



**Hancock
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*A Division of Hancock Timber Resource Group,
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Evans Valley mesocarnivore surveys in the Klamath Mountains, Jackson and Josephine County, Oregon



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This study was intended to investigate the presence of mesocarnivores, primarily fisher, within a portion of the Klamath Mountains of southern Oregon. The study was conducted by W.M. Beaty & Associates under a contract with Hancock Forest Management. W.M. Beaty & Associates provided personnel, digital cameras, bait, field survey supplies, conducted the surveys and completed this report.

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ABSTRACT

Due to the ecological importance of mesocarnivores surveys were conducted to determine the presence of mesocarnivores on Hancock Forest Management managed forestlands in a portion of the Klamath Mountains of southern Oregon. Thirty-four baited camera stations were surveyed within 17 sampling units encompassing 44,242 acres or approximately 69 square miles. The mean number of operational days that camera stations were functional was 24 days. Surveys detected 19 different species including 16 mammals and 3 bird species. Only four mesocarnivores were detected and no fisher were detected. The combination of bobcat, gray fox and mountain lion, all species known to be in direct competition with fisher, occurred at 79% of camera stations. When combined with black bear detections, 94% of camera stations detected a direct intraguild or apex competitor. We believe intraguild or apex predator competition or interference appears high within the study area and may have contributed to not detecting fisher.

1.0 INTRODUCTION

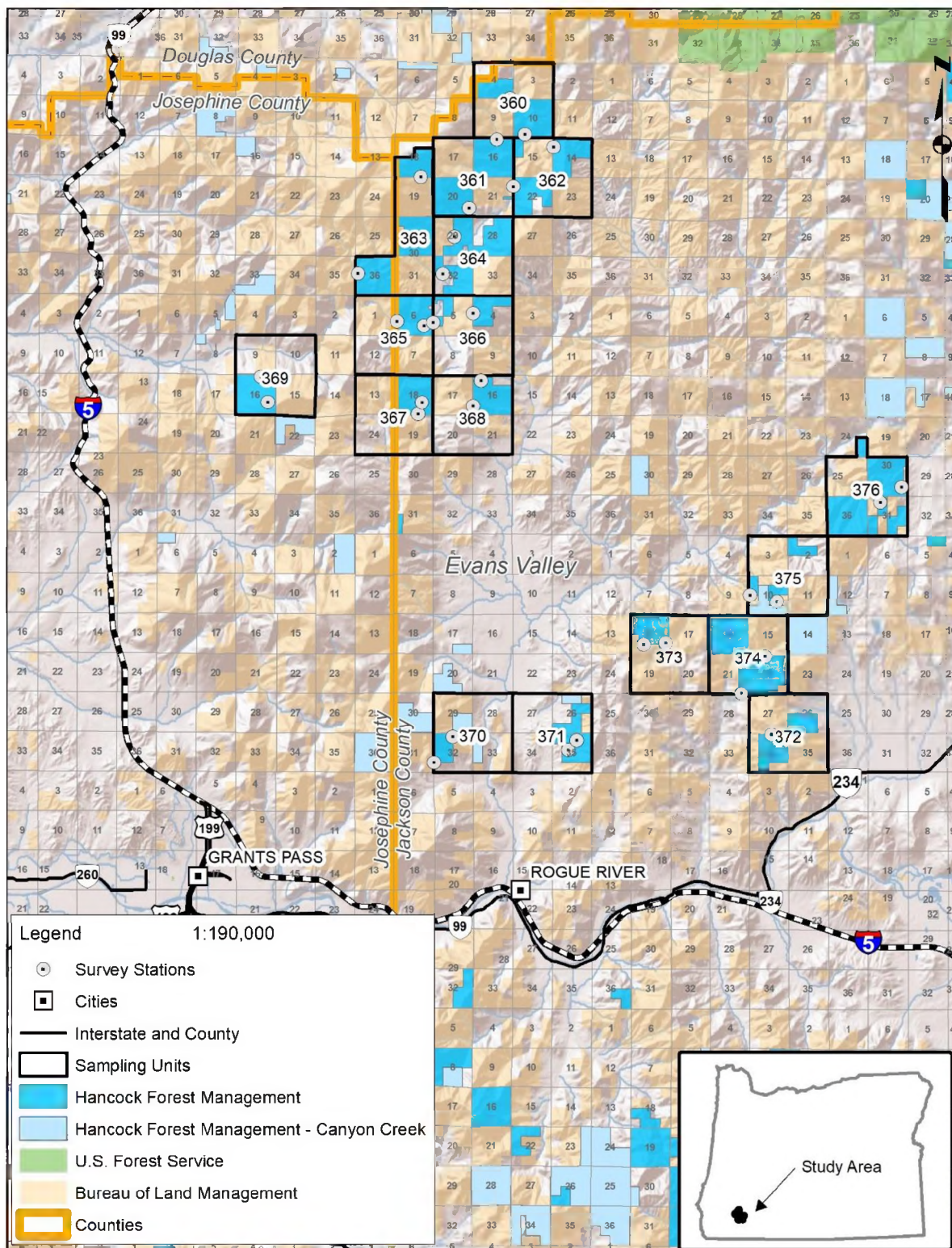
Hancock Forest Management (HFM) manages privately owned forestland in Douglas, Jackson, Josephine and Klamath Counties, Oregon. The general management goal of HFM is to maintain and enhance the value of the land and manage their properties as healthy natural areas that provide aesthetic, recreational, wildlife and community values. Mesocarnivores serve an important ecological role in western coniferous forests. This study was intended to investigate the presence of mesocarnivores, primarily fisher, within the HFM managed forestlands in a portion of the Klamath Mountains of southern Oregon.

Mesocarnivores are typically more numerous and represent a wide diversity of species as compared to large carnivores which are typically the apex species of their ecological communities (Roemer et al. 2009). While the distribution of fisher within the Klamath Mountains of southern Oregon is not well documented, fisher have been detected in portions of the southern Cascades (Farber and Nicolls 2015) and Klamath Mountains of Southern Oregon Mountains (Moriarty et al. 2016, Nicolls and Farber 2016). These recent detections in the Klamath Mountains, south of both Interstate 5 and the Rogue River, are now considered the range extent of fisher. This study lies north and outside the current known range of fisher.

2.0 ENVIRONMENT

The study area lies west of Medford and northeast of Grants Pass, Oregon within the Klamath Mountains of southern Oregon (Figure 1). The Klamath Mountains province is bounded on the south by the Sacramento Valley, west by the Pacific Ocean, and on the east by the Cascades Mountains and north by the coast ranges (Thorson et al. 2003). They have a varied geology, with substantial areas of serpentine and marble. The Mediterranean climate is characterized by moderately cold winters with heavy snowfall and warm, dry summers with limited rainfall. Within the study area elevations range from 420 feet (128 meters) along the Rogue River to 5,130 feet (1564 meters) on the highest peaks. Annual precipitation within the study area, from nomographs, range from 40 to 62 inches (102 to 157 cm) in the study area and decreases from west to east. As a result of the geology, soil types and climate the Klamath Mountains support a large diversity of confers as well as a variety of fish and wildlife species.

The study area encompasses approximately 44,242 acres or approximately 69 square miles of forestlands. Land ownership in the study area includes; HFM managed forestlands, 17,629 acres (40%), Bureau of Land Management, 19,182 acres (43%) and other private ownerships, 7,431 acres (17%). While the study area is comprised of a mix of private and public ownership, all camera stations occurred on HFM managed forestlands (Figure 1).

Figure 1 Study Area

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Within the study area, elevation, aspects, geology and disturbance patterns have created three distinct vegetation patterns: mixed evergreen zone, mixed conifer zone and the white fir zone (Franklin and Dyrness 1973). At lower elevations in the study area the mixed-evergreen zone includes predominant tree species of Douglas-fir (*Pseudotsuga menziesii*) Tan-Oak (*Notholithocarpus densiflorus*), Madrone (*Arbutus menziesii*), canyon live oak (*Quercus chrysolepis*), ponderosa pine (*Pinus ponderosa*), sugar pine (*Pinus lambertiana*). The mixed-conifer zone includes predominant tree species of Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*), sugar pine (*Pinus lambertiana*), white fir (*Abies concolor*) and incense-cedar (*Libocedrus decurrens*). Within the highest elevation areas is the white fir zone, the predominant tree species include white fir and incense-cedar with an occasional noble fir (*Abies procera*) and grand fir (*Abies monticola*).

3.0 METHODS

The mesocarnivore surveys were conducted following a modified Zielinski and Kucera (1995) protocol. The study area was divided into 17 four-square mile sampling units (Figure 1). The goal of the sampling protocol was to maximize the probability of detecting mesocarnivores, specifically fisher, while minimizing multiple detections of the same animal (Zielinski and Kucera 1995). Each four-square mile sampling unit had two baited digital camera stations (hereafter, referred as "camera stations"). Camera stations were selected (i.e. locations were not randomly located) within sampling units as recommended in Zielinski and Kucera (1995). The selection of camera station locations focused on areas likely to detect mesocarnivores, including stream riparian areas and ridge top locations (Buck et al. 1983, Seglund 1995, Swiers and Powell 2010).

As recommend by Zielinski and Kucera (1995) and Slauson et al. (2009), the goal was to conduct surveys at each sampling station during the fall and winter periods for a minimum of 28 days. When camera stations did not operate during the previous 7-day sampling period, either due to extreme weather conditions or equipment malfunctions, an additional 7-day period was added. Cameras and bait were examined every 7 days and bait was replaced as necessary. Each camera station was baited with a minimum of one piece of raw chicken and two cans of cat food within a chicken wire basket. No additional olfactory attractants or visual attractants were used as mesocarnivores can be readily detected with or without additional attractants (Farber and Schwartz 2008, Swiers and Powell 2010). The basket was placed one half to one meter from the base of the tree to allow all species to be attracted to the station. A goal was to aim the camera so that the base of the tree and bait was included in the camera frame. Each camera was placed within four meters of the bait to ensure recording of photographs for each motion event.

We used Moultrie GameSpy Digital Model D55 cameras and Model D55-IRXT (Appendix A). This model has a digital camera imbedded within a protective plastic case. The sensor units,

according to the manufacturers, are a “passive infrared sensor” or a motion detection unit. The cameras are set to record the date and time for each photograph, taking three photographs for every motion event and a minimum one-minute delay between motion events.

We recorded physical and environmental conditions found at each camera station. We recorded legal location, landowner, elevation, aspect, slope and temperature. GPS coordinates were recorded for all camera station locations and are listed in Appendix B.

4.0 RESULTS

Surveys were conducted within all 17 sampling units with a total of 34 camera stations (Figure 2). The mean elevation of camera stations within the study area was 2,617 feet (798 m) and ranged from 1,581 feet (482 m) to 4,237 feet (1,292 m). Stations occurred primarily on south and east aspects (76%), but occurred on all four aspect categories including: 9% North (315° to 45°), 35% East (45° to 135°), 41% South (135° to 225°), and 15% West (225° to 315°). The mean slope between all survey stations was 37% and ranged from 3% to 85%.

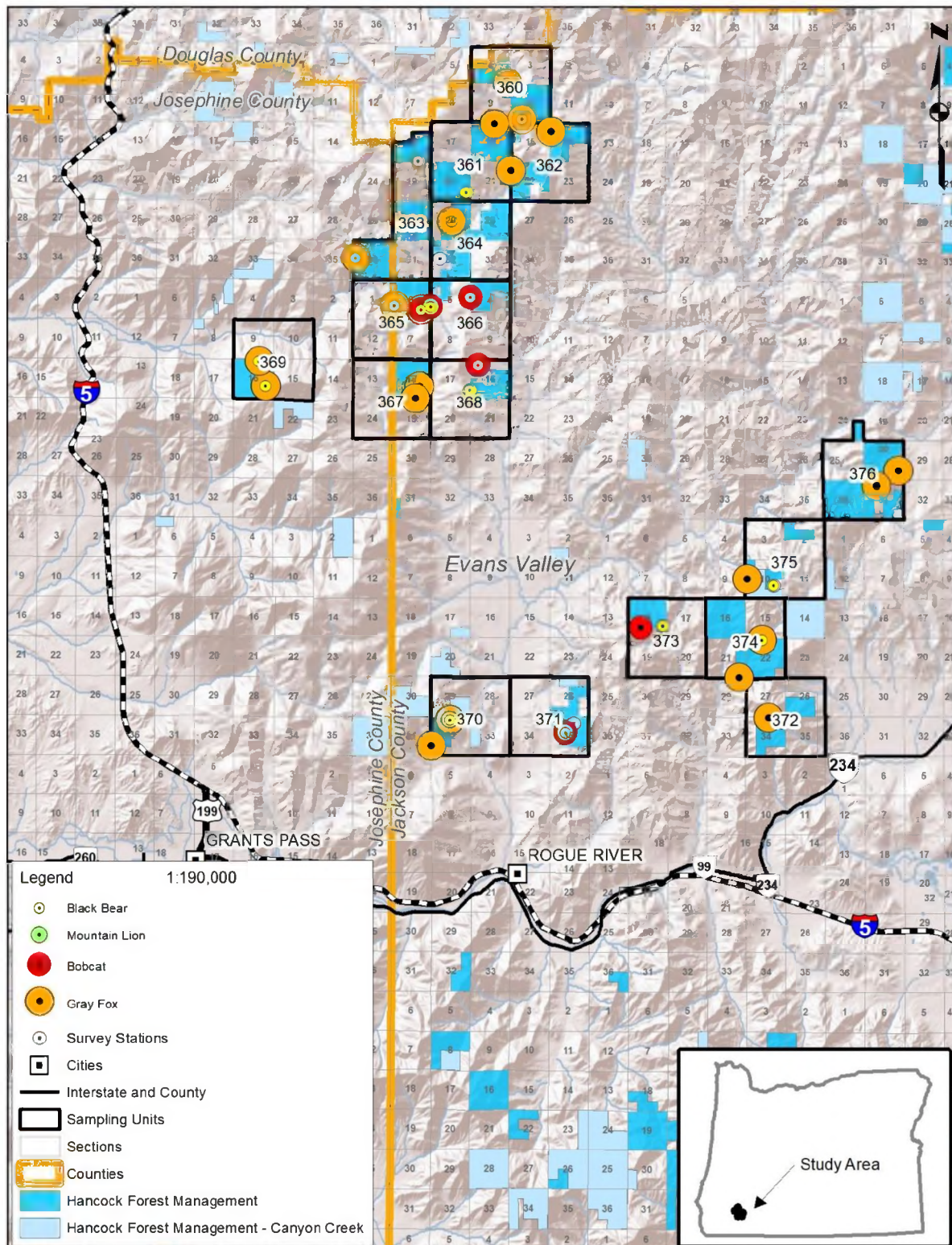
Wildlife Species Detected

The camera stations detected 19 different species including 16 mammals and 3 bird species (Table 1). Of the 16 mammals, only 4 mesocarnivore species were detected and fisher was not detected. Intraguild competitors like bobcat and gray fox were detected at six and twenty one camera stations, respectively, and the mean days to first detection of mesocarnivores varied by species (Table 2).

Sampling Days and Survey Efficiency

Surveys were completed during two 28 day sampling periods in the fall and winter of 2016. The northwestern portion of the study area was surveyed beginning on October 3rd and the southeastern portion began on November 8th, 2016 (Figure 2, Appendix B). The mean number of days that cameras were deployed at each station was 30 days and mean operational days (i.e. days where the camera and bait were functioning to protocol) was 24 days. Operational days ranged from 13 to 30 days. Forty percent of camera stations and 94% of sampling units were operational equal to or greater than the protocol recommended 28 days. Camera stations were not always operational primarily due to black bear or gray fox damage to the bait, camera, or both. Black bear was detected at 19 of 34 or 56% of the camera stations, and gray fox at 21 of 34 or 62% of the camera stations.

Figure 2 Location of two mesocarnivore and two carnivore species detected.



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Table 1 Species detected

Lifeform	Common Name	Scientific Name
Mesocarnivore (n=4)	Bobcat Gray fox Spotted skunk Striped skunk	<i>Felis rufus</i> <i>Urocyon cinereoargenteus</i> <i>Spilogale gracilis</i> <i>Mephitis mephitis</i>
Other Mammals (n=12)	Chipmunk sp. Black bear Bushy-tailed woodrat Deer mouse Domestic dog Douglas squirrel Flying squirrel Ground squirrel Mountain lion Black-tail deer Opossum Western gray squirrel	<i>Tamias sp.</i> <i>Ursus americanus</i> <i>Neotoma cinerea</i> <i>Peromyscus maniculatus</i> <i>Canis lupus familiaris</i> <i>Tamiasciurus douglasii</i> <i>Glaucomys sabrinus</i> <i>Spermophilus beecheyi</i> <i>Felis concolor</i> <i>Odocoileus hemionus</i> <i>Didelphis virginiana</i> <i>Sciurus griseus</i>
Birds (n=3)	Stellar's jay Grey jay Turkey	<i>Cyanocitta stelleri</i> <i>Perisoreus canadensis</i> <i>Meleagris gallopavo</i>

Table 2 Mesocarnivores detected

Species	Number of Stations with Detections	Mean Days to first detection	Median Days to first detection	+/- 1 SD
Bobcat	6	22.7	27	4.3
Gray fox	21	7.1	5	1.4
Spotted skunk	15	13.1	8	2.6
Striped skunk	4	17.8	18	5.6

5.0 DISCUSSION

One goal of this study was to determine fisher use of HFM managed forestland within the study area. Fisher have been previously detected on HFM managed forestlands in the Klamath Mountains of Southern Oregon (Nicolls and Farber 2016). In that study that occurred south of Interstate 5 and the Rogue River in what is now considered the range extent of fisher, they found that fisher occupied mid-seral, intensively managed forestlands. Even though our study area occurred within similar mid-seral, intensively managed forestlands, we did not detect fisher in our study area and confirmed that fisher do not currently occupy portions of the Klamath Mountains immediately north of Interstate 5 and the Rogue River.

Another goal of this study was to determine the distribution of other mesocarnivores in this portion of the Klamath Mountains. It has been suggested that intraguild competition between mesocarnivores may explain presence or absence, relative abundance and distribution of specific mesocarnivores (Gosselink et al. 2003, Major 1997, Roemer et al. 2009). In northern California, based on DNA taken from fisher killed by a predator, 60% were predated by bobcat and 33% by mountain lion (Wengert 2012). Based on these results, studies are on-going to better understand intraguild competition between mesocarnivores, specifically, bobcat and fisher (Wengert 2012). We detected several direct intraguild competitors including bobcat and gray fox and apex carnivores including mountain lion and black bear. The combination of bobcat, gray fox and mountain lion, all species known to be in direct competition with fisher, occurred at 27 of 34 or 79% of camera stations within the study area. When combined with black bear detections, 32 of 34 or 94% of camera stations detected a direct intraguild or apex competitor. We believe intraguild or apex predator competition or interference appears high within the study area and may have contributed to not detecting fisher.

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Appendix A: Digital Camera Types

Moultrie D55 Digital Camera



Moultrie D55-IRXT Digital Camera



Appendix B Evans Valley Digital Camera Stations (n=17)

Unit	Camera Station	UTM North	UTM East	Elevation (meters)	Start Date	End Date
360	360A	4730221	485894	982	10/3/2016	11/1/2016
	360B	4728761	486482	901	10/3/2016	11/1/2016
361	361A	4728564	485356	947	10/3/2016	11/2/2016
	361B	4725765	484223	875	10/4/2016	11/2/2016
362	362A	4728252	487666	1042	10/3/2016	11/1/2016
	362B	4726649	486021	848	10/3/2016	11/1/2016
363	363A	4727032	482251	1292	10/3/2016	11/1/2016
	363B	4723094	479686	793	10/3/2016	11/1/2016
364	364A	4724585	483620	832	10/3/2016	11/1/2016
	364B	4723071	483149	767	10/3/2016	11/2/2016
365	365A	4720959	482374	724	10/3/2016	11/8/2016
	365B	4721139	481283	715	10/3/2016	11/8/2016
366	366A	4721470	484387	866	10/3/2016	11/2/2016
	366B	4721086	482715	731	10/3/2016	11/1/2016
367	367A	4717829	482303	710	10/4/2016	11/2/2016
	367B	4717351	482137	709	10/4/2016	11/2/2016
368	368A	4717675	484380	871	10/4/2016	11/8/2016
	368B	4718703	484705	893	10/4/2016	11/8/2016
369	369A	4717835	476001	1106	10/4/2016	11/8/2016
	369B	4718871	475729	819	10/4/2016	11/8/2016
370	370A	4704177	483553	760	11/9/2016	12/13/2016
	370B	4703125	482788	532	11/9/2016	12/13/2016
371	371A	4704035	488617	555	11/8/2016	12/23/2016
	371B	4703649	488269	482	11/8/2016	12/13/2016
372	372A	4704264	496584	908	11/9/2016	12/19/2016
	372B	4704067	497153	874	11/9/2016	12/14/2016
373	373A	4707937	491370	870	11/9/2016	12/14/2016
	373B	4708015	492259	900	11/9/2016	12/14/2016
374	374A	4705932	495362	534	11/9/2016	12/14/2016
	374B	4707143	496325	628	11/9/2016	12/14/2016
375	375A	4709889	495702	761	11/8/2016	12/13/2016
	375B	4709706	496790	696	11/16/2016	12/14/2016
376	376A	4713754	501006	593	11/9/2016	12/13/2016
	376B	4714368	501880	625	11/9/2016	12/13/2016