	1
8/1/2013	MCAAP	R2	1

8/1/2013	MCAAP	R2	1
8/1/2013	MCAAP	R2	1
8/2/2013	MCAAP	2A Center	1
8/2/2013	MCAAP	2A Center	1
8/3/2013	MCAAP	2A Center	1
8/3/2013	MCAAP	2A Center	1
8/4/2013	MCAAP	2A Center	1
8/4/2013	MCAAP	2A Center	1
8/4/2013	MCAAP	2A Center	1
8/6/2013	Clark Pond	S2	0
8/6/2013	James Collins	17	0
8/6/2013	James Collins	16	1
8/6/2013	Midgett	8	1
8/6/2013	Midgett	8	1
8/6/2013	Midgett	8	1
8/6/2013	Midgett	8	1
8/6/2013	Midgett	8	1
8/6/2013	Midgett	8	1
8/6/2013	Midgett	8	1
8/6/2013	Midgett	8	1
8/6/2013	Midgett	8	1
8/6/2013	Midgett	8	1
8/6/2013	Midgett	7	1
8/6/2013	Midgett	7	1
8/6/2013	Midgett	7	1
8/6/2013	Midgett	7	1
8/6/2013	Midgett	7	1
8/6/2013	Midgett	7	1
8/6/2013	Midgett	7	1
8/6/2013	Midgett	7	1
8/6/2013	Midgett	7	1
8/6/2013	Midgett	7	1
8/6/2013	Midgett	6	1
8/6/2013	Midgett	6	1
8/6/2013	Midgett	6	1
8/6/2013	Midgett	6	1
8/6/2013	Midgett	6	1

8/6/2013	Midgett	6	1
8/6/2013	Midgett	6	1
8/6/2013	Midgett	6	1
8/6/2013	Midgett	6	1
8/6/2013	Midgett	6	1
8/6/2013	Midgett	6	1
8/6/2013	Midgett	6	1
8/6/2013	Midgett	6	1
8/6/2013	Midgett	6	1
8/6/2013	Midgett	6	1
8/6/2013	Midgett	6	1
8/6/2013	Midgett	5	1
8/6/2013	Midgett	5	1
8/6/2013	Midgett	5	1
8/6/2013	Midgett	5	1
8/6/2013	Midgett	5	1
8/6/2013	Midgett	5	1
8/6/2013	Midgett	5	1
8/6/2013	Midgett	5	1
8/6/2013	Midgett	5	1
8/6/2013	Midgett	5	1
8/6/2013	Midgett	9	1
8/6/2013	Midgett	9	1
8/6/2013	Midgett	9	1
8/6/2013	Midgett	10	1
8/6/2013	Midgett	10	1
8/6/2013	Midgett	10	1
8/6/2013	Clark Pond	S1	1
8/6/2013	Clark Pond	S1	1
8/6/2013	Clark Pond	S1	1
8/6/2013	Clark Pond	S1	1
8/7/2013	Clark Pond	S2	0
8/7/2013	James Collins	17	0
8/7/2013	Clark Pond	S1	1
8/7/2013	James Collins	16	1
8/8/2013	Clark Pond	E1	0
8/8/2013	Clark Pond	E2	0

8/8/2013	James Collins	15	0
8/8/2013	James Collins	19	0
8/13/2013	Clark Pond	S1	1
8/13/2013	Clark Pond	S1	1
8/13/2013	Clark Pond	S1	1
8/13/2013	Clark Pond	S1	1
8/13/2013	Clark Pond	S1	1
8/13/2013	Clark Pond	S2	1
8/13/2013	Clark Pond	S2	1
8/13/2013	Clark Pond	S2	1
8/13/2013	Clark Pond	S2	1
8/13/2013	Clark Pond	S2	1
8/13/2013	Clark Pond	S2	1
8/13/2013	James Collins	17	1
8/13/2013	James Collins	16	0
8/13/2013	Clark Pond	S2	1
8/14/2013	James Collins	15	1
8/14/2013	James Collins	19	1
8/14/2013	Clark Pond	NNE 1	1
8/14/2013	Clark Pond	NNE 2	0
8/15/2013	Clark Pond	E1	0
8/15/2013	Clark Pond	E2	0
8/15/2013	James Collins	15	0
8/15/2013	James Collins	19	0
8/16/2013	James Collins	15	1
8/16/2013	James Collins	15	1
8/16/2013	James Collins	15	1
8/16/2013	James Collins	15	1
8/16/2013	Clark Pond	E1	0
8/16/2013	Clark Pond	E2	0
8/16/2013	James Collins	19	0
8/17/2013	Clark Pond	ENE 1	0
8/17/2013	Clark Pond	ENE 2	0
8/17/2013	James Collins	15	0
8/17/2013	James Collins	19	0
8/18/2013	Clark Pond	ENE 1	0
8/18/2013	Clark Pond	ENE 2	0

8/18/2013	James Collins	15	0
8/18/2013	James Collins	19	0
8/23/2013	Clark Pond	S2	1
8/23/2013	Clark Pond	S2	1
8/23/2013	Clark Pond	S2	1
8/23/2013	Clark Pond	S2	1
8/23/2013	Clark Pond	S2	1
8/23/2013	Clark Pond	S2	1
8/23/2013	Clark Pond	S2	1
8/23/2013	Clark Pond	S2	1
8/23/2013	Clark Pond	S2	1
8/23/2013	Clark Pond	S1	1
8/23/2013	Clark Pond	S1	1
8/23/2013	James Collins	16	1
8/23/2013	James Collins	17	0
8/24/2013	James Collins	17	1
8/24/2013	James Collins	16	1
8/24/2013	James Collins	16	1
8/24/2013	Clark Pond	S2	1
8/24/2013	Clark Pond	S1	0
8/25/2013	James Collins	16	1
8/25/2013	Clark Pond	S1	0
8/25/2013	Clark Pond	S2	0
8/25/2013	James Collins	17	0
8/30/2013	James Collins	17	1
8/30/2013	Clark Pond	S1	1
8/30/2013	Clark Pond	S1	1
8/30/2013	Clark Pond	S1	1
8/30/2013	Clark Pond	S1	1
8/30/2013	Clark Pond	S1	1
8/30/2013	Clark Pond	S2	1
8/30/2013	James Collins	16	0
8/30/2013	Clark Pond	S2	1
8/31/2013	James Collins	17	1
8/31/2013	Clark Pond	S1	1
8/31/2013	Clark Pond	S2	1
8/31/2013	James Collins	17	1

8/31/2013	James Collins	17	1
8/31/2013	James Collins	16	0
9/1/2013	Clark Pond	S1	1
9/1/2013	James Collins	17	1
9/1/2013	James Collins	17	1
9/1/2013	Clark Pond	S2	0
9/1/2013	James Collins	16	0
9/6/2013	Clark Pond	S2	1
9/6/2013	Clark Pond	S2	1
9/6/2013	Clark Pond	S1	0
9/6/2013	James Collins	16	0
9/6/2013	James Collins	17	0
9/7/2013	Clark Pond	S1	1
9/7/2013	Clark Pond	S2	1
9/7/2013	Clark Pond	S2	1
9/7/2013	Clark Pond	S2	1
9/7/2013	James Collins	16	0
9/7/2013	James Collins	17	0
9/8/2013	Clark Pond	S1	1
9/8/2013	James Collins	16	1
9/8/2013	James Collins	17	1
9/8/2013	Clark Pond	S2	0
9/13/2013	Clark Pond	S1	0
9/14/2013	James Collins	16	1
9/14/2013	Clark Pond	S1	0
9/14/2013	Clark Pond	S2	0
9/14/2013	James Collins	17	1
9/15/2013	James Collins	17	1
9/15/2013	James Collins	16	1
9/15/2013	Clark Pond	S2	1
9/15/2013	Clark Pond	S2	1
9/15/2013	Clark Pond	S2	1
9/15/2013	James Collins	17	1
9/15/2013	James Collins	16	1
9/15/2013	Clark Pond	S1	0
9/27/2013	Clark Pond	S1	1
9/27/2013	Clark Pond	S1	1

9/27/2013	Clark Pond	S2	0
9/27/2013	James Collins	16	0
9/27/2013	James Collins	17	0
9/28/2013	Clark Pond	S2	1
9/28/2013	Clark Pond	S1	0
9/28/2013	James Collins	16	0
9/28/2013	James Collins	17	0
9/29/2013	Clark Pond	S1	0
9/29/2013	Clark Pond	S2	0
9/29/2013	James Collins	16	0
9/29/2013	James Collins	17	0
10/4/2013	Clark Pond	S1	0
10/4/2013	Clark Pond	S2	0
10/4/2013	James Collins	16	0
10/4/2013	James Collins	17	0

2014 Trapping Combined

Date	**Site**	**Trap#**	**ABB**
5/15/2014	James Collins	7	0
5/15/2014	James Collins	15	0
5/15/2014	McAAP	1AC	0
5/15/2014	McAAP	2AC	0
5/15/2014	McAAP	3AC	0
5/16/2014	James Collins	7	0
5/16/2014	James Collins	18	0
5/16/2014	McAAP	1AC	0
5/16/2014	McAAP	2AC	0
5/16/2014	McAAP	3AC	0
5/20/2014	James Collins	7	0
5/20/2014	James Collins	18	0

5/20/2014	McAAP	1AC	0
5/20/2014	McAAP	2AC	0
5/20/2014	McAAP	3AC	0
5/21/2014	James Collins	7	0
5/21/2014	James Collins	18	0
5/21/2014	McAAP	1AC	0
5/21/2014	McAAP	2AC	0
5/21/2014	McAAP	3AC	0
5/22/2014	James Collins	7	2
5/22/2014	James Collins	18	0
5/22/2014	McAAP	1AC	0
5/22/2014	McAAP	2AC	0
5/22/2014	McAAP	3AC	2
5/26/2014	James Collins	7	1
5/26/2014	James Collins	17	1
5/26/2014	McAAP	3A-1	0
5/26/2014	McAAP	3A-10	0
5/26/2014	McAAP	3A-11	2
5/26/2014	McAAP	3A-12	5
5/26/2014	McAAP	3A-13	0
5/26/2014	McAAP	3A-14	0
5/26/2014	McAAP	3A-15	2
5/26/2014	McAAP	3A-16	0
5/26/2014	McAAP	3A-2	2
5/26/2014	McAAP	3A-3	0
5/26/2014	McAAP	3A-4	0
5/26/2014	McAAP	3A-5	0
5/26/2014	McAAP	3A-6	1
5/26/2014	McAAP	3A-7	0
5/26/2014	McAAP	3A-8	1
5/26/2014	McAAP	3A-9	0
5/26/2014	McAAP	3BC	2
5/27/2014	James Collins	7	0
5/27/2014	James Collins	17	0
5/27/2014	McAAP	3A-1	0
5/27/2014	McAAP	3A-10	1
5/27/2014	McAAP	3A-11	0

5/27/2014	McAAP	3A-12	4
5/27/2014	McAAP	3A-13	0
5/27/2014	McAAP	3A-14	0
5/27/2014	McAAP	3A-15	3
5/27/2014	McAAP	3A-16	1
5/27/2014	McAAP	3A-2	0
5/27/2014	McAAP	3A-3	0
5/27/2014	McAAP	3A-4	0
5/27/2014	McAAP	3A-5	0
5/27/2014	McAAP	3A-6	2
5/27/2014	McAAP	3A-7	1
5/27/2014	McAAP	3A-8	0
5/27/2014	McAAP	3A-9	2
5/27/2014	McAAP	3BC	4
5/28/2014	James Collins	7	0
5/28/2014	James Collins	17	0
5/28/2014	McAAP	1A-1	0
5/28/2014	McAAP	1A-10	0
5/28/2014	McAAP	1A-11	0
5/28/2014	McAAP	1A-12	0
5/28/2014	McAAP	1A-13	0
5/28/2014	McAAP	1A-14	0
5/28/2014	McAAP	1A-15	0
5/28/2014	McAAP	1A-16	0
5/28/2014	McAAP	1A-2	0
5/28/2014	McAAP	1A-3	0
5/28/2014	McAAP	1A-4	0
5/28/2014	McAAP	1A-5	0
5/28/2014	McAAP	1A-6	0
5/28/2014	McAAP	1A-7	0
5/28/2014	McAAP	1A-8	0
5/28/2014	McAAP	1A-9	0
5/28/2014	McAAP	1BC	0
5/28/2014	McAAP	3A-1	0
5/28/2014	McAAP	3A-10	0
5/28/2014	McAAP	3A-11	0
5/28/2014	McAAP	3A-12	0

5/28/2014	McAAP	3A-13	0
5/28/2014	McAAP	3A-14	0
5/28/2014	McAAP	3A-15	0
5/28/2014	McAAP	3A-16	0
5/28/2014	McAAP	3A-2	0
5/28/2014	McAAP	3A-3	0
5/28/2014	McAAP	3A-4	0
5/28/2014	McAAP	3A-5	0
5/28/2014	McAAP	3A-6	0
5/28/2014	McAAP	3A-7	0
5/28/2014	McAAP	3A-8	0
5/28/2014	McAAP	3A-9	0
5/28/2014	McAAP	3BC	2
5/29/2014	James Collins	7	3
5/29/2014	James Collins	17	2
5/29/2014	McAAP	1A-1	4
5/29/2014	McAAP	1A-10	0
5/29/2014	McAAP	1A-11	0
5/29/2014	McAAP	1A-12	0
5/29/2014	McAAP	1A-13	9
5/29/2014	McAAP	1A-14	0
5/29/2014	McAAP	1A-15	1
5/29/2014	McAAP	1A-16	0
5/29/2014	McAAP	1A-2	0
5/29/2014	McAAP	1A-3	0
5/29/2014	McAAP	1A-4	0
5/29/2014	McAAP	1A-5	0
5/29/2014	McAAP	1A-6	4
5/29/2014	McAAP	1A-7	1
5/29/2014	McAAP	1A-8	0
5/29/2014	McAAP	1A-9	0
5/29/2014	McAAP	1BC	0
5/30/2014	James Collins	7	1
5/30/2014	James Collins	17	1
5/30/2014	McAAP	1A-1	3
5/30/2014	McAAP	1A-10	0
5/30/2014	McAAP	1A-11	0

5/30/2014	McAAP	1A-12	0
5/30/2014	McAAP	1A-13	3
5/30/2014	McAAP	1A-14	0
5/30/2014	McAAP	1A-15	1
5/30/2014	McAAP	1A-16	0
5/30/2014	McAAP	1A-2	0
5/30/2014	McAAP	1A-3	0
5/30/2014	McAAP	1A-4	0
5/30/2014	McAAP	1A-5	3
5/30/2014	McAAP	1A-6	6
5/30/2014	McAAP	1A-7	0
5/30/2014	McAAP	1A-8	0
5/30/2014	McAAP	1A-9	0
5/30/2014	McAAP	1BC	0
6/2/2014	James Collins	7	0
6/2/2014	James Collins	17	0
6/2/2014	McAAP	1AC	4
6/2/2014	McAAP	1B-1	0
6/2/2014	McAAP	1B-10	0
6/2/2014	McAAP	1B-11	0
6/2/2014	McAAP	1B-12	0
6/2/2014	McAAP	1B-13	0
6/2/2014	McAAP	1B-14	0
6/2/2014	McAAP	1B-15	0
6/2/2014	McAAP	1B-16	0
6/2/2014	McAAP	1B-2	0
6/2/2014	McAAP	1B-3	0
6/2/2014	McAAP	1B-4	0
6/2/2014	McAAP	1B-5	0
6/2/2014	McAAP	1B-6	0
6/2/2014	McAAP	1B-7	0
6/2/2014	McAAP	1B-8	0
6/2/2014	McAAP	1B-9	0
6/3/2014	James Collins	7	0
6/3/2014	James Collins	17	0
6/3/2014	McAAP	1AC	0
6/3/2014	McAAP	1B-1	0

6/3/2014	McAAP	1B-10	1
6/3/2014	McAAP	1B-11	0
6/3/2014	McAAP	1B-12	0
6/3/2014	McAAP	1B-13	0
6/3/2014	McAAP	1B-14	0
6/3/2014	McAAP	1B-15	0
6/3/2014	McAAP	1B-16	0
6/3/2014	McAAP	1B-2	0
6/3/2014	McAAP	1B-3	1
6/3/2014	McAAP	1B-4	0
6/3/2014	McAAP	1B-5	0
6/3/2014	McAAP	1B-6	0
6/3/2014	McAAP	1B-7	0
6/3/2014	McAAP	1B-8	0
6/3/2014	McAAP	1B-9	2
6/3/2014	McAAP	3AC	0
6/3/2014	McAAP	3B-1	0
6/3/2014	McAAP	3B-10	0
6/3/2014	McAAP	3B-11	4
6/3/2014	McAAP	3B-12	3
6/3/2014	McAAP	3B-13	0
6/3/2014	McAAP	3B-14	0
6/3/2014	McAAP	3B-15	3
6/3/2014	McAAP	3B-16	4
6/3/2014	McAAP	3B-2	0
6/3/2014	McAAP	3B-3	0
6/3/2014	McAAP	3B-4	0
6/3/2014	McAAP	3B-5	0
6/3/2014	McAAP	3B-6	2
6/3/2014	McAAP	3B-7	0
6/3/2014	McAAP	3B-8	0
6/3/2014	McAAP	3B-9	0
6/3/2014	McAAP	R1	0
6/3/2014	McAAP	R2	2
6/3/2014	McAAP	R3	0
6/3/2014	McAAP	R4	0
6/4/2014	James Collins	7	0

6/4/2014	James Collins	17	0
6/4/2014	McAAP	1AC	6
6/4/2014	McAAP	1B-1	1
6/4/2014	McAAP	1B-10	0
6/4/2014	McAAP	1B-11	0
6/4/2014	McAAP	1B-12	1
6/4/2014	McAAP	1B-13	0
6/4/2014	McAAP	1B-14	0
6/4/2014	McAAP	1B-15	0
6/4/2014	McAAP	1B-16	0
6/4/2014	McAAP	1B-2	1
6/4/2014	McAAP	1B-3	0
6/4/2014	McAAP	1B-4	0
6/4/2014	McAAP	1B-5	1
6/4/2014	McAAP	1B-6	0
6/4/2014	McAAP	1B-7	0
6/4/2014	McAAP	1B-8	2
6/4/2014	McAAP	1B-9	0
6/4/2014	McAAP	3AC	0
6/4/2014	McAAP	3B-1	0
6/4/2014	McAAP	3B-10	0
6/4/2014	McAAP	3B-11	1
6/4/2014	McAAP	3B-12	0
6/4/2014	McAAP	3B-13	0
6/4/2014	McAAP	3B-14	0
6/4/2014	McAAP	3B-15	6
6/4/2014	McAAP	3B-16	1
6/4/2014	McAAP	3B-2	1
6/4/2014	McAAP	3B-3	0
6/4/2014	McAAP	3B-4	1
6/4/2014	McAAP	3B-5	0
6/4/2014	McAAP	3B-6	0
6/4/2014	McAAP	3B-7	0
6/4/2014	McAAP	3B-8	0
6/4/2014	McAAP	3B-9	2
6/4/2014	McAAP	R1	2
6/4/2014	McAAP	R2	2

6/4/2014	McAAP	R3	1
6/4/2014	McAAP	R4	0
6/5/2014	McAAP	3AC	1
6/5/2014	McAAP	3B-1	0
6/5/2014	McAAP	3B-10	1
6/5/2014	McAAP	3B-11	0
6/5/2014	McAAP	3B-12	0
6/5/2014	McAAP	3B-13	1
6/5/2014	McAAP	3B-14	1
6/5/2014	McAAP	3B-15	16
6/5/2014	McAAP	3B-16	3
6/5/2014	McAAP	3B-2	0
6/5/2014	McAAP	3B-3	1
6/5/2014	McAAP	3B-4	1
6/5/2014	McAAP	3B-5	1
6/5/2014	McAAP	3B-6	1
6/5/2014	McAAP	3B-7	0
6/5/2014	McAAP	3B-8	0
6/5/2014	McAAP	3B-9	0
6/5/2014	McAAP	R1	1
6/5/2014	McAAP	R2	2
6/5/2014	McAAP	R3	1
6/5/2014	McAAP	R4	3
6/9/2014	James Collins	7	0
6/9/2014	James Collins	17	0
6/9/2014	McAAP	3A-1	0
6/9/2014	McAAP	3A-10	0
6/9/2014	McAAP	3A-11	0
6/9/2014	McAAP	3A-12	0
6/9/2014	McAAP	3A-13	0
6/9/2014	McAAP	3A-14	0
6/9/2014	McAAP	3A-15	0
6/9/2014	McAAP	3A-16	0
6/9/2014	McAAP	3A-2	0
6/9/2014	McAAP	3A-3	0
6/9/2014	McAAP	3A-4	0
6/9/2014	McAAP	3A-5	0

6/9/2014	McAAP	3A-6	0
6/9/2014	McAAP	3A-7	0
6/9/2014	McAAP	3A-8	0
6/9/2014	McAAP	3A-9	0
6/9/2014	McAAP	3BC	0
6/10/2014	James Collins	7	0
6/10/2014	James Collins	17	0
6/10/2014	McAAP	3A-1	0
6/10/2014	McAAP	3A-10	0
6/10/2014	McAAP	3A-11	0
6/10/2014	McAAP	3A-12	0
6/10/2014	McAAP	3A-13	0
6/10/2014	McAAP	3A-14	0
6/10/2014	McAAP	3A-15	0
6/10/2014	McAAP	3A-16	0
6/10/2014	McAAP	3A-2	0
6/10/2014	McAAP	3A-3	0
6/10/2014	McAAP	3A-4	0
6/10/2014	McAAP	3A-5	0
6/10/2014	McAAP	3A-6	0
6/10/2014	McAAP	3A-7	0
6/10/2014	McAAP	3A-8	0
6/10/2014	McAAP	3A-9	0
6/10/2014	McAAP	3BC	2
6/11/2014	James Collins	7	0
6/11/2014	James Collins	17	0
6/11/2014	McAAP	2A-1	0
6/11/2014	McAAP	2A-10	0
6/11/2014	McAAP	2A-11	0
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6/11/2014	McAAP	2A-14	0
6/11/2014	McAAP	2A-15	0
6/11/2014	McAAP	2A-16	0
6/11/2014	McAAP	2A-2	0
6/11/2014	McAAP	2A-3	0
6/11/2014	McAAP	2A-4	0

6/11/2014	McAAP	2A-5	0
6/11/2014	McAAP	2A-6	0
6/11/2014	McAAP	2A-7	0
6/11/2014	McAAP	2A-8	0
6/11/2014	McAAP	2A-9	0
6/11/2014	McAAP	2BC	0
6/11/2014	McAAP	3A-1	1
6/11/2014	McAAP	3A-10	0
6/11/2014	McAAP	3A-11	0
6/11/2014	McAAP	3A-12	0
6/11/2014	McAAP	3A-13	0
6/11/2014	McAAP	3A-14	0
6/11/2014	McAAP	3A-15	0
6/11/2014	McAAP	3A-16	0
6/11/2014	McAAP	3A-2	0
6/11/2014	McAAP	3A-3	0
6/11/2014	McAAP	3A-4	0
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6/11/2014	McAAP	3A-6	0
6/11/2014	McAAP	3A-7	0
6/11/2014	McAAP	3A-8	0
6/11/2014	McAAP	3A-9	0
6/11/2014	McAAP	3BC	0
6/12/2014	McAAP	2A-1	0
6/12/2014	McAAP	2A-10	0
6/12/2014	McAAP	2A-11	0
6/12/2014	McAAP	2A-12	0
6/12/2014	McAAP	2A-13	0
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6/12/2014	McAAP	2A-15	0
6/12/2014	McAAP	2A-16	0
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6/12/2014	McAAP	2A-3	0
6/12/2014	McAAP	2A-4	0
6/12/2014	McAAP	2A-5	0
6/12/2014	McAAP	2A-6	0
6/12/2014	McAAP	2A-7	0

6/12/2014	McAAP	2A-8	0
6/12/2014	McAAP	2A-9	0
6/12/2014	McAAP	2BC	0
6/13/2014	McAAP	2A-1	0
6/13/2014	McAAP	2A-10	0
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6/13/2014	McAAP	2A-15	0
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6/13/2014	McAAP	2BC	0
6/13/2014	McAAP	R8	1
6/14/2014	McAAP	R10	1
6/14/2014	McAAP	R11	0
6/14/2014	McAAP	R12	0
6/14/2014	McAAP	R6	0
6/14/2014	McAAP	R8	0
6/17/2014	James Collins	7	0
6/17/2014	James Collins	17	0
6/17/2014	McAAP	2AC	0
6/17/2014	McAAP	2B-1	0
6/17/2014	McAAP	2B-10	0
6/17/2014	McAAP	2B-11	0
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6/17/2014	McAAP	2B-13	0
6/17/2014	McAAP	2B-14	0
6/17/2014	McAAP	2B-15	0
6/17/2014	McAAP	2B-16	0

6/17/2014	McAAP	2B-2	0
6/17/2014	McAAP	2B-3	0
6/17/2014	McAAP	2B-4	0
6/17/2014	McAAP	2B-5	0
6/17/2014	McAAP	2B-6	0
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6/17/2014	McAAP	3AC	0
6/17/2014	McAAP	3B-1	0
6/17/2014	McAAP	3B-10	2
6/17/2014	McAAP	3B-11	3
6/17/2014	McAAP	3B-12	0
6/17/2014	McAAP	3B-13	0
6/17/2014	McAAP	3B-14	0
6/17/2014	McAAP	3B-15	0
6/17/2014	McAAP	3B-16	0
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6/17/2014	McAAP	3B-8	0
6/17/2014	McAAP	3B-9	0
6/17/2014	McAAP	R1	0
6/17/2014	McAAP	R2	0
6/17/2014	McAAP	R3	0
6/17/2014	McAAP	R4	0
6/17/2014	McAAP	R7	0
6/17/2014	McAAP	R8	0
6/18/2014	James Collins	7	0
6/18/2014	James Collins	17	0
6/18/2014	McAAP	2AC	0
6/18/2014	McAAP	2B-1	0
6/18/2014	McAAP	2B-10	1
6/18/2014	McAAP	2B-11	1

6/18/2014	McAAP	2B-12	0
6/18/2014	McAAP	2B-13	0
6/18/2014	McAAP	2B-14	0
6/18/2014	McAAP	2B-15	0
6/18/2014	McAAP	2B-16	3
6/18/2014	McAAP	2B-2	0
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6/18/2014	McAAP	3B-10	1
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6/18/2014	McAAP	3B-16	0
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6/18/2014	McAAP	3B-7	0
6/18/2014	McAAP	3B-8	0
6/18/2014	McAAP	3B-9	0
6/18/2014	McAAP	R1	0
6/18/2014	McAAP	R2	0
6/18/2014	McAAP	R3	0
6/18/2014	McAAP	R4	0
6/18/2014	McAAP	R7	0
6/18/2014	McAAP	R8	0
6/19/2014	James Collins	7	0

6/19/2014	James Collins	17	1
6/19/2014	McAAP	2AC	0
6/19/2014	McAAP	2B-1	0
6/19/2014	McAAP	2B-10	0
6/19/2014	McAAP	2B-11	0
6/19/2014	McAAP	2B-12	0
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6/19/2014	McAAP	2B-7	0
6/19/2014	McAAP	2B-8	0
6/19/2014	McAAP	2B-9	0
6/19/2014	McAAP	3AC	0
6/19/2014	McAAP	3B-1	0
6/19/2014	McAAP	3B-10	0
6/19/2014	McAAP	3B-11	0
6/19/2014	McAAP	3B-12	0
6/19/2014	McAAP	3B-13	0
6/19/2014	McAAP	3B-14	0
6/19/2014	McAAP	3B-15	0
6/19/2014	McAAP	3B-16	0
6/19/2014	McAAP	3B-2	1
6/19/2014	McAAP	3B-3	1
6/19/2014	McAAP	3B-4	0
6/19/2014	McAAP	3B-5	0
6/19/2014	McAAP	3B-6	0
6/19/2014	McAAP	3B-7	0
6/19/2014	McAAP	3B-8	0
6/19/2014	McAAP	3B-9	0
6/19/2014	McAAP	R1	1
6/19/2014	McAAP	R2	0

6/19/2014	McAAP	R3	0
6/19/2014	McAAP	R4	0
6/19/2014	McAAP	R7	0
6/19/2014	McAAP	R8	0
6/24/2014	Crawford	1	0
6/24/2014	Crawford	2	0
6/24/2014	Crawford	3	0
6/24/2014	James Collins	7	0
6/24/2014	James Collins	17	0
6/24/2014	McAAP	1A-1	0
6/24/2014	McAAP	1A-10	0
6/24/2014	McAAP	1A-11	0
6/24/2014	McAAP	1A-12	0
6/24/2014	McAAP	1A-13	0
6/24/2014	McAAP	1A-14	0
6/24/2014	McAAP	1A-15	0
6/24/2014	McAAP	1A-16	0
6/24/2014	McAAP	1A-2	0
6/24/2014	McAAP	1A-3	0
6/24/2014	McAAP	1A-4	0
6/24/2014	McAAP	1A-5	0
6/24/2014	McAAP	1A-6	0
6/24/2014	McAAP	1A-7	0
6/24/2014	McAAP	1A-8	0
6/24/2014	McAAP	1A-9	0
6/24/2014	McAAP	1BC	0
6/25/2014	Crawford	1	0
6/25/2014	Crawford	2	0
6/25/2014	Crawford	3	0
6/25/2014	James Collins	7	0
6/25/2014	James Collins	17	0
6/25/2014	McAAP	1A-1	1
6/25/2014	McAAP	1A-10	0
6/25/2014	McAAP	1A-11	0
6/25/2014	McAAP	1A-12	0
6/25/2014	McAAP	1A-13	1
6/25/2014	McAAP	1A-14	0

6/25/2014	McAAP	1A-15	0
6/25/2014	McAAP	1A-16	0
6/25/2014	McAAP	1A-2	0
6/25/2014	McAAP	1A-3	0
6/25/2014	McAAP	1A-4	0
6/25/2014	McAAP	1A-5	0
6/25/2014	McAAP	1A-6	0
6/25/2014	McAAP	1A-7	0
6/25/2014	McAAP	1A-8	0
6/25/2014	McAAP	1A-9	2
6/25/2014	McAAP	1BC	0
6/25/2014	McAAP	R10	0
6/25/2014	McAAP	R11	0
6/25/2014	McAAP	R12	0
6/25/2014	McAAP	R13	0
6/25/2014	McAAP	R6	0
6/25/2014	McAAP	R9	0
6/26/2014	Crawford	1	0
6/26/2014	Crawford	2	0
6/26/2014	Crawford	3	0
6/26/2014	James Collins	7	0
6/26/2014	James Collins	17	0
6/26/2014	McAAP	1A-1	1
6/26/2014	McAAP	1A-10	0
6/26/2014	McAAP	1A-11	0
6/26/2014	McAAP	1A-12	0
6/26/2014	McAAP	1A-13	0
6/26/2014	McAAP	1A-14	0
6/26/2014	McAAP	1A-15	0
6/26/2014	McAAP	1A-16	0
6/26/2014	McAAP	1A-2	0
6/26/2014	McAAP	1A-3	0
6/26/2014	McAAP	1A-4	0
6/26/2014	McAAP	1A-5	0
6/26/2014	McAAP	1A-6	0
6/26/2014	McAAP	1A-7	0
6/26/2014	McAAP	1A-8	0

6/26/2014	McAAP	1A-9	1
6/26/2014	McAAP	1BC	0
6/26/2014	McAAP	R10	0
6/26/2014	McAAP	R11	0
6/26/2014	McAAP	R12	0
6/26/2014	McAAP	R13	0
6/26/2014	McAAP	R6	0
6/26/2014	McAAP	R9	0
6/27/2014	McAAP	R10	1
6/27/2014	McAAP	R11	0
6/27/2014	McAAP	R12	0
6/27/2014	McAAP	R13	0
6/27/2014	McAAP	R6	0
6/27/2014	McAAP	R9	0
7/1/2014	Crawford	1	0
7/1/2014	Crawford	2	0
7/1/2014	Crawford	3	0
7/1/2014	James Collins	7	3
7/1/2014	James Collins	17	2
7/1/2014	McAAP	2A-1	0
7/1/2014	McAAP	2A-10	0
7/1/2014	McAAP	2A-11	0
7/1/2014	McAAP	2A-12	0
7/1/2014	McAAP	2A-13	0
7/1/2014	McAAP	2A-14	0
7/1/2014	McAAP	2A-15	0
7/1/2014	McAAP	2A-16	0
7/1/2014	McAAP	2A-2	0
7/1/2014	McAAP	2A-3	0
7/1/2014	McAAP	2A-4	0
7/1/2014	McAAP	2A-5	0
7/1/2014	McAAP	2A-6	0
7/1/2014	McAAP	2A-7	0
7/1/2014	McAAP	2A-8	0
7/1/2014	McAAP	2A-9	0
7/1/2014	McAAP	2BC	0
7/1/2014	McAAP	R1	0

7/1/2014	McAAP	R2	0
7/1/2014	McAAP	R3	1
7/1/2014	McAAP	R4	1
7/1/2014	McAAP	R7	2
7/1/2014	McAAP	R8	0
7/2/2014	Crawford	1	0
7/2/2014	Crawford	2	0
7/2/2014	Crawford	3	0
7/2/2014	James Collins	7	1
7/2/2014	James Collins	17	0
7/2/2014	McAAP	2A-1	1
7/2/2014	McAAP	2A-10	0
7/2/2014	McAAP	2A-11	0
7/2/2014	McAAP	2A-12	0
7/2/2014	McAAP	2A-13	0
7/2/2014	McAAP	2A-14	0
7/2/2014	McAAP	2A-15	0
7/2/2014	McAAP	2A-16	0
7/2/2014	McAAP	2A-2	0
7/2/2014	McAAP	2A-3	0
7/2/2014	McAAP	2A-4	0
7/2/2014	McAAP	2A-5	0
7/2/2014	McAAP	2A-6	0
7/2/2014	McAAP	2A-7	0
7/2/2014	McAAP	2A-8	0
7/2/2014	McAAP	2A-9	0
7/2/2014	McAAP	2BC	0
7/2/2014	McAAP	R1	0
7/2/2014	McAAP	R2	1
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7/2/2014	McAAP	R4	0
7/2/2014	McAAP	R7	0
7/2/2014	McAAP	R8	0
7/3/2014	Crawford	1	0
7/3/2014	Crawford	2	0
7/3/2014	Crawford	3	0
7/3/2014	James Collins	7	0

7/3/2014	James Collins	17	1
7/3/2014	McAAP	2A-1	1
7/3/2014	McAAP	2A-10	0
7/3/2014	McAAP	2A-11	0
7/3/2014	McAAP	2A-12	0
7/3/2014	McAAP	2A-13	0
7/3/2014	McAAP	2A-14	0
7/3/2014	McAAP	2A-15	0
7/3/2014	McAAP	2A-16	0
7/3/2014	McAAP	2A-2	0
7/3/2014	McAAP	2A-3	2
7/3/2014	McAAP	2A-4	0
7/3/2014	McAAP	2A-5	0
7/3/2014	McAAP	2A-6	0
7/3/2014	McAAP	2A-7	0
7/3/2014	McAAP	2A-8	0
7/3/2014	McAAP	2A-9	0
7/3/2014	McAAP	2BC	0
7/3/2014	McAAP	R1	0
7/3/2014	McAAP	R2	0
7/3/2014	McAAP	R3	0
7/3/2014	McAAP	R4	0
7/3/2014	McAAP	R7	0
7/3/2014	McAAP	R8	0
7/8/2014	James Collins	7	7
7/8/2014	James Collins	17	0
7/8/2014	McAAP	1AC	2
7/8/2014	McAAP	1B-1	0
7/8/2014	McAAP	1B-10	0
7/8/2014	McAAP	1B-11	0
7/8/2014	McAAP	1B-12	0
7/8/2014	McAAP	1B-13	0
7/8/2014	McAAP	1B-14	1
7/8/2014	McAAP	1B-15	0
7/8/2014	McAAP	1B-16	0
7/8/2014	McAAP	1B-2	1
7/8/2014	McAAP	1B-3	0

7/8/2014	McAAP	1B-4	0
7/8/2014	McAAP	1B-5	0
7/8/2014	McAAP	1B-6	0
7/8/2014	McAAP	1B-7	0
7/8/2014	McAAP	1B-8	0
7/8/2014	McAAP	1B-9	3
7/8/2014	McAAP	2AC	0
7/8/2014	McAAP	2B-1	0
7/8/2014	McAAP	2B-10	0
7/8/2014	McAAP	2B-11	0
7/8/2014	McAAP	2B-12	0
7/8/2014	McAAP	2B-13	1
7/8/2014	McAAP	2B-14	0
7/8/2014	McAAP	2B-15	0
7/8/2014	McAAP	2B-16	0
7/8/2014	McAAP	2B-2	0
7/8/2014	McAAP	2B-3	0
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7/8/2014	McAAP	2B-5	0
7/8/2014	McAAP	2B-6	0
7/8/2014	McAAP	2B-7	0
7/8/2014	McAAP	2B-8	0
7/8/2014	McAAP	2B-9	0
7/8/2014	McAAP	R10	0
7/8/2014	McAAP	R11	0
7/8/2014	McAAP	R12	0
7/8/2014	McAAP	R13	0
7/8/2014	McAAP	R6	0
7/8/2014	McAAP	R9	3
7/9/2014	James Collins	7	3
7/9/2014	James Collins	17	1
7/9/2014	McAAP	1AC	0
7/9/2014	McAAP	1B-1	0
7/9/2014	McAAP	1B-10	0
7/9/2014	McAAP	1B-11	0
7/9/2014	McAAP	1B-12	0
7/9/2014	McAAP	1B-13	1

7/9/2014	McAAP	1B-14	0
7/9/2014	McAAP	1B-15	0
7/9/2014	McAAP	1B-16	0
7/9/2014	McAAP	1B-2	4
7/9/2014	McAAP	1B-3	0
7/9/2014	McAAP	1B-4	0
7/9/2014	McAAP	1B-5	0
7/9/2014	McAAP	1B-6	0
7/9/2014	McAAP	1B-7	0
7/9/2014	McAAP	1B-8	0
7/9/2014	McAAP	1B-9	1
7/9/2014	McAAP	2AC	0
7/9/2014	McAAP	2B-1	0
7/9/2014	McAAP	2B-10	0
7/9/2014	McAAP	2B-11	0
7/9/2014	McAAP	2B-12	0
7/9/2014	McAAP	2B-13	2
7/9/2014	McAAP	2B-14	0
7/9/2014	McAAP	2B-15	0
7/9/2014	McAAP	2B-16	0
7/9/2014	McAAP	2B-2	1
7/9/2014	McAAP	2B-3	0
7/9/2014	McAAP	2B-4	0
7/9/2014	McAAP	2B-5	0
7/9/2014	McAAP	2B-6	0
7/9/2014	McAAP	2B-7	1
7/9/2014	McAAP	2B-8	0
7/9/2014	McAAP	2B-9	0
7/9/2014	McAAP	R10	0
7/9/2014	McAAP	R11	0
7/9/2014	McAAP	R12	0
7/9/2014	McAAP	R13	0
7/9/2014	McAAP	R6	0
7/9/2014	McAAP	R9	0
7/10/2014	James Collins	7	0
7/10/2014	James Collins	17	0
7/10/2014	McAAP	1AC	1

7/10/2014	McAAP	1B-1	0
7/10/2014	McAAP	1B-10	0
7/10/2014	McAAP	1B-11	0
7/10/2014	McAAP	1B-12	0
7/10/2014	McAAP	1B-13	0
7/10/2014	McAAP	1B-14	0
7/10/2014	McAAP	1B-15	0
7/10/2014	McAAP	1B-16	0
7/10/2014	McAAP	1B-2	1
7/10/2014	McAAP	1B-3	1
7/10/2014	McAAP	1B-4	0
7/10/2014	McAAP	1B-5	0
7/10/2014	McAAP	1B-6	0
7/10/2014	McAAP	1B-7	0
7/10/2014	McAAP	1B-8	0
7/10/2014	McAAP	1B-9	0
7/10/2014	McAAP	2AC	0
7/10/2014	McAAP	2B-1	0
7/10/2014	McAAP	2B-10	0
7/10/2014	McAAP	2B-11	0
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7/10/2014	McAAP	2B-13	0
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7/10/2014	McAAP	2B-15	0
7/10/2014	McAAP	2B-16	0
7/10/2014	McAAP	2B-2	1
7/10/2014	McAAP	2B-3	0
7/10/2014	McAAP	2B-4	0
7/10/2014	McAAP	2B-5	1
7/10/2014	McAAP	2B-6	0
7/10/2014	McAAP	2B-7	0
7/10/2014	McAAP	2B-8	0
7/10/2014	McAAP	2B-9	0
7/10/2014	McAAP	R10	1
7/10/2014	McAAP	R11	2
7/10/2014	McAAP	R12	0
7/10/2014	McAAP	R13	0

7/10/2014	McAAP	R6	0
7/10/2014	McAAP	R9	0
7/14/2014	James Collins	7	0
7/14/2014	James Collins	17	0
7/14/2014	McAAP	2A-1	0
7/14/2014	McAAP	2A-10	0
7/14/2014	McAAP	2A-11	0
7/14/2014	McAAP	2A-12	0
7/14/2014	McAAP	2A-13	0
7/14/2014	McAAP	2A-14	0
7/14/2014	McAAP	2A-15	0
7/14/2014	McAAP	2A-16	0
7/14/2014	McAAP	2A-2	0
7/14/2014	McAAP	2A-3	0
7/14/2014	McAAP	2A-4	0
7/14/2014	McAAP	2A-5	0
7/14/2014	McAAP	2A-6	0
7/14/2014	McAAP	2A-7	0
7/14/2014	McAAP	2A-8	0
7/14/2014	McAAP	2A-9	0
7/14/2014	McAAP	2BC	0
7/14/2014	McAAP	3A-1	0
7/14/2014	McAAP	3A-10	0
7/14/2014	McAAP	3A-11	1
7/14/2014	McAAP	3A-12	1
7/14/2014	McAAP	3A-13	0
7/14/2014	McAAP	3A-14	0
7/14/2014	McAAP	3A-15	0
7/14/2014	McAAP	3A-16	0
7/14/2014	McAAP	3A-2	0
7/14/2014	McAAP	3A-3	0
7/14/2014	McAAP	3A-4	0
7/14/2014	McAAP	3A-5	1
7/14/2014	McAAP	3A-6	0
7/14/2014	McAAP	3A-7	0
7/14/2014	McAAP	3A-8	0
7/14/2014	McAAP	3A-9	0

7/14/2014	McAAP	3BC	1
7/14/2014	McAAP	R1	0
7/14/2014	McAAP	R2	0
7/14/2014	McAAP	R3	0
7/14/2014	McAAP	R4	0
7/14/2014	McAAP	R7	0
7/14/2014	McAAP	R8	0
7/15/2014	James Collins	7	1
7/15/2014	James Collins	17	0
7/15/2014	McAAP	2A-1	0
7/15/2014	McAAP	2A-10	0
7/15/2014	McAAP	2A-11	0
7/15/2014	McAAP	2A-12	0
7/15/2014	McAAP	2A-13	0
7/15/2014	McAAP	2A-14	0
7/15/2014	McAAP	2A-15	1
7/15/2014	McAAP	2A-16	0
7/15/2014	McAAP	2A-2	0
7/15/2014	McAAP	2A-3	0
7/15/2014	McAAP	2A-4	0
7/15/2014	McAAP	2A-5	0
7/15/2014	McAAP	2A-6	0
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7/15/2014	McAAP	2A-8	0
7/15/2014	McAAP	2A-9	0
7/15/2014	McAAP	2BC	2
7/15/2014	McAAP	3A-1	0
7/15/2014	McAAP	3A-10	0
7/15/2014	McAAP	3A-11	2
7/15/2014	McAAP	3A-12	2
7/15/2014	McAAP	3A-13	0
7/15/2014	McAAP	3A-14	2
7/15/2014	McAAP	3A-15	2
7/15/2014	McAAP	3A-16	0
7/15/2014	McAAP	3A-2	1
7/15/2014	McAAP	3A-3	0
7/15/2014	McAAP	3A-4	0

7/15/2014	McAAP	3A-5	0
7/15/2014	McAAP	3A-6	0
7/15/2014	McAAP	3A-7	1
7/15/2014	McAAP	3A-8	0
7/15/2014	McAAP	3A-9	0
7/15/2014	McAAP	3BC	4
7/15/2014	McAAP	R1	0
7/15/2014	McAAP	R2	0
7/15/2014	McAAP	R3	0
7/15/2014	McAAP	R4	3
7/15/2014	McAAP	R7	0
7/15/2014	McAAP	R8	0
7/16/2014	James Collins	7	0
7/16/2014	James Collins	17	0
7/16/2014	McAAP	2A-1	0
7/16/2014	McAAP	2A-10	0
7/16/2014	McAAP	2A-11	0
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7/16/2014	McAAP	2A-15	0
7/16/2014	McAAP	2A-16	0
7/16/2014	McAAP	2A-2	0
7/16/2014	McAAP	2A-3	0
7/16/2014	McAAP	2A-4	0
7/16/2014	McAAP	2A-5	0
7/16/2014	McAAP	2A-6	0
7/16/2014	McAAP	2A-7	0
7/16/2014	McAAP	2A-8	0
7/16/2014	McAAP	2A-9	0
7/16/2014	McAAP	2BC	0
7/16/2014	McAAP	3A-1	0
7/16/2014	McAAP	3A-10	0
7/16/2014	McAAP	3A-11	0
7/16/2014	McAAP	3A-12	0
7/16/2014	McAAP	3A-13	1
7/16/2014	McAAP	3A-14	0

7/16/2014	McAAP	3A-15	0
7/16/2014	McAAP	3A-16	1
7/16/2014	McAAP	3A-2	0
7/16/2014	McAAP	3A-3	0
7/16/2014	McAAP	3A-4	0
7/16/2014	McAAP	3A-5	1
7/16/2014	McAAP	3A-6	0
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7/16/2014	McAAP	3A-8	0
7/16/2014	McAAP	3A-9	0
7/16/2014	McAAP	3BC	0
7/16/2014	McAAP	R1	0
7/16/2014	McAAP	R2	0
7/16/2014	McAAP	R3	0
7/16/2014	McAAP	R4	0
7/16/2014	McAAP	R7	1
7/16/2014	McAAP	R8	0
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7/19/2014	Midgett	4	0
7/19/2014	Midgett	5	0
7/19/2014	Midgett	7	0
7/20/2014	Midgett	1	1
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7/20/2014	Midgett	5	0
7/20/2014	Midgett	7	0
7/21/2014	Midgett	1	3
7/21/2014	Midgett	4	1
7/21/2014	Midgett	5	0
7/21/2014	Midgett	7	0
7/22/2014	James Collins	7	0
7/22/2014	James Collins	17	0
7/22/2014	McAAP	2AC	0
7/22/2014	McAAP	2B-1	0
7/22/2014	McAAP	2B-10	0
7/22/2014	McAAP	2B-11	0
7/22/2014	McAAP	2B-12	2
7/22/2014	McAAP	2B-13	0

7/22/2014	McAAP	2B-14	0
7/22/2014	McAAP	2B-15	0
7/22/2014	McAAP	2B-16	0
7/22/2014	McAAP	2B-2	0
7/22/2014	McAAP	2B-3	0
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7/22/2014	McAAP	2B-5	0
7/22/2014	McAAP	2B-6	1
7/22/2014	McAAP	2B-7	0
7/22/2014	McAAP	2B-8	0
7/22/2014	McAAP	2B-9	0
7/22/2014	McAAP	3AC	0
7/22/2014	McAAP	3B-1	0
7/22/2014	McAAP	3B-10	0
7/22/2014	McAAP	3B-11	0
7/22/2014	McAAP	3B-12	0
7/22/2014	McAAP	3B-13	0
7/22/2014	McAAP	3B-14	1
7/22/2014	McAAP	3B-15	3
7/22/2014	McAAP	3B-16	0
7/22/2014	McAAP	3B-2	0
7/22/2014	McAAP	3B-3	0
7/22/2014	McAAP	3B-4	0
7/22/2014	McAAP	3B-5	0
7/22/2014	McAAP	3B-6	1
7/22/2014	McAAP	3B-7	0
7/22/2014	McAAP	3B-8	0
7/22/2014	McAAP	3B-9	0
7/22/2014	McAAP	R10	6
7/22/2014	McAAP	R11	0
7/22/2014	McAAP	R12	0
7/22/2014	McAAP	R13	0
7/22/2014	McAAP	R6	0
7/22/2014	McAAP	R9	0
7/23/2014	James Collins	7	2
7/23/2014	James Collins	17	2
7/23/2014	McAAP	2AC	0

7/23/2014	McAAP	2B-1	0
7/23/2014	McAAP	2B-10	0
7/23/2014	McAAP	2B-11	1
7/23/2014	McAAP	2B-12	1
7/23/2014	McAAP	2B-13	0
7/23/2014	McAAP	2B-14	0
7/23/2014	McAAP	2B-15	0
7/23/2014	McAAP	2B-16	0
7/23/2014	McAAP	2B-2	0
7/23/2014	McAAP	2B-3	1
7/23/2014	McAAP	2B-4	1
7/23/2014	McAAP	2B-5	1
7/23/2014	McAAP	2B-6	0
7/23/2014	McAAP	2B-7	0
7/23/2014	McAAP	2B-8	0
7/23/2014	McAAP	2B-9	1
7/23/2014	McAAP	3AC	2
7/23/2014	McAAP	3B-1	0
7/23/2014	McAAP	3B-10	0
7/23/2014	McAAP	3B-11	0
7/23/2014	McAAP	3B-12	0
7/23/2014	McAAP	3B-13	1
7/23/2014	McAAP	3B-14	0
7/23/2014	McAAP	3B-15	2
7/23/2014	McAAP	3B-16	3
7/23/2014	McAAP	3B-2	1
7/23/2014	McAAP	3B-3	2
7/23/2014	McAAP	3B-4	0
7/23/2014	McAAP	3B-5	1
7/23/2014	McAAP	3B-6	0
7/23/2014	McAAP	3B-7	0
7/23/2014	McAAP	3B-8	1
7/23/2014	McAAP	3B-9	0
7/23/2014	McAAP	R10	7
7/23/2014	McAAP	R11	2
7/23/2014	McAAP	R12	0
7/23/2014	McAAP	R13	3

7/23/2014	McAAP	R6	2
7/23/2014	McAAP	R9	8
7/24/2014	James Collins	7	0
7/24/2014	James Collins	17	0
7/24/2014	McAAP	2AC	0
7/24/2014	McAAP	2B-1	1
7/24/2014	McAAP	2B-10	0
7/24/2014	McAAP	2B-11	0
7/24/2014	McAAP	2B-12	0
7/24/2014	McAAP	2B-13	1
7/24/2014	McAAP	2B-14	0
7/24/2014	McAAP	2B-15	0
7/24/2014	McAAP	2B-16	0
7/24/2014	McAAP	2B-2	0
7/24/2014	McAAP	2B-3	0
7/24/2014	McAAP	2B-4	0
7/24/2014	McAAP	2B-5	0
7/24/2014	McAAP	2B-6	0
7/24/2014	McAAP	2B-7	1
7/24/2014	McAAP	2B-8	1
7/24/2014	McAAP	2B-9	0
7/24/2014	McAAP	3AC	0
7/24/2014	McAAP	3B-1	0
7/24/2014	McAAP	3B-10	1
7/24/2014	McAAP	3B-11	0
7/24/2014	McAAP	3B-12	0
7/24/2014	McAAP	3B-13	5
7/24/2014	McAAP	3B-14	0
7/24/2014	McAAP	3B-15	1
7/24/2014	McAAP	3B-16	1
7/24/2014	McAAP	3B-2	0
7/24/2014	McAAP	3B-3	1
7/24/2014	McAAP	3B-4	0
7/24/2014	McAAP	3B-5	1
7/24/2014	McAAP	3B-6	0
7/24/2014	McAAP	3B-7	0
7/24/2014	McAAP	3B-8	0

7/24/2014	McAAP	3B-9	0
7/24/2014	McAAP	R10	4
7/24/2014	McAAP	R11	1
7/24/2014	McAAP	R12	0
7/24/2014	McAAP	R13	0
7/24/2014	McAAP	R6	2
7/24/2014	McAAP	R9	4
7/29/2014	James Collins	7	0
7/29/2014	James Collins	17	0
7/29/2014	McAAP	1A-1	3
7/29/2014	McAAP	1A-10	0
7/29/2014	McAAP	1A-11	0
7/29/2014	McAAP	1A-12	0
7/29/2014	McAAP	1A-13	7
7/29/2014	McAAP	1A-14	2
7/29/2014	McAAP	1A-15	0
7/29/2014	McAAP	1A-16	0
7/29/2014	McAAP	1A-2	2
7/29/2014	McAAP	1A-3	0
7/29/2014	McAAP	1A-4	0
7/29/2014	McAAP	1A-5	4
7/29/2014	McAAP	1A-6	0
7/29/2014	McAAP	1A-7	0
7/29/2014	McAAP	1A-8	1
7/29/2014	McAAP	1A-9	0
7/29/2014	McAAP	1BC	0
7/30/2014	James Collins	7	0
7/30/2014	James Collins	17	0
7/30/2014	McAAP	1A-1	3
7/30/2014	McAAP	1A-10	0
7/30/2014	McAAP	1A-11	0
7/30/2014	McAAP	1A-12	0
7/30/2014	McAAP	1A-13	1
7/30/2014	McAAP	1A-14	0
7/30/2014	McAAP	1A-15	0
7/30/2014	McAAP	1A-16	0
7/30/2014	McAAP	1A-2	3

7/30/2014	McAAP	1A-3	0
7/30/2014	McAAP	1A-4	0
7/30/2014	McAAP	1A-5	4
7/30/2014	McAAP	1A-6	0
7/30/2014	McAAP	1A-7	1
7/30/2014	McAAP	1A-8	0
7/30/2014	McAAP	1A-9	2
7/30/2014	McAAP	1BC	0
7/31/2014	James Collins	7	0
7/31/2014	James Collins	17	0
7/31/2014	McAAP	1A-1	0
7/31/2014	McAAP	1A-10	0
7/31/2014	McAAP	1A-11	0
7/31/2014	McAAP	1A-12	0
7/31/2014	McAAP	1A-13	0
7/31/2014	McAAP	1A-14	0
7/31/2014	McAAP	1A-15	0
7/31/2014	McAAP	1A-16	0
7/31/2014	McAAP	1A-2	0
7/31/2014	McAAP	1A-3	0
7/31/2014	McAAP	1A-4	0
7/31/2014	McAAP	1A-5	0
7/31/2014	McAAP	1A-6	0
7/31/2014	McAAP	1A-7	0
7/31/2014	McAAP	1A-8	0
7/31/2014	McAAP	1A-9	0
7/31/2014	McAAP	1BC	0
8/5/2014	James Collins	7	0
8/5/2014	James Collins	17	0
8/5/2014	McAAP	1AC	0
8/5/2014	McAAP	1B-1	0
8/5/2014	McAAP	1B-10	0
8/5/2014	McAAP	1B-11	0
8/5/2014	McAAP	1B-12	0
8/5/2014	McAAP	1B-13	4
8/5/2014	McAAP	1B-14	0
8/5/2014	McAAP	1B-15	0

8/5/2014	McAAP	1B-16	0
8/5/2014	McAAP	1B-2	0
8/5/2014	McAAP	1B-3	4
8/5/2014	McAAP	1B-4	0
8/5/2014	McAAP	1B-5	0
8/5/2014	McAAP	1B-6	0
8/5/2014	McAAP	1B-7	1
8/5/2014	McAAP	1B-8	0
8/5/2014	McAAP	1B-9	0
8/5/2014	Midgett	1	0
8/5/2014	Midgett	4	2
8/5/2014	Midgett	5	0
8/5/2014	Midgett	7	0
8/6/2014	James Collins	7	0
8/6/2014	James Collins	17	0
8/6/2014	McAAP	1AC	1
8/6/2014	McAAP	1B-1	0
8/6/2014	McAAP	1B-10	0
8/6/2014	McAAP	1B-11	0
8/6/2014	McAAP	1B-12	0
8/6/2014	McAAP	1B-13	2
8/6/2014	McAAP	1B-14	1
8/6/2014	McAAP	1B-15	0
8/6/2014	McAAP	1B-16	0
8/6/2014	McAAP	1B-2	1
8/6/2014	McAAP	1B-3	0
8/6/2014	McAAP	1B-4	0
8/6/2014	McAAP	1B-5	1
8/6/2014	McAAP	1B-6	0
8/6/2014	McAAP	1B-7	1
8/6/2014	McAAP	1B-8	0
8/6/2014	McAAP	1B-9	1
8/6/2014	Midgett	1	0
8/6/2014	Midgett	4	5
8/6/2014	Midgett	5	0
8/6/2014	Midgett	7	0
8/7/2014	James Collins	7	0

8/7/2014	James Collins	17	0
8/7/2014	McAAP	1AC	1
8/7/2014	McAAP	1B-1	0
8/7/2014	McAAP	1B-10	0
8/7/2014	McAAP	1B-11	2
8/7/2014	McAAP	1B-12	0
8/7/2014	McAAP	1B-13	2
8/7/2014	McAAP	1B-14	0
8/7/2014	McAAP	1B-15	1
8/7/2014	McAAP	1B-16	0
8/7/2014	McAAP	1B-2	0
8/7/2014	McAAP	1B-3	0
8/7/2014	McAAP	1B-4	0
8/7/2014	McAAP	1B-5	1
8/7/2014	McAAP	1B-6	3
8/7/2014	McAAP	1B-7	1
8/7/2014	McAAP	1B-8	0
8/7/2014	McAAP	1B-9	0
8/7/2014	Midgett	1	0
8/7/2014	Midgett	4	2
8/7/2014	Midgett	5	1
8/7/2014	Midgett	7	0
8/8/2014	James Collins	7	0
8/8/2014	James Collins	17	0
8/8/2014	McAAP	2AC	0
8/8/2014	McAAP	2BC	0
8/8/2014	McAAP	3AC	1
8/8/2014	McAAP	3BC	2
8/8/2014	McAAP	R10	0
8/8/2014	McAAP	R9	5
8/9/2014	James Collins	7	3
8/9/2014	James Collins	17	0
8/9/2014	McAAP	2AC	3
8/9/2014	McAAP	2BC	0
8/9/2014	McAAP	3AC	0
8/9/2014	McAAP	3BC	1
8/9/2014	McAAP	R10	0

8/9/2014	McAAP	R9	2
8/10/2014	James Collins	7	0
8/10/2014	James Collins	17	0
8/10/2014	McAAP	2AC	0
8/10/2014	McAAP	2BC	1
8/10/2014	McAAP	3AC	0
8/10/2014	McAAP	3BC	2
8/10/2014	McAAP	R9	4
8/10/2014	McAAP	R10	2
8/22/2014	James Collins	7	0
8/22/2014	James Collins	17	0
8/22/2014	McAAP	1AC	0
8/22/2014	McAAP	1BC	0
8/22/2014	McAAP	3AC	1
8/22/2014	McAAP	3BC	1
8/22/2014	McAAP	R9	1
8/22/2014	McAAP	R10	0
8/23/2014	James Collins	7	2
8/23/2014	James Collins	17	0
8/23/2014	McAAP	1AC	0
8/23/2014	McAAP	1BC	0
8/23/2014	McAAP	3AC	1
8/23/2014	McAAP	3BC	1
8/23/2014	McAAP	R9	1
8/23/2014	McAAP	R10	4
8/24/2014	James Collins	7	0
8/24/2014	James Collins	17	1
8/24/2014	McAAP	1AC	0
8/24/2014	McAAP	1BC	0
8/24/2014	McAAP	3AC	0
8/24/2014	McAAP	3BC	1
8/24/2014	McAAP	R9	1
8/24/2014	McAAP	R10	1
9/5/2014	Brooks	1	0
9/5/2014	Brooks	2	3
9/5/2014	Crawford	1	1
9/5/2014	Crawford	2	1

9/5/2014	James Collins	7	3
9/5/2014	James Collins	17	1
9/5/2014	McAAP	1AC	1
9/5/2014	McAAP	3AC	1
9/5/2014	McAAP	R9	3
9/5/2014	McAAP	R10	2
9/5/2014	Riner	1	7
9/5/2014	Riner	2	2
9/5/2014	Tiffany	1	0
9/5/2014	Tiffany	2	0
9/5/2014	Tiffany	3	0
9/6/2014	Brooks	1	1
9/6/2014	Brooks	2	1
9/6/2014	Crawford	1	0
9/6/2014	Crawford	2	0
9/6/2014	James Collins	7	3
9/6/2014	James Collins	17	0
9/6/2014	McAAP	1AC	0
9/6/2014	McAAP	3AC	2
9/6/2014	McAAP	R9	1
9/6/2014	McAAP	R10	2
9/6/2014	Riner	1	0
9/6/2014	Riner	2	1
9/6/2014	Tiffany	1	0
9/6/2014	Tiffany	2	0
9/6/2014	Tiffany	3	0
9/7/2014	Brooks	3	0
9/7/2014	Brooks	4	0
9/7/2014	Crawford	1	0
9/7/2014	Crawford	2	0
9/7/2014	James Collins	7	4
9/7/2014	James Collins	17	0
9/7/2014	McAAP	1AC	0
9/7/2014	McAAP	3AC	0
9/7/2014	McAAP	R9	0
9/7/2014	McAAP	R10	0
9/7/2014	Riner	3	0

9/7/2014	Riner	4	0
9/7/2014	Tiffany	3	0
9/7/2014	Tiffany	4	0
9/7/2014	Tiffany	5	0
9/12/2014	Brooks	3	0
9/12/2014	Brooks	4	0
9/12/2014	Crawford	1	0
9/12/2014	Crawford	2	0
9/12/2014	James Collins	7	0
9/12/2014	James Collins	17	0
9/12/2014	McAAP	1AC	0
9/12/2014	McAAP	3AC	0
9/12/2014	McAAP	R9	0
9/12/2014	McAAP	R10	0
9/12/2014	Riner	3	0
9/12/2014	Riner	4	0
9/12/2014	Tiffany	3	0
9/12/2014	Tiffany	4	0
9/12/2014	Tiffany	5	0
9/13/2014	Brooks	3	0
9/13/2014	Brooks	4	0
9/13/2014	Crawford	1	0
9/13/2014	Crawford	2	0
9/13/2014	James Collins	7	0
9/13/2014	James Collins	17	0
9/13/2014	McAAP	1AC	0
9/13/2014	McAAP	3AC	0
9/13/2014	McAAP	R9	0
9/13/2014	McAAP	R10	0
9/13/2014	Riner	3	0
9/13/2014	Riner	4	0
9/13/2014	Tiffany	3	0
9/13/2014	Tiffany	4	0
9/13/2014	Tiffany	5	0
9/14/2014	Brooks	3	0
9/14/2014	Brooks	4	0
9/14/2014	Crawford	1	0

9/14/2014	Crawford	2	0
9/14/2014	James Collins	7	0
9/14/2014	James Collins	17	0
9/14/2014	McAAP	1AC	0
9/14/2014	McAAP	3AC	0
9/14/2014	McAAP	R9	0
9/14/2014	McAAP	R10	0
9/14/2014	Riner	3	0
9/14/2014	Riner	4	0
9/14/2014	Tiffany	3	0
9/14/2014	Tiffany	4	0
9/14/2014	Tiffany	5	0
9/19/2014	Brooks	1	0
9/19/2014	Brooks	2	0
9/19/2014	Riner	1	0
9/19/2014	Riner	2	0
9/19/2014	Tiffany	1	0
9/19/2014	Tiffany	2	0
9/19/2014	Tiffany	3	0
9/20/2014	Brooks	1	0
9/20/2014	Brooks	2	0
9/20/2014	Riner	1	0
9/20/2014	Riner	2	0
9/20/2014	Tiffany	1	0
9/20/2014	Tiffany	2	0
9/20/2014	Tiffany	3	0
9/21/2014	Brooks	1	0
9/21/2014	Brooks	2	0
9/21/2014	Riner	1	0
9/21/2014	Riner	2	0
9/21/2014	Tiffany	1	0
9/21/2014	Tiffany	2	0
9/21/2014	Tiffany	3	0

2015 Trapping Combined

Date	**Site**	**Trap#**	**ABB**
5/5/2015	JC	1	0
5/5/2015	JC	2	0
5/5/2015	MCAAP	1AC	0
5/5/2015	MCAAP	2AC	0
5/5/2015	MCAAP	3AC	0
5/6/2015	JC	RS 1	0
5/6/2015	JC	RS 2	0
5/6/2015	MCAAP	1AC	0
5/6/2015	MCAAP	2AC	0
5/6/2015	MCAAP	3AC	0
5/7/2015	JC	RS 1	0
5/7/2015	JC	RS 2	0
5/7/2015	MCAAP	1AC	0
5/7/2015	MCAAP	2AC	0
5/7/2015	MCAAP	3AC	0
5/12/2015	JC	RS 1	0
5/12/2015	JC	RS 2	0
5/12/2015	MCAAP	1AC	0
5/12/2015	MCAAP	2AC	0
5/12/2015	MCAAP	3AC	0
5/13/2015	JC	RS 1	0
5/13/2015	JC	RS 2	0
5/13/2015	MCAAP	1AC	0
5/13/2015	MCAAP	2AC	0
5/13/2015	MCAAP	3AC	0
5/14/2015	JC	RS 1	0
5/14/2015	JC	RS 2	0
5/14/2015	MCAAP	1AC	0
5/14/2015	MCAAP	2AC	0
5/14/2015	MCAAP	3AC	0

5/19/2015	JC	RS 1	0
5/19/2015	JC	RS 2	0
5/19/2015	MCAAP	1AC	0
5/19/2015	MCAAP	2AC	0
5/19/2015	MCAAP	3AC	0
5/20/2015	JC	RS 1	0
5/20/2015	JC	RS 2	0
5/20/2015	MCAAP	1AC	0
5/20/2015	MCAAP	2AC	0
5/20/2015	MCAAP	3AC	0
5/21/2015	JC	RS 1	0
5/21/2015	JC	RS 2	0
5/21/2015	MCAAP	1AC	0
5/21/2015	MCAAP	2AC	0
5/21/2015	MCAAP	3AC	0
5/26/2015	JC	RS 1	0
5/26/2015	JC	RS 2	0
5/26/2015	MCAAP	3A-1	0
5/26/2015	MCAAP	3A-10	0
5/26/2015	MCAAP	3A-11	0
5/26/2015	MCAAP	3A-12	0
5/26/2015	MCAAP	3A-13	0
5/26/2015	MCAAP	3A-14	0
5/26/2015	MCAAP	3A-15	0
5/26/2015	MCAAP	3A-16	0
5/26/2015	MCAAP	3A-2	0
5/26/2015	MCAAP	3A-3	0
5/26/2015	MCAAP	3A-4	0
5/26/2015	MCAAP	3A-5	0
5/26/2015	MCAAP	3A-6	0
5/26/2015	MCAAP	3A-7	0
5/26/2015	MCAAP	3A-8	0
5/26/2015	MCAAP	3A-9	0
5/26/2015	MCAAP	3B-C	0
5/27/2015	JC	RS 1	0
5/27/2015	JC	RS 2	0
5/27/2015	MCAAP	3A-1	0

5/27/2015	MCAAP	3A-10	0
5/27/2015	MCAAP	3A-11	0
5/27/2015	MCAAP	3A-12	0
5/27/2015	MCAAP	3A-13	0
5/27/2015	MCAAP	3A-14	0
5/27/2015	MCAAP	3A-15	0
5/27/2015	MCAAP	3A-16	0
5/27/2015	MCAAP	3A-2	0
5/27/2015	MCAAP	3A-3	0
5/27/2015	MCAAP	3A-4	0
5/27/2015	MCAAP	3A-5	0
5/27/2015	MCAAP	3A-6	0
5/27/2015	MCAAP	3A-7	0
5/27/2015	MCAAP	3A-8	0
5/27/2015	MCAAP	3A-9	0
5/27/2015	MCAAP	3B-C	0
5/28/2015	JC	RS 1	0
5/28/2015	JC	RS 2	0
5/28/2015	MCAAP	3A-1	0
5/28/2015	MCAAP	3A-10	0
5/28/2015	MCAAP	3A-11	0
5/28/2015	MCAAP	3A-12	1
5/28/2015	MCAAP	3A-13	0
5/28/2015	MCAAP	3A-14	0
5/28/2015	MCAAP	3A-15	0
5/28/2015	MCAAP	3A-16	0
5/28/2015	MCAAP	3A-2	0
5/28/2015	MCAAP	3A-3	0
5/28/2015	MCAAP	3A-4	0
5/28/2015	MCAAP	3A-5	0
5/28/2015	MCAAP	3A-6	0
5/28/2015	MCAAP	3A-7	0
5/28/2015	MCAAP	3A-8	0
5/28/2015	MCAAP	3A-9	0
5/28/2015	MCAAP	3B-C	1
6/2/2015	JC	RS 1	0
6/2/2015	JC	RS 2	0

6/2/2015	MCAAP	3A-C	0
6/2/2015	MCAAP	3B-1	0
6/2/2015	MCAAP	3B-10	0
6/2/2015	MCAAP	3B-11	0
6/2/2015	MCAAP	3B-12	0
6/2/2015	MCAAP	3B-13	0
6/2/2015	MCAAP	3B-14	0
6/2/2015	MCAAP	3B-15	0
6/2/2015	MCAAP	3B-16	0
6/2/2015	MCAAP	3B-2	0
6/2/2015	MCAAP	3B-3	0
6/2/2015	MCAAP	3B-4	0
6/2/2015	MCAAP	3B-5	0
6/2/2015	MCAAP	3B-6	0
6/2/2015	MCAAP	3B-7	0
6/2/2015	MCAAP	3B-8	0
6/2/2015	MCAAP	3B-9	0
6/3/2015	JC	RS 1	0
6/3/2015	JC	RS 2	0
6/3/2015	MCAAP	3A-C	0
6/3/2015	MCAAP	3B-1	0
6/3/2015	MCAAP	3B-10	0
6/3/2015	MCAAP	3B-11	0
6/3/2015	MCAAP	3B-12	0
6/3/2015	MCAAP	3B-13	0
6/3/2015	MCAAP	3B-14	0
6/3/2015	MCAAP	3B-15	0
6/3/2015	MCAAP	3B-16	0
6/3/2015	MCAAP	3B-2	0
6/3/2015	MCAAP	3B-3	0
6/3/2015	MCAAP	3B-4	0
6/3/2015	MCAAP	3B-5	14
6/3/2015	MCAAP	3B-6	0
6/3/2015	MCAAP	3B-7	0
6/3/2015	MCAAP	3B-8	0
6/3/2015	MCAAP	3B-9	0
6/4/2015	JC	RS 1	0

6/4/2015	JC	RS 2	1
6/4/2015	MCAAP	3A-C	0
6/4/2015	MCAAP	3B-1	0
6/4/2015	MCAAP	3B-10	2
6/4/2015	MCAAP	3B-11	0
6/4/2015	MCAAP	3B-12	0
6/4/2015	MCAAP	3B-13	0
6/4/2015	MCAAP	3B-14	0
6/4/2015	MCAAP	3B-15	0
6/4/2015	MCAAP	3B-16	0
6/4/2015	MCAAP	3B-2	0
6/4/2015	MCAAP	3B-3	0
6/4/2015	MCAAP	3B-4	0
6/4/2015	MCAAP	3B-5	0
6/4/2015	MCAAP	3B-6	0
6/4/2015	MCAAP	3B-7	0
6/4/2015	MCAAP	3B-8	1
6/4/2015	MCAAP	3B-9	0
6/8/2015	JC	RS 1	0
6/8/2015	JC	RS 2	3
6/8/2015	MCAAP	2A-1	0
6/8/2015	MCAAP	2A-10	0
6/8/2015	MCAAP	2A-11	0
6/8/2015	MCAAP	2A-12	0
6/8/2015	MCAAP	2A-13	0
6/8/2015	MCAAP	2A-14	2
6/8/2015	MCAAP	2A-15	1
6/8/2015	MCAAP	2A-16	0
6/8/2015	MCAAP	2A-2	0
6/8/2015	MCAAP	2A-3	0
6/8/2015	MCAAP	2A-4	0
6/8/2015	MCAAP	2A-5	0
6/8/2015	MCAAP	2A-6	1
6/8/2015	MCAAP	2A-7	1
6/8/2015	MCAAP	2A-8	0
6/8/2015	MCAAP	2A-9	0
6/8/2015	MCAAP	2B-C	2

6/9/2015	JC	RS 1	2
6/9/2015	JC	RS 2	0
6/9/2015	MCAAP	2A-1	0
6/9/2015	MCAAP	2A-10	0
6/9/2015	MCAAP	2A-11	1
6/9/2015	MCAAP	2A-12	0
6/9/2015	MCAAP	2A-13	0
6/9/2015	MCAAP	2A-14	0
6/9/2015	MCAAP	2A-15	1
6/9/2015	MCAAP	2A-16	0
6/9/2015	MCAAP	2A-2	0
6/9/2015	MCAAP	2A-3	1
6/9/2015	MCAAP	2A-4	0
6/9/2015	MCAAP	2A-5	0
6/9/2015	MCAAP	2A-6	0
6/9/2015	MCAAP	2A-7	0
6/9/2015	MCAAP	2A-8	0
6/9/2015	MCAAP	2A-9	0
6/9/2015	MCAAP	2B-C	1
6/10/2015	JC	RS 1	0
6/10/2015	JC	RS 2	0
6/10/2015	MCAAP	2A-1	0
6/10/2015	MCAAP	2A-10	0
6/10/2015	MCAAP	2A-11	0
6/10/2015	MCAAP	2A-12	0
6/10/2015	MCAAP	2A-13	0
6/10/2015	MCAAP	2A-14	1
6/10/2015	MCAAP	2A-15	0
6/10/2015	MCAAP	2A-16	2
6/10/2015	MCAAP	2A-2	0
6/10/2015	MCAAP	2A-3	0
6/10/2015	MCAAP	2A-4	0
6/10/2015	MCAAP	2A-5	0
6/10/2015	MCAAP	2A-6	0
6/10/2015	MCAAP	2A-7	0
6/10/2015	MCAAP	2A-8	0
6/10/2015	MCAAP	2A-9	0

6/10/2015	MCAAP	2B-C	0
6/17/2015	JC	RS 1	0
6/17/2015	JC	RS 2	0
6/17/2015	MCAAP	2A-C	0
6/17/2015	MCAAP	2B-1	0
6/17/2015	MCAAP	2B-10	0
6/17/2015	MCAAP	2B-11	0
6/17/2015	MCAAP	2B-12	0
6/17/2015	MCAAP	2B-13	0
6/17/2015	MCAAP	2B-14	0
6/17/2015	MCAAP	2B-15	0
6/17/2015	MCAAP	2B-16	0
6/17/2015	MCAAP	2B-2	0
6/17/2015	MCAAP	2B-3	0
6/17/2015	MCAAP	2B-4	0
6/17/2015	MCAAP	2B-5	0
6/17/2015	MCAAP	2B-6	0
6/17/2015	MCAAP	2B-7	0
6/17/2015	MCAAP	2B-8	0
6/17/2015	MCAAP	2B-9	0
6/18/2015	JC	RS 1	0
6/18/2015	JC	RS 2	0
6/18/2015	MCAAP	2A-C	0
6/18/2015	MCAAP	2B-1	0
6/18/2015	MCAAP	2B-10	0
6/18/2015	MCAAP	2B-11	0
6/18/2015	MCAAP	2B-12	0
6/18/2015	MCAAP	2B-13	0
6/18/2015	MCAAP	2B-14	0
6/18/2015	MCAAP	2B-15	0
6/18/2015	MCAAP	2B-16	0
6/18/2015	MCAAP	2B-2	0
6/18/2015	MCAAP	2B-3	0
6/18/2015	MCAAP	2B-4	0
6/18/2015	MCAAP	2B-5	0
6/18/2015	MCAAP	2B-6	0
6/18/2015	MCAAP	2B-7	0

6/18/2015	MCAAP	2B-8	0
6/18/2015	MCAAP	2B-9	0
6/19/2015	JC	RS 1	0
6/19/2015	JC	RS 2	0
6/19/2015	MCAAP	2A-C	0
6/19/2015	MCAAP	2B-1	0
6/19/2015	MCAAP	2B-10	0
6/19/2015	MCAAP	2B-11	0
6/19/2015	MCAAP	2B-12	4
6/19/2015	MCAAP	2B-13	0
6/19/2015	MCAAP	2B-14	0
6/19/2015	MCAAP	2B-15	0
6/19/2015	MCAAP	2B-16	0
6/19/2015	MCAAP	2B-2	0
6/19/2015	MCAAP	2B-3	0
6/19/2015	MCAAP	2B-4	0
6/19/2015	MCAAP	2B-5	0
6/19/2015	MCAAP	2B-6	0
6/19/2015	MCAAP	2B-7	0
6/19/2015	MCAAP	2B-8	0
6/19/2015	MCAAP	2B-9	0
6/23/2015	JC	RS 1	0
6/23/2015	JC	RS 2	0
6/23/2015	MCAAP	1A-1	1
6/23/2015	MCAAP	1A-10	9
6/23/2015	MCAAP	1A-11	0
6/23/2015	MCAAP	1A-12	0
6/23/2015	MCAAP	1A-13	5
6/23/2015	MCAAP	1A-14	0
6/23/2015	MCAAP	1A-15	0
6/23/2015	MCAAP	1A-16	0
6/23/2015	MCAAP	1A-2	2
6/23/2015	MCAAP	1A-3	0
6/23/2015	MCAAP	1A-4	1
6/23/2015	MCAAP	1A-5	3
6/23/2015	MCAAP	1A-6	0
6/23/2015	MCAAP	1A-7	2

6/23/2015	MCAAP	1A-8	0
6/23/2015	MCAAP	1A-9	2
6/23/2015	MCAAP	1B-C	0
6/23/2015	MCAAP	3A-1	0
6/23/2015	MCAAP	3A-10	0
6/23/2015	MCAAP	3A-11	1
6/23/2015	MCAAP	3A-12	0
6/23/2015	MCAAP	3A-13	2
6/23/2015	MCAAP	3A-14	0
6/23/2015	MCAAP	3A-15	2
6/23/2015	MCAAP	3A-16	2
6/23/2015	MCAAP	3A-2	0
6/23/2015	MCAAP	3A-3	4
6/23/2015	MCAAP	3A-4	2
6/23/2015	MCAAP	3A-5	0
6/23/2015	MCAAP	3A-6	0
6/23/2015	MCAAP	3A-7	1
6/23/2015	MCAAP	3A-8	0
6/23/2015	MCAAP	3A-9	0
6/23/2015	MCAAP	3B-C	4
6/24/2015	JC	RS 1	0
6/24/2015	JC	RS 2	0
6/24/2015	MCAAP	1A-1	0
6/24/2015	MCAAP	1A-10	0
6/24/2015	MCAAP	1A-11	0
6/24/2015	MCAAP	1A-12	0
6/24/2015	MCAAP	1A-13	2
6/24/2015	MCAAP	1A-14	1
6/24/2015	MCAAP	1A-15	0
6/24/2015	MCAAP	1A-16	1
6/24/2015	MCAAP	1A-2	3
6/24/2015	MCAAP	1A-3	3
6/24/2015	MCAAP	1A-4	0
6/24/2015	MCAAP	1A-5	4
6/24/2015	MCAAP	1A-6	1
6/24/2015	MCAAP	1A-7	1
6/24/2015	MCAAP	1A-8	0

6/24/2015	MCAAP	1A-9	3
6/24/2015	MCAAP	1B-C	0
6/24/2015	MCAAP	3A-1	0
6/24/2015	MCAAP	3A-10	0
6/24/2015	MCAAP	3A-11	1
6/24/2015	MCAAP	3A-12	1
6/24/2015	MCAAP	3A-13	0
6/24/2015	MCAAP	3A-14	0
6/24/2015	MCAAP	3A-15	0
6/24/2015	MCAAP	3A-16	1
6/24/2015	MCAAP	3A-2	0
6/24/2015	MCAAP	3A-3	0
6/24/2015	MCAAP	3A-4	0
6/24/2015	MCAAP	3A-5	0
6/24/2015	MCAAP	3A-6	0
6/24/2015	MCAAP	3A-7	0
6/24/2015	MCAAP	3A-8	3
6/24/2015	MCAAP	3A-9	0
6/24/2015	MCAAP	3B-C	4
6/30/2015	JC	RS 1	0
6/30/2015	JC	RS 2	0
6/30/2015	MCAAP	1A-C	0
6/30/2015	MCAAP	1B-1	7
6/30/2015	MCAAP	1B-10	0
6/30/2015	MCAAP	1B-11	0
6/30/2015	MCAAP	1B-12	0
6/30/2015	MCAAP	1B-13	0
6/30/2015	MCAAP	1B-14	2
6/30/2015	MCAAP	1B-15	0
6/30/2015	MCAAP	1B-16	0
6/30/2015	MCAAP	1B-2	0
6/30/2015	MCAAP	1B-3	0
6/30/2015	MCAAP	1B-4	0
6/30/2015	MCAAP	1B-5	0
6/30/2015	MCAAP	1B-6	0
6/30/2015	MCAAP	1B-7	0
6/30/2015	MCAAP	1B-8	0

6/30/2015	MCAAP	1B-9	0
6/30/2015	MCAAP	3A-C	1
6/30/2015	MCAAP	3B-1	0
6/30/2015	MCAAP	3B-10	0
6/30/2015	MCAAP	3B-11	0
6/30/2015	MCAAP	3B-12	0
6/30/2015	MCAAP	3B-13	0
6/30/2015	MCAAP	3B-14	0
6/30/2015	MCAAP	3B-15	1
6/30/2015	MCAAP	3B-16	1
6/30/2015	MCAAP	3B-2	0
6/30/2015	MCAAP	3B-3	0
6/30/2015	MCAAP	3B-4	0
6/30/2015	MCAAP	3B-5	1
6/30/2015	MCAAP	3B-6	0
6/30/2015	MCAAP	3B-7	0
6/30/2015	MCAAP	3B-8	0
6/30/2015	MCAAP	3B-9	0
7/1/2015	JC	RS 1	0
7/1/2015	JC	RS 2	0
7/1/2015	MCAAP	1A-C	0
7/1/2015	MCAAP	1B-1	0
7/1/2015	MCAAP	1B-10	0
7/1/2015	MCAAP	1B-11	0
7/1/2015	MCAAP	1B-12	0
7/1/2015	MCAAP	1B-13	0
7/1/2015	MCAAP	1B-14	0
7/1/2015	MCAAP	1B-15	0
7/1/2015	MCAAP	1B-16	0
7/1/2015	MCAAP	1B-2	0
7/1/2015	MCAAP	1B-3	0
7/1/2015	MCAAP	1B-4	0
7/1/2015	MCAAP	1B-5	0
7/1/2015	MCAAP	1B-6	2
7/1/2015	MCAAP	1B-7	0
7/1/2015	MCAAP	1B-8	0
7/1/2015	MCAAP	1B-9	0

7/1/2015	MCAAP	3A-C	0
7/1/2015	MCAAP	3B-1	1
7/1/2015	MCAAP	3B-10	0
7/1/2015	MCAAP	3B-11	1
7/1/2015	MCAAP	3B-12	0
7/1/2015	MCAAP	3B-13	0
7/1/2015	MCAAP	3B-14	1
7/1/2015	MCAAP	3B-15	0
7/1/2015	MCAAP	3B-16	0
7/1/2015	MCAAP	3B-2	0
7/1/2015	MCAAP	3B-3	1
7/1/2015	MCAAP	3B-4	1
7/1/2015	MCAAP	3B-5	2
7/1/2015	MCAAP	3B-6	0
7/1/2015	MCAAP	3B-7	0
7/1/2015	MCAAP	3B-8	0
7/1/2015	MCAAP	3B-9	0
7/2/2015	JC	RS 1	2
7/2/2015	JC	RS 2	2
7/2/2015	MCAAP	1A-C	0
7/2/2015	MCAAP	1B-1	1
7/2/2015	MCAAP	1B-10	0
7/2/2015	MCAAP	1B-11	1
7/2/2015	MCAAP	1B-12	0
7/2/2015	MCAAP	1B-13	0
7/2/2015	MCAAP	1B-14	0
7/2/2015	MCAAP	1B-15	0
7/2/2015	MCAAP	1B-16	0
7/2/2015	MCAAP	1B-2	0
7/2/2015	MCAAP	1B-3	0
7/2/2015	MCAAP	1B-4	0
7/2/2015	MCAAP	1B-5	0
7/2/2015	MCAAP	1B-6	0
7/2/2015	MCAAP	1B-7	0
7/2/2015	MCAAP	1B-8	0
7/2/2015	MCAAP	1B-9	0
7/2/2015	MCAAP	3A-C	0

7/2/2015	MCAAP	3B-1	1
7/2/2015	MCAAP	3B-10	0
7/2/2015	MCAAP	3B-11	0
7/2/2015	MCAAP	3B-12	0
7/2/2015	MCAAP	3B-13	0
7/2/2015	MCAAP	3B-14	2
7/2/2015	MCAAP	3B-15	0
7/2/2015	MCAAP	3B-16	0
7/2/2015	MCAAP	3B-2	1
7/2/2015	MCAAP	3B-3	2
7/2/2015	MCAAP	3B-4	1
7/2/2015	MCAAP	3B-5	0
7/2/2015	MCAAP	3B-6	0
7/2/2015	MCAAP	3B-7	0
7/2/2015	MCAAP	3B-8	1
7/2/2015	MCAAP	3B-9	0
7/7/2015	JC	RS-1	0
7/7/2015	JC	RS-2	0
7/7/2015	MCAAP	2A-1	0
7/7/2015	MCAAP	2A-10	0
7/7/2015	MCAAP	2A-11	0
7/7/2015	MCAAP	2A-12	0
7/7/2015	MCAAP	2A-13	0
7/7/2015	MCAAP	2A-14	0
7/7/2015	MCAAP	2A-15	0
7/7/2015	MCAAP	2A-16	0
7/7/2015	MCAAP	2A-2	0
7/7/2015	MCAAP	2A-3	0
7/7/2015	MCAAP	2A-4	0
7/7/2015	MCAAP	2A-5	0
7/7/2015	MCAAP	2A-6	0
7/7/2015	MCAAP	2A-7	0
7/7/2015	MCAAP	2A-8	0
7/7/2015	MCAAP	2A-9	0
7/8/2015	JC	RS-1	0
7/8/2015	JC	RS-2	0
7/8/2015	MCAAP	2A-1	0

7/8/2015	MCAAP	2A-10	0
7/8/2015	MCAAP	2A-11	0
7/8/2015	MCAAP	2A-12	1
7/8/2015	MCAAP	2A-13	0
7/8/2015	MCAAP	2A-14	0
7/8/2015	MCAAP	2A-15	0
7/8/2015	MCAAP	2A-16	0
7/8/2015	MCAAP	2A-2	0
7/8/2015	MCAAP	2A-3	0
7/8/2015	MCAAP	2A-4	0
7/8/2015	MCAAP	2A-5	0
7/8/2015	MCAAP	2A-6	0
7/8/2015	MCAAP	2A-7	0
7/8/2015	MCAAP	2A-8	0
7/8/2015	MCAAP	2A-9	0
7/9/2015	JC	RS-1	0
7/9/2015	JC	RS-2	0
7/9/2015	MCAAP	2A-1	0
7/9/2015	MCAAP	2A-10	0
7/9/2015	MCAAP	2A-11	0
7/9/2015	MCAAP	2A-12	0
7/9/2015	MCAAP	2A-13	0
7/9/2015	MCAAP	2A-14	0
7/9/2015	MCAAP	2A-15	0
7/9/2015	MCAAP	2A-16	0
7/9/2015	MCAAP	2A-2	1
7/9/2015	MCAAP	2A-3	0
7/9/2015	MCAAP	2A-4	0
7/9/2015	MCAAP	2A-5	0
7/9/2015	MCAAP	2A-6	0
7/9/2015	MCAAP	2A-7	0
7/9/2015	MCAAP	2A-8	1
7/9/2015	MCAAP	2A-9	0
7/14/2015	JC	RS-2	0
7/14/2015	JC	RS-1	0
7/14/2015	MCAAP	1A-1	6
7/14/2015	MCAAP	1A-10	0

7/14/2015	MCAAP	1A-11	0
7/14/2015	MCAAP	1A-12	1
7/14/2015	MCAAP	1A-13	6
7/14/2015	MCAAP	1A-14	0
7/14/2015	MCAAP	1A-15	0
7/14/2015	MCAAP	1A-16	2
7/14/2015	MCAAP	1A-2	1
7/14/2015	MCAAP	1A-3	0
7/14/2015	MCAAP	1A-4	0
7/14/2015	MCAAP	1A-5	4
7/14/2015	MCAAP	1A-6	5
7/14/2015	MCAAP	1A-7	2
7/14/2015	MCAAP	1A-8	1
7/14/2015	MCAAP	1A-9	4
7/14/2015	MCAAP	1B-C	1
7/14/2015	MCAAP	2A-C	0
7/14/2015	MCAAP	2B-1	1
7/14/2015	MCAAP	2B-10	0
7/14/2015	MCAAP	2B-11	0
7/14/2015	MCAAP	2B-12	0
7/14/2015	MCAAP	2B-13	1
7/14/2015	MCAAP	2B-14	1
7/14/2015	MCAAP	2B-15	0
7/14/2015	MCAAP	2B-16	1
7/14/2015	MCAAP	2B-2	0
7/14/2015	MCAAP	2B-3	1
7/14/2015	MCAAP	2B-4	0
7/14/2015	MCAAP	2B-5	1
7/14/2015	MCAAP	2B-6	0
7/14/2015	MCAAP	2B-7	1
7/14/2015	MCAAP	2B-8	1
7/14/2015	MCAAP	2B-9	0
7/15/2015	JC	RS-2	1
7/15/2015	JC	RS-1	0
7/15/2015	MCAAP	1A-1	4
7/15/2015	MCAAP	1A-10	0
7/15/2015	MCAAP	1A-11	2

7/15/2015	MCAAP	1A-12	1
7/15/2015	MCAAP	1A-13	2
7/15/2015	MCAAP	1A-14	1
7/15/2015	MCAAP	1A-15	0
7/15/2015	MCAAP	1A-16	1
7/15/2015	MCAAP	1A-2	2
7/15/2015	MCAAP	1A-3	2
7/15/2015	MCAAP	1A-4	2
7/15/2015	MCAAP	1A-5	5
7/15/2015	MCAAP	1A-6	0
7/15/2015	MCAAP	1A-7	0
7/15/2015	MCAAP	1A-8	1
7/15/2015	MCAAP	1A-9	1
7/15/2015	MCAAP	1B-C	0
7/15/2015	MCAAP	2A-C	0
7/15/2015	MCAAP	2B-1	1
7/15/2015	MCAAP	2B-10	1
7/15/2015	MCAAP	2B-11	0
7/15/2015	MCAAP	2B-12	1
7/15/2015	MCAAP	2B-13	1
7/15/2015	MCAAP	2B-14	0
7/15/2015	MCAAP	2B-15	1
7/15/2015	MCAAP	2B-16	0
7/15/2015	MCAAP	2B-2	0
7/15/2015	MCAAP	2B-3	2
7/15/2015	MCAAP	2B-4	0
7/15/2015	MCAAP	2B-5	1
7/15/2015	MCAAP	2B-6	0
7/15/2015	MCAAP	2B-7	0
7/15/2015	MCAAP	2B-8	0
7/15/2015	MCAAP	2B-9	0
7/16/2015	JC	RS-2	2
7/16/2015	JC	RS-1	1
7/16/2015	MCAAP	1A-1	0
7/16/2015	MCAAP	1A-10	0
7/16/2015	MCAAP	1A-11	0
7/16/2015	MCAAP	1A-12	0

7/16/2015	MCAAP	1A-13	0
7/16/2015	MCAAP	1A-14	0
7/16/2015	MCAAP	1A-15	0
7/16/2015	MCAAP	1A-16	0
7/16/2015	MCAAP	1A-2	4
7/16/2015	MCAAP	1A-3	0
7/16/2015	MCAAP	1A-4	1
7/16/2015	MCAAP	1A-5	6
7/16/2015	MCAAP	1A-6	1
7/16/2015	MCAAP	1A-7	1
7/16/2015	MCAAP	1A-8	1
7/16/2015	MCAAP	1A-9	0
7/16/2015	MCAAP	1B-C	0
7/16/2015	MCAAP	2A-C	0
7/16/2015	MCAAP	2B-1	0
7/16/2015	MCAAP	2B-10	0
7/16/2015	MCAAP	2B-11	0
7/16/2015	MCAAP	2B-12	1
7/16/2015	MCAAP	2B-13	0
7/16/2015	MCAAP	2B-14	1
7/16/2015	MCAAP	2B-15	0
7/16/2015	MCAAP	2B-16	1
7/16/2015	MCAAP	2B-2	0
7/16/2015	MCAAP	2B-3	0
7/16/2015	MCAAP	2B-4	0
7/16/2015	MCAAP	2B-5	0
7/16/2015	MCAAP	2B-6	0
7/16/2015	MCAAP	2B-7	0
7/16/2015	MCAAP	2B-8	0
7/16/2015	MCAAP	2B-9	0
7/21/2015	JC	RS-1	5
7/21/2015	JC	RS-2	2
7/21/2015	MCAAP	1A-C	10
7/21/2015	MCAAP	1B-1	2
7/21/2015	MCAAP	1B-10	0
7/21/2015	MCAAP	1B-11	1
7/21/2015	MCAAP	1B-12	0

7/21/2015	MCAAP	1B-13	1
7/21/2015	MCAAP	1B-14	1
7/21/2015	MCAAP	1B-15	0
7/21/2015	MCAAP	1B-16	0
7/21/2015	MCAAP	1B-2	3
7/21/2015	MCAAP	1B-3	0
7/21/2015	MCAAP	1B-4	0
7/21/2015	MCAAP	1B-5	0
7/21/2015	MCAAP	1B-6	1
7/21/2015	MCAAP	1B-7	2
7/21/2015	MCAAP	1B-8	0
7/21/2015	MCAAP	1B-9	0
7/21/2015	MCAAP	3A-1	1
7/21/2015	MCAAP	3A-10	0
7/21/2015	MCAAP	3A-11	3
7/21/2015	MCAAP	3A-12	2
7/21/2015	MCAAP	3A-13	7
7/21/2015	MCAAP	3A-14	1
7/21/2015	MCAAP	3A-15	1
7/21/2015	MCAAP	3A-16	6
7/21/2015	MCAAP	3A-2	0
7/21/2015	MCAAP	3A-3	2
7/21/2015	MCAAP	3A-4	1
7/21/2015	MCAAP	3A-5	1
7/21/2015	MCAAP	3A-6	1
7/21/2015	MCAAP	3A-7	2
7/21/2015	MCAAP	3A-8	3
7/21/2015	MCAAP	3A-9	0
7/21/2015	MCAAP	3B-C	0
7/22/2015	JC	RS-1	2
7/22/2015	JC	RS-2	3
7/22/2015	MCAAP	1A-C	2
7/22/2015	MCAAP	1B-1	0
7/22/2015	MCAAP	1B-10	0
7/22/2015	MCAAP	1B-11	0
7/22/2015	MCAAP	1B-12	0
7/22/2015	MCAAP	1B-13	0

7/22/2015	MCAAP	1B-14	0
7/22/2015	MCAAP	1B-15	0
7/22/2015	MCAAP	1B-16	0
7/22/2015	MCAAP	1B-2	0
7/22/2015	MCAAP	1B-3	0
7/22/2015	MCAAP	1B-4	0
7/22/2015	MCAAP	1B-5	0
7/22/2015	MCAAP	1B-6	0
7/22/2015	MCAAP	1B-7	1
7/22/2015	MCAAP	1B-8	1
7/22/2015	MCAAP	1B-9	0
7/22/2015	MCAAP	3A-1	1
7/22/2015	MCAAP	3A-10	1
7/22/2015	MCAAP	3A-11	0
7/22/2015	MCAAP	3A-12	2
7/22/2015	MCAAP	3A-13	2
7/22/2015	MCAAP	3A-14	1
7/22/2015	MCAAP	3A-15	2
7/22/2015	MCAAP	3A-16	0
7/22/2015	MCAAP	3A-2	1
7/22/2015	MCAAP	3A-3	2
7/22/2015	MCAAP	3A-4	1
7/22/2015	MCAAP	3A-5	0
7/22/2015	MCAAP	3A-6	1
7/22/2015	MCAAP	3A-7	1
7/22/2015	MCAAP	3A-8	2
7/22/2015	MCAAP	3A-9	0
7/22/2015	MCAAP	3B-C	2
7/23/2015	JC	RS-1	2
7/23/2015	JC	RS-2	2
7/23/2015	MCAAP	1A-C	1
7/23/2015	MCAAP	1B-1	0
7/23/2015	MCAAP	1B-10	0
7/23/2015	MCAAP	1B-11	0
7/23/2015	MCAAP	1B-12	0
7/23/2015	MCAAP	1B-13	0
7/23/2015	MCAAP	1B-14	0

7/23/2015	MCAAP	1B-15	0
7/23/2015	MCAAP	1B-16	0
7/23/2015	MCAAP	1B-2	0
7/23/2015	MCAAP	1B-3	0
7/23/2015	MCAAP	1B-4	2
7/23/2015	MCAAP	1B-5	0
7/23/2015	MCAAP	1B-6	0
7/23/2015	MCAAP	1B-7	11
7/23/2015	MCAAP	1B-8	1
7/23/2015	MCAAP	1B-9	0
7/23/2015	MCAAP	3A-1	0
7/23/2015	MCAAP	3A-10	0
7/23/2015	MCAAP	3A-11	0
7/23/2015	MCAAP	3A-12	1
7/23/2015	MCAAP	3A-13	0
7/23/2015	MCAAP	3A-14	0
7/23/2015	MCAAP	3A-15	1
7/23/2015	MCAAP	3A-16	1
7/23/2015	MCAAP	3A-2	0
7/23/2015	MCAAP	3A-3	0
7/23/2015	MCAAP	3A-4	0
7/23/2015	MCAAP	3A-5	0
7/23/2015	MCAAP	3A-6	1
7/23/2015	MCAAP	3A-7	0
7/23/2015	MCAAP	3A-8	1
7/23/2015	MCAAP	3A-9	0
7/23/2015	MCAAP	3B-C	10
7/28/2015	JC	RS-1	3
7/28/2015	JC	RS-2	2
7/28/2015	MCAAP	1A-1	4
7/28/2015	MCAAP	1A-10	0
7/28/2015	MCAAP	1A-11	3
7/28/2015	MCAAP	1A-12	2
7/28/2015	MCAAP	1A-13	13
7/28/2015	MCAAP	1A-14	0
7/28/2015	MCAAP	1A-15	0
7/28/2015	MCAAP	1A-16	1

7/28/2015	MCAAP	1A-2	5
7/28/2015	MCAAP	1A-3	6
7/28/2015	MCAAP	1A-4	1
7/28/2015	MCAAP	1A-5	5
7/28/2015	MCAAP	1A-6	0
7/28/2015	MCAAP	1A-7	0
7/28/2015	MCAAP	1A-8	1
7/28/2015	MCAAP	1A-9	3
7/28/2015	MCAAP	1B-C	0
7/28/2015	MCAAP	3A-C	3
7/28/2015	MCAAP	3B-1	4
7/28/2015	MCAAP	3B-10	3
7/28/2015	MCAAP	3B-11	3
7/28/2015	MCAAP	3B-12	3
7/28/2015	MCAAP	3B-13	5
7/28/2015	MCAAP	3B-14	4
7/28/2015	MCAAP	3B-15	6
7/28/2015	MCAAP	3B-16	6
7/28/2015	MCAAP	3B-2	3
7/28/2015	MCAAP	3B-3	2
7/28/2015	MCAAP	3B-4	1
7/28/2015	MCAAP	3B-5	3
7/28/2015	MCAAP	3B-6	2
7/28/2015	MCAAP	3B-7	2
7/28/2015	MCAAP	3B-8	1
7/28/2015	MCAAP	3B-9	1
7/29/2015	JC	RS-1	0
7/29/2015	JC	RS-2	1
7/29/2015	MCAAP	1A-1	5
7/29/2015	MCAAP	1A-10	3
7/29/2015	MCAAP	1A-11	0
7/29/2015	MCAAP	1A-12	2
7/29/2015	MCAAP	1A-13	3
7/29/2015	MCAAP	1A-14	2
7/29/2015	MCAAP	1A-15	1
7/29/2015	MCAAP	1A-16	0
7/29/2015	MCAAP	1A-2	6

7/29/2015	MCAAP	1A-3	1
7/29/2015	MCAAP	1A-4	1
7/29/2015	MCAAP	1A-5	7
7/29/2015	MCAAP	1A-6	3
7/29/2015	MCAAP	1A-7	1
7/29/2015	MCAAP	1A-8	3
7/29/2015	MCAAP	1A-9	0
7/29/2015	MCAAP	1B-C	0
7/29/2015	MCAAP	3A-C	2
7/29/2015	MCAAP	3B-1	4
7/29/2015	MCAAP	3B-10	4
7/29/2015	MCAAP	3B-11	3
7/29/2015	MCAAP	3B-12	3
7/29/2015	MCAAP	3B-13	5
7/29/2015	MCAAP	3B-14	1
7/29/2015	MCAAP	3B-15	1
7/29/2015	MCAAP	3B-16	0
7/29/2015	MCAAP	3B-2	1
7/29/2015	MCAAP	3B-3	2
7/29/2015	MCAAP	3B-4	1
7/29/2015	MCAAP	3B-5	1
7/29/2015	MCAAP	3B-6	2
7/29/2015	MCAAP	3B-7	2
7/29/2015	MCAAP	3B-8	2
7/29/2015	MCAAP	3B-9	0
7/30/2015	JC	RS-1	0
7/30/2015	JC	RS-2	6
7/30/2015	MCAAP	1A-1	0
7/30/2015	MCAAP	1A-10	1
7/30/2015	MCAAP	1A-11	1
7/30/2015	MCAAP	1A-12	1
7/30/2015	MCAAP	1A-13	1
7/30/2015	MCAAP	1A-14	0
7/30/2015	MCAAP	1A-15	0
7/30/2015	MCAAP	1A-16	0
7/30/2015	MCAAP	1A-2	0
7/30/2015	MCAAP	1A-3	1

7/30/2015	MCAAP	1A-4	0
7/30/2015	MCAAP	1A-5	2
7/30/2015	MCAAP	1A-6	0
7/30/2015	MCAAP	1A-7	1
7/30/2015	MCAAP	1A-8	2
7/30/2015	MCAAP	1A-9	0
7/30/2015	MCAAP	1B-C	0
7/30/2015	MCAAP	3A-C	0
7/30/2015	MCAAP	3B-1	0
7/30/2015	MCAAP	3B-10	4
7/30/2015	MCAAP	3B-11	0
7/30/2015	MCAAP	3B-12	2
7/30/2015	MCAAP	3B-13	2
7/30/2015	MCAAP	3B-14	1
7/30/2015	MCAAP	3B-15	1
7/30/2015	MCAAP	3B-16	4
7/30/2015	MCAAP	3B-2	2
7/30/2015	MCAAP	3B-3	1
7/30/2015	MCAAP	3B-4	1
7/30/2015	MCAAP	3B-5	0
7/30/2015	MCAAP	3B-6	7
7/30/2015	MCAAP	3B-7	0
7/30/2015	MCAAP	3B-8	3
7/30/2015	MCAAP	3B-9	2
8/4/2015	JC	RS-1	2
8/4/2015	JC	RS-2	1
8/4/2015	MCAAP	1A-C	3
8/4/2015	MCAAP	1B-1	3
8/4/2015	MCAAP	1B-10	0
8/4/2015	MCAAP	1B-11	0
8/4/2015	MCAAP	1B-12	0
8/4/2015	MCAAP	1B-13	3
8/4/2015	MCAAP	1B-14	2
8/4/2015	MCAAP	1B-15	0
8/4/2015	MCAAP	1B-16	0
8/4/2015	MCAAP	1B-2	0
8/4/2015	MCAAP	1B-3	0

8/4/2015	MCAAP	1B-4	0
8/4/2015	MCAAP	1B-5	4
8/4/2015	MCAAP	1B-6	1
8/4/2015	MCAAP	1B-7	1
8/4/2015	MCAAP	1B-8	0
8/4/2015	MCAAP	1B-9	3
8/4/2015	MCAAP	2A-1	1
8/4/2015	MCAAP	2A-10	0
8/4/2015	MCAAP	2A-11	2
8/4/2015	MCAAP	2A-12	1
8/4/2015	MCAAP	2A-13	3
8/4/2015	MCAAP	2A-14	2
8/4/2015	MCAAP	2A-15	2
8/4/2015	MCAAP	2A-16	0
8/4/2015	MCAAP	2A-2	0
8/4/2015	MCAAP	2A-3	1
8/4/2015	MCAAP	2A-4	3
8/4/2015	MCAAP	2A-5	0
8/4/2015	MCAAP	2A-6	1
8/4/2015	MCAAP	2A-7	1
8/4/2015	MCAAP	2A-8	1
8/4/2015	MCAAP	2A-9	0
8/4/2015	MCAAP	2B-C	1
8/5/2015	JC	RS-1	0
8/5/2015	JC	RS-2	0
8/5/2015	MCAAP	1A-C	3
8/5/2015	MCAAP	1B-1	0
8/5/2015	MCAAP	1B-10	0
8/5/2015	MCAAP	1B-11	0
8/5/2015	MCAAP	1B-12	1
8/5/2015	MCAAP	1B-13	0
8/5/2015	MCAAP	1B-14	0
8/5/2015	MCAAP	1B-15	0
8/5/2015	MCAAP	1B-16	0
8/5/2015	MCAAP	1B-2	2
8/5/2015	MCAAP	1B-3	0
8/5/2015	MCAAP	1B-4	0

8/5/2015	MCAAP	1B-5	0
8/5/2015	MCAAP	1B-6	0
8/5/2015	MCAAP	1B-7	0
8/5/2015	MCAAP	1B-8	2
8/5/2015	MCAAP	1B-9	2
8/5/2015	MCAAP	2A-1	0
8/5/2015	MCAAP	2A-10	2
8/5/2015	MCAAP	2A-11	0
8/5/2015	MCAAP	2A-12	1
8/5/2015	MCAAP	2A-13	5
8/5/2015	MCAAP	2A-14	0
8/5/2015	MCAAP	2A-15	0
8/5/2015	MCAAP	2A-16	0
8/5/2015	MCAAP	2A-2	0
8/5/2015	MCAAP	2A-3	1
8/5/2015	MCAAP	2A-4	2
8/5/2015	MCAAP	2A-5	0
8/5/2015	MCAAP	2A-6	0
8/5/2015	MCAAP	2A-7	1
8/5/2015	MCAAP	2A-8	1
8/5/2015	MCAAP	2A-9	0
8/5/2015	MCAAP	2B-C	2
8/6/2015	JC	RS-1	0
8/6/2015	JC	RS-2	1
8/6/2015	MCAAP	1A-C	0
8/6/2015	MCAAP	1B-1	4
8/6/2015	MCAAP	1B-10	0
8/6/2015	MCAAP	1B-11	0
8/6/2015	MCAAP	1B-12	3
8/6/2015	MCAAP	1B-13	0
8/6/2015	MCAAP	1B-14	1
8/6/2015	MCAAP	1B-15	0
8/6/2015	MCAAP	1B-16	0
8/6/2015	MCAAP	1B-2	0
8/6/2015	MCAAP	1B-3	0
8/6/2015	MCAAP	1B-4	3
8/6/2015	MCAAP	1B-5	0

8/6/2015	MCAAP	1B-6	0
8/6/2015	MCAAP	1B-7	4
8/6/2015	MCAAP	1B-8	0
8/6/2015	MCAAP	1B-9	0
8/6/2015	MCAAP	2A-1	0
8/6/2015	MCAAP	2A-10	0
8/6/2015	MCAAP	2A-11	0
8/6/2015	MCAAP	2A-12	1
8/6/2015	MCAAP	2A-13	0
8/6/2015	MCAAP	2A-14	0
8/6/2015	MCAAP	2A-15	0
8/6/2015	MCAAP	2A-16	0
8/6/2015	MCAAP	2A-2	1
8/6/2015	MCAAP	2A-3	0
8/6/2015	MCAAP	2A-4	0
8/6/2015	MCAAP	2A-5	0
8/6/2015	MCAAP	2A-6	0
8/6/2015	MCAAP	2A-7	1
8/6/2015	MCAAP	2A-8	2
8/6/2015	MCAAP	2A-9	0
8/6/2015	MCAAP	2B-C	1
8/11/2015	JC	RS-1	1
8/11/2015	JC	RS-2	0
8/11/2015	MCAAP	2A-C	1
8/11/2015	MCAAP	2B-1	0
8/11/2015	MCAAP	2B-10	1
8/11/2015	MCAAP	2B-11	0
8/11/2015	MCAAP	2B-12	4
8/11/2015	MCAAP	2B-13	1
8/11/2015	MCAAP	2B-14	1
8/11/2015	MCAAP	2B-15	2
8/11/2015	MCAAP	2B-16	0
8/11/2015	MCAAP	2B-2	1
8/11/2015	MCAAP	2B-3	2
8/11/2015	MCAAP	2B-4	1
8/11/2015	MCAAP	2B-5	0
8/11/2015	MCAAP	2B-6	0

8/11/2015	MCAAP	2B-7	0
8/11/2015	MCAAP	2B-8	0
8/11/2015	MCAAP	2B-9	0
8/12/2015	JC	RS-1	1
8/12/2015	JC	RS-2	0
8/12/2015	MCAAP	2A-C	0
8/12/2015	MCAAP	2B-1	0
8/12/2015	MCAAP	2B-10	0
8/12/2015	MCAAP	2B-11	0
8/12/2015	MCAAP	2B-12	3
8/12/2015	MCAAP	2B-13	0
8/12/2015	MCAAP	2B-14	2
8/12/2015	MCAAP	2B-15	1
8/12/2015	MCAAP	2B-16	0
8/12/2015	MCAAP	2B-2	2
8/12/2015	MCAAP	2B-3	1
8/12/2015	MCAAP	2B-4	2
8/12/2015	MCAAP	2B-5	2
8/12/2015	MCAAP	2B-6	0
8/12/2015	MCAAP	2B-7	0
8/12/2015	MCAAP	2B-8	2
8/12/2015	MCAAP	2B-9	1
8/13/2015	JC	RS-1	0
8/13/2015	JC	RS-2	0
8/13/2015	MCAAP	2A-C	0
8/13/2015	MCAAP	2B-1	0
8/13/2015	MCAAP	2B-10	0
8/13/2015	MCAAP	2B-11	2
8/13/2015	MCAAP	2B-12	0
8/13/2015	MCAAP	2B-13	0
8/13/2015	MCAAP	2B-14	0
8/13/2015	MCAAP	2B-15	0
8/13/2015	MCAAP	2B-16	0
8/13/2015	MCAAP	2B-2	0
8/13/2015	MCAAP	2B-3	1
8/13/2015	MCAAP	2B-4	1
8/13/2015	MCAAP	2B-5	0

8/13/2015	MCAAP	2B-6	0
8/13/2015	MCAAP	2B-7	0
8/13/2015	MCAAP	2B-8	1
8/13/2015	MCAAP	2B-9	1
8/21/2015	JC	RS-1	1
8/21/2015	JC	RS-2	1
8/21/2015	MCAAP	1A-1	1
8/21/2015	MCAAP	1A-10	0
8/21/2015	MCAAP	1A-11	0
8/21/2015	MCAAP	1A-12	0
8/21/2015	MCAAP	1A-13	3
8/21/2015	MCAAP	1A-14	1
8/21/2015	MCAAP	1A-15	0
8/21/2015	MCAAP	1A-16	0
8/21/2015	MCAAP	1A-2	2
8/21/2015	MCAAP	1A-3	1
8/21/2015	MCAAP	1A-4	1
8/21/2015	MCAAP	1A-5	1
8/21/2015	MCAAP	1A-6	0
8/21/2015	MCAAP	1A-7	0
8/21/2015	MCAAP	1A-8	0
8/21/2015	MCAAP	1A-9	1
8/21/2015	MCAAP	1B-C	1
8/21/2015	MCAAP	2A-1	0
8/21/2015	MCAAP	2A-10	0
8/21/2015	MCAAP	2A-11	3
8/21/2015	MCAAP	2A-12	0
8/21/2015	MCAAP	2A-13	0
8/21/2015	MCAAP	2A-14	0
8/21/2015	MCAAP	2A-15	0
8/21/2015	MCAAP	2A-16	1
8/21/2015	MCAAP	2A-2	0
8/21/2015	MCAAP	2A-3	0
8/21/2015	MCAAP	2A-4	0
8/21/2015	MCAAP	2A-5	0
8/21/2015	MCAAP	2A-6	0
8/21/2015	MCAAP	2A-7	0

8/21/2015	MCAAP	2A-8	0
8/21/2015	MCAAP	2A-9	0
8/21/2015	MCAAP	2B-C	0
8/22/2015	JC	RS-1	2
8/22/2015	JC	RS-2	0
8/22/2015	MCAAP	1A-1	2
8/22/2015	MCAAP	1A-10	0
8/22/2015	MCAAP	1A-11	0
8/22/2015	MCAAP	1A-12	0
8/22/2015	MCAAP	1A-13	4
8/22/2015	MCAAP	1A-14	0
8/22/2015	MCAAP	1A-15	0
8/22/2015	MCAAP	1A-16	2
8/22/2015	MCAAP	1A-2	1
8/22/2015	MCAAP	1A-3	0
8/22/2015	MCAAP	1A-4	1
8/22/2015	MCAAP	1A-5	3
8/22/2015	MCAAP	1A-6	1
8/22/2015	MCAAP	1A-7	0
8/22/2015	MCAAP	1A-8	0
8/22/2015	MCAAP	1A-9	1
8/22/2015	MCAAP	1B-C	0
8/22/2015	MCAAP	2A-1	2
8/22/2015	MCAAP	2A-10	0
8/22/2015	MCAAP	2A-11	1
8/22/2015	MCAAP	2A-12	0
8/22/2015	MCAAP	2A-13	1
8/22/2015	MCAAP	2A-14	1
8/22/2015	MCAAP	2A-15	0
8/22/2015	MCAAP	2A-16	0
8/22/2015	MCAAP	2A-2	0
8/22/2015	MCAAP	2A-3	0
8/22/2015	MCAAP	2A-4	2
8/22/2015	MCAAP	2A-5	1
8/22/2015	MCAAP	2A-6	1
8/22/2015	MCAAP	2A-7	0
8/22/2015	MCAAP	2A-8	0

8/22/2015	MCAAP	2A-9	0
8/22/2015	MCAAP	2B-C	0
8/23/2015	JC	RS-1	0
8/23/2015	JC	RS-2	1
8/23/2015	MCAAP	1A-1	3
8/23/2015	MCAAP	1A-10	0
8/23/2015	MCAAP	1A-11	2
8/23/2015	MCAAP	1A-12	0
8/23/2015	MCAAP	1A-13	5
8/23/2015	MCAAP	1A-14	5
8/23/2015	MCAAP	1A-15	1
8/23/2015	MCAAP	1A-16	0
8/23/2015	MCAAP	1A-2	0
8/23/2015	MCAAP	1A-3	0
8/23/2015	MCAAP	1A-4	0
8/23/2015	MCAAP	1A-5	1
8/23/2015	MCAAP	1A-6	1
8/23/2015	MCAAP	1A-7	0
8/23/2015	MCAAP	1A-8	0
8/23/2015	MCAAP	1A-9	1
8/23/2015	MCAAP	1B-C	1
8/23/2015	MCAAP	2A-1	0
8/23/2015	MCAAP	2A-10	0
8/23/2015	MCAAP	2A-11	0
8/23/2015	MCAAP	2A-12	0
8/23/2015	MCAAP	2A-13	0
8/23/2015	MCAAP	2A-14	0
8/23/2015	MCAAP	2A-15	0
8/23/2015	MCAAP	2A-16	0
8/23/2015	MCAAP	2A-2	0
8/23/2015	MCAAP	2A-3	0
8/23/2015	MCAAP	2A-4	0
8/23/2015	MCAAP	2A-5	0
8/23/2015	MCAAP	2A-6	3
8/23/2015	MCAAP	2A-7	1
8/23/2015	MCAAP	2A-8	1
8/23/2015	MCAAP	2A-9	1

8/23/2015	MCAAP	2B-C	3
8/28/2015	JC	RS-1	1
8/28/2015	JC	RS-2	0
8/28/2015	MCAAP	1A-C	0
8/28/2015	MCAAP	1B-1	4
8/28/2015	MCAAP	1B-10	1
8/28/2015	MCAAP	1B-11	0
8/28/2015	MCAAP	1B-12	0
8/28/2015	MCAAP	1B-13	0
8/28/2015	MCAAP	1B-14	0
8/28/2015	MCAAP	1B-15	0
8/28/2015	MCAAP	1B-16	0
8/28/2015	MCAAP	1B-2	0
8/28/2015	MCAAP	1B-3	0
8/28/2015	MCAAP	1B-4	0
8/28/2015	MCAAP	1B-5	2
8/28/2015	MCAAP	1B-6	0
8/28/2015	MCAAP	1B-7	0
8/28/2015	MCAAP	1B-8	0
8/28/2015	MCAAP	1B-9	0
8/28/2015	MCAAP	2A-C	0
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8/28/2015	MCAAP	2B-10	0
8/28/2015	MCAAP	2B-11	0
8/28/2015	MCAAP	2B-12	0
8/28/2015	MCAAP	2B-13	1
8/28/2015	MCAAP	2B-14	0
8/28/2015	MCAAP	2B-15	0
8/28/2015	MCAAP	2B-16	0
8/28/2015	MCAAP	2B-2	0
8/28/2015	MCAAP	2B-3	0
8/28/2015	MCAAP	2B-4	0
8/28/2015	MCAAP	2B-5	0
8/28/2015	MCAAP	2B-6	0
8/28/2015	MCAAP	2B-7	0
8/28/2015	MCAAP	2B-8	0
8/28/2015	MCAAP	2B-9	0

8/29/2015	JC	RS-1	1
8/29/2015	JC	RS-2	1
8/29/2015	MCAAP	1A-C	1
8/29/2015	MCAAP	1B-1	6
8/29/2015	MCAAP	1B-10	0
8/29/2015	MCAAP	1B-11	0
8/29/2015	MCAAP	1B-12	0
8/29/2015	MCAAP	1B-13	0
8/29/2015	MCAAP	1B-14	1
8/29/2015	MCAAP	1B-15	0
8/29/2015	MCAAP	1B-16	0
8/29/2015	MCAAP	1B-2	2
8/29/2015	MCAAP	1B-3	0
8/29/2015	MCAAP	1B-4	0
8/29/2015	MCAAP	1B-5	0
8/29/2015	MCAAP	1B-6	0
8/29/2015	MCAAP	1B-7	0
8/29/2015	MCAAP	1B-8	1
8/29/2015	MCAAP	1B-9	0
8/29/2015	MCAAP	2A-C	0
8/29/2015	MCAAP	2B-1	0
8/29/2015	MCAAP	2B-10	0
8/29/2015	MCAAP	2B-11	0
8/29/2015	MCAAP	2B-12	0
8/29/2015	MCAAP	2B-13	0
8/29/2015	MCAAP	2B-14	0
8/29/2015	MCAAP	2B-15	1
8/29/2015	MCAAP	2B-16	0
8/29/2015	MCAAP	2B-2	0
8/29/2015	MCAAP	2B-3	0
8/29/2015	MCAAP	2B-4	0
8/29/2015	MCAAP	2B-5	0
8/29/2015	MCAAP	2B-6	0
8/29/2015	MCAAP	2B-7	0
8/29/2015	MCAAP	2B-8	0
8/29/2015	MCAAP	2B-9	0
8/30/2015	JC	RS-1	1

8/30/2015	JC	RS-2	2
8/30/2015	MCAAP	1A-C	1
8/30/2015	MCAAP	1B-1	2
8/30/2015	MCAAP	1B-10	1
8/30/2015	MCAAP	1B-11	1
8/30/2015	MCAAP	1B-12	0
8/30/2015	MCAAP	1B-13	3
8/30/2015	MCAAP	1B-14	0
8/30/2015	MCAAP	1B-15	0
8/30/2015	MCAAP	1B-16	1
8/30/2015	MCAAP	1B-2	0
8/30/2015	MCAAP	1B-3	0
8/30/2015	MCAAP	1B-4	0
8/30/2015	MCAAP	1B-5	0
8/30/2015	MCAAP	1B-6	1
8/30/2015	MCAAP	1B-7	0
8/30/2015	MCAAP	1B-8	0
8/30/2015	MCAAP	1B-9	0
8/30/2015	MCAAP	2A-C	0
8/30/2015	MCAAP	2B-1	1
8/30/2015	MCAAP	2B-10	1
8/30/2015	MCAAP	2B-11	0
8/30/2015	MCAAP	2B-12	0
8/30/2015	MCAAP	2B-13	0
8/30/2015	MCAAP	2B-14	0
8/30/2015	MCAAP	2B-15	0
8/30/2015	MCAAP	2B-16	0
8/30/2015	MCAAP	2B-2	0
8/30/2015	MCAAP	2B-3	0
8/30/2015	MCAAP	2B-4	0
8/30/2015	MCAAP	2B-5	1
8/30/2015	MCAAP	2B-6	0
8/30/2015	MCAAP	2B-7	0
8/30/2015	MCAAP	2B-8	0
8/30/2015	MCAAP	2B-9	0
9/4/2015	JC	RS-1	1
9/4/2015	JC	RS-2	0

9/4/2015	MCAAP	2A-1	1
9/4/2015	MCAAP	2A-10	0
9/4/2015	MCAAP	2A-11	1
9/4/2015	MCAAP	2A-12	1
9/4/2015	MCAAP	2A-13	0
9/4/2015	MCAAP	2A-14	0
9/4/2015	MCAAP	2A-15	0
9/4/2015	MCAAP	2A-16	0
9/4/2015	MCAAP	2A-2	1
9/4/2015	MCAAP	2A-3	0
9/4/2015	MCAAP	2A-4	1
9/4/2015	MCAAP	2A-5	0
9/4/2015	MCAAP	2A-6	0
9/4/2015	MCAAP	2A-7	0
9/4/2015	MCAAP	2A-8	0
9/4/2015	MCAAP	2A-9	0
9/4/2015	MCAAP	2B-C	0
9/4/2015	MCAAP	3A-1	0
9/4/2015	MCAAP	3A-10	0
9/4/2015	MCAAP	3A-11	0
9/4/2015	MCAAP	3A-12	4
9/4/2015	MCAAP	3A-13	0
9/4/2015	MCAAP	3A-14	0
9/4/2015	MCAAP	3A-15	3
9/4/2015	MCAAP	3A-16	1
9/4/2015	MCAAP	3A-2	0
9/4/2015	MCAAP	3A-3	1
9/4/2015	MCAAP	3A-4	3
9/4/2015	MCAAP	3A-5	0
9/4/2015	MCAAP	3A-6	3
9/4/2015	MCAAP	3A-7	0
9/4/2015	MCAAP	3A-8	3
9/4/2015	MCAAP	3A-9	1
9/4/2015	MCAAP	3B-C	5
9/5/2015	JC	RS-1	0
9/5/2015	JC	RS-2	0
9/5/2015	MCAAP	2A-1	2

9/5/2015	MCAAP	2A-10	0
9/5/2015	MCAAP	2A-11	0
9/5/2015	MCAAP	2A-12	2
9/5/2015	MCAAP	2A-13	2
9/5/2015	MCAAP	2A-14	1
9/5/2015	MCAAP	2A-15	0
9/5/2015	MCAAP	2A-16	1
9/5/2015	MCAAP	2A-2	0
9/5/2015	MCAAP	2A-3	0
9/5/2015	MCAAP	2A-4	3
9/5/2015	MCAAP	2A-5	0
9/5/2015	MCAAP	2A-6	0
9/5/2015	MCAAP	2A-7	0
9/5/2015	MCAAP	2A-8	0
9/5/2015	MCAAP	2A-9	0
9/5/2015	MCAAP	2B-C	0
9/5/2015	MCAAP	3A-1	0
9/5/2015	MCAAP	3A-10	0
9/5/2015	MCAAP	3A-11	0
9/5/2015	MCAAP	3A-12	3
9/5/2015	MCAAP	3A-13	1
9/5/2015	MCAAP	3A-14	3
9/5/2015	MCAAP	3A-15	0
9/5/2015	MCAAP	3A-16	0
9/5/2015	MCAAP	3A-2	1
9/5/2015	MCAAP	3A-3	2
9/5/2015	MCAAP	3A-4	0
9/5/2015	MCAAP	3A-5	0
9/5/2015	MCAAP	3A-6	1
9/5/2015	MCAAP	3A-7	0
9/5/2015	MCAAP	3A-8	1
9/5/2015	MCAAP	3A-9	1
9/5/2015	MCAAP	3B-C	6
9/6/2015	JC	RS-1	1
9/6/2015	JC	RS-2	0
9/6/2015	MCAAP	2A-1	1
9/6/2015	MCAAP	2A-10	0

9/6/2015	MCAAP	2A-11	0
9/6/2015	MCAAP	2A-12	0
9/6/2015	MCAAP	2A-13	1
9/6/2015	MCAAP	2A-14	1
9/6/2015	MCAAP	2A-15	0
9/6/2015	MCAAP	2A-16	1
9/6/2015	MCAAP	2A-2	0
9/6/2015	MCAAP	2A-3	0
9/6/2015	MCAAP	2A-4	1
9/6/2015	MCAAP	2A-5	0
9/6/2015	MCAAP	2A-6	0
9/6/2015	MCAAP	2A-7	0
9/6/2015	MCAAP	2A-8	0
9/6/2015	MCAAP	2A-9	0
9/6/2015	MCAAP	2B-C	0
9/6/2015	MCAAP	3A-1	2
9/6/2015	MCAAP	3A-10	1
9/6/2015	MCAAP	3A-11	0
9/6/2015	MCAAP	3A-12	0
9/6/2015	MCAAP	3A-13	0
9/6/2015	MCAAP	3A-14	2
9/6/2015	MCAAP	3A-15	0
9/6/2015	MCAAP	3A-16	2
9/6/2015	MCAAP	3A-2	1
9/6/2015	MCAAP	3A-3	0
9/6/2015	MCAAP	3A-4	0
9/6/2015	MCAAP	3A-5	0
9/6/2015	MCAAP	3A-6	0
9/6/2015	MCAAP	3A-7	0
9/6/2015	MCAAP	3A-8	0
9/6/2015	MCAAP	3A-9	0
9/6/2015	MCAAP	3B-C	0
9/11/2015	JC	RS-1	0
9/11/2015	JC	RS-2	1
9/11/2015	MCAAP	2A-C	0
9/11/2015	MCAAP	2B-1	1
9/11/2015	MCAAP	2B-10	0

9/11/2015	MCAAP	2B-11	0
9/11/2015	MCAAP	2B-12	0
9/11/2015	MCAAP	2B-13	0
9/11/2015	MCAAP	2B-14	1
9/11/2015	MCAAP	2B-15	0
9/11/2015	MCAAP	2B-16	0
9/11/2015	MCAAP	2B-2	0
9/11/2015	MCAAP	2B-3	0
9/11/2015	MCAAP	2B-4	0
9/11/2015	MCAAP	2B-5	0
9/11/2015	MCAAP	2B-6	0
9/11/2015	MCAAP	2B-7	1
9/11/2015	MCAAP	2B-8	0
9/11/2015	MCAAP	2B-9	1
9/11/2015	MCAAP	3A-C	4
9/11/2015	MCAAP	3B-1	2
9/11/2015	MCAAP	3B-10	2
9/11/2015	MCAAP	3B-11	2
9/11/2015	MCAAP	3B-12	0
9/11/2015	MCAAP	3B-13	0
9/11/2015	MCAAP	3B-14	0
9/11/2015	MCAAP	3B-15	0
9/11/2015	MCAAP	3B-16	1
9/11/2015	MCAAP	3B-2	3
9/11/2015	MCAAP	3B-3	3
9/11/2015	MCAAP	3B-4	0
9/11/2015	MCAAP	3B-5	1
9/11/2015	MCAAP	3B-6	1
9/11/2015	MCAAP	3B-7	1
9/11/2015	MCAAP	3B-8	1
9/11/2015	MCAAP	3B-9	7
9/12/2015	JC	RS-1	0
9/12/2015	JC	RS-2	0
9/12/2015	MCAAP	2A-C	0
9/12/2015	MCAAP	2B-1	0
9/12/2015	MCAAP	2B-10	0
9/12/2015	MCAAP	2B-11	0

9/12/2015	MCAAP	2B-12	0
9/12/2015	MCAAP	2B-13	0
9/12/2015	MCAAP	2B-14	1
9/12/2015	MCAAP	2B-15	0
9/12/2015	MCAAP	2B-16	0
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9/12/2015	MCAAP	2B-3	0
9/12/2015	MCAAP	2B-4	0
9/12/2015	MCAAP	2B-5	0
9/12/2015	MCAAP	2B-6	0
9/12/2015	MCAAP	2B-7	1
9/12/2015	MCAAP	2B-8	0
9/12/2015	MCAAP	2B-9	2
9/12/2015	MCAAP	3A-C	0
9/12/2015	MCAAP	3B-1	0
9/12/2015	MCAAP	3B-10	5
9/12/2015	MCAAP	3B-11	0
9/12/2015	MCAAP	3B-12	0
9/12/2015	MCAAP	3B-13	0
9/12/2015	MCAAP	3B-14	2
9/12/2015	MCAAP	3B-15	2
9/12/2015	MCAAP	3B-16	1
9/12/2015	MCAAP	3B-2	1
9/12/2015	MCAAP	3B-3	1
9/12/2015	MCAAP	3B-4	0
9/12/2015	MCAAP	3B-5	1
9/12/2015	MCAAP	3B-6	0
9/12/2015	MCAAP	3B-7	2
9/12/2015	MCAAP	3B-8	4
9/12/2015	MCAAP	3B-9	3
9/13/2015	JC	RS-1	0
9/13/2015	JC	RS-2	0
9/13/2015	MCAAP	2A-C	0
9/13/2015	MCAAP	2B-1	0
9/13/2015	MCAAP	2B-10	0
9/13/2015	MCAAP	2B-11	1
9/13/2015	MCAAP	2B-12	0

9/13/2015	MCAAP	2B-13	1
9/13/2015	MCAAP	2B-14	0
9/13/2015	MCAAP	2B-15	0
9/13/2015	MCAAP	2B-16	0
9/13/2015	MCAAP	2B-2	0
9/13/2015	MCAAP	2B-3	0
9/13/2015	MCAAP	2B-4	0
9/13/2015	MCAAP	2B-5	0
9/13/2015	MCAAP	2B-6	0
9/13/2015	MCAAP	2B-7	0
9/13/2015	MCAAP	2B-8	0
9/13/2015	MCAAP	2B-9	1
9/13/2015	MCAAP	3A-C	0
9/13/2015	MCAAP	3B-1	0
9/13/2015	MCAAP	3B-10	0
9/13/2015	MCAAP	3B-11	0
9/13/2015	MCAAP	3B-12	0
9/13/2015	MCAAP	3B-13	0
9/13/2015	MCAAP	3B-14	0
9/13/2015	MCAAP	3B-15	1
9/13/2015	MCAAP	3B-16	0
9/13/2015	MCAAP	3B-2	0
9/13/2015	MCAAP	3B-3	0
9/13/2015	MCAAP	3B-4	0
9/13/2015	MCAAP	3B-5	0
9/13/2015	MCAAP	3B-6	0
9/13/2015	MCAAP	3B-7	2
9/13/2015	MCAAP	3B-8	1
9/13/2015	MCAAP	3B-9	0
9/18/2015	JC	RS-1	0
9/18/2015	JC	RS-2	0
9/18/2015	MCAAP	1A-1	1
9/18/2015	MCAAP	1A-10	0
9/18/2015	MCAAP	1A-11	0
9/18/2015	MCAAP	1A-12	0
9/18/2015	MCAAP	1A-13	0
9/18/2015	MCAAP	1A-14	0

9/18/2015	MCAAP	1A-15	0
9/18/2015	MCAAP	1A-16	0
9/18/2015	MCAAP	1A-2	1
9/18/2015	MCAAP	1A-3	0
9/18/2015	MCAAP	1A-4	0
9/18/2015	MCAAP	1A-5	0
9/18/2015	MCAAP	1A-6	0
9/18/2015	MCAAP	1A-7	0
9/18/2015	MCAAP	1A-8	0
9/18/2015	MCAAP	1A-9	1
9/18/2015	MCAAP	1B-C	0
9/18/2015	MCAAP	3A-1	0
9/18/2015	MCAAP	3A-10	1
9/18/2015	MCAAP	3A-11	0
9/18/2015	MCAAP	3A-12	1
9/18/2015	MCAAP	3A-13	0
9/18/2015	MCAAP	3A-14	0
9/18/2015	MCAAP	3A-15	0
9/18/2015	MCAAP	3A-16	2
9/18/2015	MCAAP	3A-2	0
9/18/2015	MCAAP	3A-3	0
9/18/2015	MCAAP	3A-4	1
9/18/2015	MCAAP	3A-5	0
9/18/2015	MCAAP	3A-6	2
9/18/2015	MCAAP	3A-7	0
9/18/2015	MCAAP	3A-8	1
9/18/2015	MCAAP	3A-9	0
9/18/2015	MCAAP	3B-C	2
9/19/2015	JC	RS-1	0
9/19/2015	JC	RS-2	0
9/19/2015	MCAAP	1A-1	1
9/19/2015	MCAAP	1A-10	1
9/19/2015	MCAAP	1A-11	0
9/19/2015	MCAAP	1A-12	0
9/19/2015	MCAAP	1A-13	0
9/19/2015	MCAAP	1A-14	0
9/19/2015	MCAAP	1A-15	0

9/19/2015	MCAAP	1A-16	0
9/19/2015	MCAAP	1A-2	1
9/19/2015	MCAAP	1A-3	0
9/19/2015	MCAAP	1A-4	0
9/19/2015	MCAAP	1A-5	1
9/19/2015	MCAAP	1A-6	0
9/19/2015	MCAAP	1A-7	0
9/19/2015	MCAAP	1A-8	0
9/19/2015	MCAAP	1A-9	0
9/19/2015	MCAAP	1B-C	0
9/19/2015	MCAAP	3A-1	0
9/19/2015	MCAAP	3A-10	0
9/19/2015	MCAAP	3A-11	0
9/19/2015	MCAAP	3A-12	0
9/19/2015	MCAAP	3A-13	3
9/19/2015	MCAAP	3A-14	0
9/19/2015	MCAAP	3A-15	0
9/19/2015	MCAAP	3A-16	1
9/19/2015	MCAAP	3A-2	0
9/19/2015	MCAAP	3A-3	3
9/19/2015	MCAAP	3A-4	2
9/19/2015	MCAAP	3A-5	1
9/19/2015	MCAAP	3A-6	0
9/19/2015	MCAAP	3A-7	0
9/19/2015	MCAAP	3A-8	1
9/19/2015	MCAAP	3A-9	1
9/19/2015	MCAAP	3B-C	3
9/20/2015	JC	RS-1	0
9/20/2015	JC	RS-2	0
9/20/2015	MCAAP	1A-1	0
9/20/2015	MCAAP	1A-10	0
9/20/2015	MCAAP	1A-11	0
9/20/2015	MCAAP	1A-12	0
9/20/2015	MCAAP	1A-13	0
9/20/2015	MCAAP	1A-14	0
9/20/2015	MCAAP	1A-15	0
9/20/2015	MCAAP	1A-16	0

9/20/2015	MCAAP	1A-2	0
9/20/2015	MCAAP	1A-3	0
9/20/2015	MCAAP	1A-4	0
9/20/2015	MCAAP	1A-5	0
9/20/2015	MCAAP	1A-6	1
9/20/2015	MCAAP	1A-7	0
9/20/2015	MCAAP	1A-8	0
9/20/2015	MCAAP	1A-9	0
9/20/2015	MCAAP	1B-C	0
9/20/2015	MCAAP	3A-1	0
9/20/2015	MCAAP	3A-10	0
9/20/2015	MCAAP	3A-11	0
9/20/2015	MCAAP	3A-12	0
9/20/2015	MCAAP	3A-13	1
9/20/2015	MCAAP	3A-14	0
9/20/2015	MCAAP	3A-15	0
9/20/2015	MCAAP	3A-16	0
9/20/2015	MCAAP	3A-2	0
9/20/2015	MCAAP	3A-3	0
9/20/2015	MCAAP	3A-4	0
9/20/2015	MCAAP	3A-5	0
9/20/2015	MCAAP	3A-6	0
9/20/2015	MCAAP	3A-7	1
9/20/2015	MCAAP	3A-8	0
9/20/2015	MCAAP	3A-9	0
9/20/2015	MCAAP	3B-C	1
9/25/2015	JC	RS-1	0
9/25/2015	JC	RS-2	0
9/25/2015	MCAAP	1A-C	0
9/25/2015	MCAAP	1B-1	0
9/25/2015	MCAAP	1B-10	0
9/25/2015	MCAAP	1B-11	0
9/25/2015	MCAAP	1B-12	0
9/25/2015	MCAAP	1B-13	0
9/25/2015	MCAAP	1B-14	0
9/25/2015	MCAAP	1B-15	0
9/25/2015	MCAAP	1B-16	0

9/25/2015	MCAAP	1B-2	0
9/25/2015	MCAAP	1B-3	0
9/25/2015	MCAAP	1B-4	0
9/25/2015	MCAAP	1B-5	1
9/25/2015	MCAAP	1B-6	0
9/25/2015	MCAAP	1B-7	0
9/25/2015	MCAAP	1B-8	0
9/25/2015	MCAAP	1B-9	0
9/25/2015	MCAAP	3A-C	0
9/25/2015	MCAAP	3B-1	0
9/25/2015	MCAAP	3B-10	0
9/25/2015	MCAAP	3B-11	0
9/25/2015	MCAAP	3B-12	1
9/25/2015	MCAAP	3B-13	0
9/25/2015	MCAAP	3B-14	0
9/25/2015	MCAAP	3B-15	0
9/25/2015	MCAAP	3B-16	0
9/25/2015	MCAAP	3B-2	1
9/25/2015	MCAAP	3B-3	0
9/25/2015	MCAAP	3B-4	0
9/25/2015	MCAAP	3B-5	3
9/25/2015	MCAAP	3B-6	0
9/25/2015	MCAAP	3B-7	0
9/25/2015	MCAAP	3B-8	2
9/25/2015	MCAAP	3B-9	0
9/26/2015	JC	RS-1	0
9/26/2015	JC	RS-2	0
9/26/2015	MCAAP	1A-C	0
9/26/2015	MCAAP	1B-1	1
9/26/2015	MCAAP	1B-10	0
9/26/2015	MCAAP	1B-11	1
9/26/2015	MCAAP	1B-12	0
9/26/2015	MCAAP	1B-13	0
9/26/2015	MCAAP	1B-14	0
9/26/2015	MCAAP	1B-15	0
9/26/2015	MCAAP	1B-16	0
9/26/2015	MCAAP	1B-2	0

9/26/2015	MCAAP	1B-3	0
9/26/2015	MCAAP	1B-4	0
9/26/2015	MCAAP	1B-5	0
9/26/2015	MCAAP	1B-6	0
9/26/2015	MCAAP	1B-7	0
9/26/2015	MCAAP	1B-8	1
9/26/2015	MCAAP	1B-9	0
9/26/2015	MCAAP	3A-C	1
9/26/2015	MCAAP	3B-1	2
9/26/2015	MCAAP	3B-10	0
9/26/2015	MCAAP	3B-11	0
9/26/2015	MCAAP	3B-12	1
9/26/2015	MCAAP	3B-13	1
9/26/2015	MCAAP	3B-14	0
9/26/2015	MCAAP	3B-15	0
9/26/2015	MCAAP	3B-16	0
9/26/2015	MCAAP	3B-2	0
9/26/2015	MCAAP	3B-3	0
9/26/2015	MCAAP	3B-4	0
9/26/2015	MCAAP	3B-5	3
9/26/2015	MCAAP	3B-6	0
9/26/2015	MCAAP	3B-7	0
9/26/2015	MCAAP	3B-8	1
9/26/2015	MCAAP	3B-9	0
9/27/2015	JC	RS-1	0
9/27/2015	JC	RS-2	0
9/27/2015	MCAAP	1A-C	1
9/27/2015	MCAAP	1B-1	2
9/27/2015	MCAAP	1B-10	0
9/27/2015	MCAAP	1B-11	0
9/27/2015	MCAAP	1B-12	0
9/27/2015	MCAAP	1B-13	0
9/27/2015	MCAAP	1B-14	0
9/27/2015	MCAAP	1B-15	0
9/27/2015	MCAAP	1B-16	3
9/27/2015	MCAAP	1B-2	0
9/27/2015	MCAAP	1B-3	0

9/27/2015	MCAAP	1B-4	0
9/27/2015	MCAAP	1B-5	0
9/27/2015	MCAAP	1B-6	0
9/27/2015	MCAAP	1B-7	0
9/27/2015	MCAAP	1B-8	0
9/27/2015	MCAAP	1B-9	0
9/27/2015	MCAAP	3A-C	0
9/27/2015	MCAAP	3B-1	0
9/27/2015	MCAAP	3B-10	1
9/27/2015	MCAAP	3B-11	0
9/27/2015	MCAAP	3B-12	1
9/27/2015	MCAAP	3B-13	1
9/27/2015	MCAAP	3B-14	0
9/27/2015	MCAAP	3B-15	0
9/27/2015	MCAAP	3B-16	1
9/27/2015	MCAAP	3B-2	0
9/27/2015	MCAAP	3B-3	0
9/27/2015	MCAAP	3B-4	0
9/27/2015	MCAAP	3B-5	5
9/27/2015	MCAAP	3B-6	0
9/27/2015	MCAAP	3B-7	0
9/27/2015	MCAAP	3B-8	1
9/27/2015	MCAAP	3B-9	2

VITA

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Doctor of Philosophy

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