# Technology Improves Odds in Battle to Control Rodents

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## Introduction

Controlling and monitoring a facility's rodent population can feel like the very definition of a rat race – an endless pursuit, though in this case, not a pointless one. Advancements in rodent detection have led to the development of electronic rodent monitoring systems that perform continuously and accurately. This article will discuss rodent control and the trademarked Motomco iQ traps powered by Bell Sensing Technologies.

## Background

### Rodent Risks and Traditional Control Measures

Modern poultry facilities provide an ideal habitat for many rodent species, such as the common house mouse (*Mus musculus*), the Norway rat (*Rattus norvegicus*) and the roof rat (*Rattus rattus*) **(Figures 1,2,3).** Layer facilities provide housing free of predators and an unlimited access to food and water. However, the relationship between property owners and the local rodent population is not symbiotic. Rodents can contaminate feed, damage property, and spread pathogens that affect people and poultry. Large rodent populations are associated with high rates of *Salmonella* infections in laying hen facilities and therefore pose a biosecurity risk to any flock.

Sanitation and rodent-proof construction are both means of prevention. Sanitation is focused on keeping the facility clean and unappealing to rodents looking for food and housing. Good sanitation practices include keeping feed storage locked up tight and cleaning spilled feed as soon as possible, as well as keeping the grass outside of the facility regularly mowed and free of debris.

**Figure 1.** House Mouse *(Mus musculus)*



**Figure 2.** Norway Rat *(Rattus norvegicus)*



**Figure 3.** Roof Rat *(Rattus rattus)*

The main goal of rodent-proof construction is to prevent rodents from entering the facility. Adding a perimeter of gravel around buildings is a simple way to discourage rodents from attempting to burrow in. For example, "install a strip of 1-inch-diameter (2.5 cm) or larger gravel laid in a band at least 2 feet (60 cm) wide and 1/2 foot (15 cm) deep" (Baker, 1994).

When rodent proofing a facility, it is important to remember a rodent's teeth curve back, so hard and slick materials work best for rodent proofing. Materials such as wood, rubber, and plastic should be avoided; use concrete, metal, or brick instead. If wood, rubber, or plastic must be used, avoid the presence of edges, which allow rodents to gnaw and create an opening.

If a rodent infestation already exists, focus first on trying to reduce the population size. The smaller the rodent population, the lower the chances of damage and spread of disease. Population reduction comes in two forms – traps and poison. Traps come in many shapes and sizes. If the rodent population is small, a snap trap may be more time-practical **(Figure 4).** Touching the trigger pad activates a snap trap. Snap traps are effective but require labor to set and maintain.

Multiple-capture live traps – also called curiosity traps – are a better alternative if the population size is larger. These traps aim to lure multiple rodents and do not allow them to escape. Curiosity traps do not require bait and can catch up to a dozen rodents in one round. It is recommended that multiple-capture live traps are maintained at least weekly. For best results, accurate capture logs are required.



**Figure 4.** Traditional snap trap

Bait stations with rodenticide are another common form of rodent reduction in facilities with defined infestations. A variety of rodenticides are available. Bait stations **(Figure 5)** reduce the risk of an accidental poisoning of nontarget species (livestock, wildlife, and/or companion animals) by protecting the bait. Dirt, dust, feces, and precipitation can affect the quality and limit the effectiveness of the bait within the station.



**Figure 5.** Traditional bait station.

Bait stations are very effective but can require considerable manpower to maintain, especially if a large number are in use. Keeping the bait stocked, fresh, and set requires labor. Recording the details on the amount of bait remaining in a station or how often a station is visited can be difficult if multiple employees are looking over multiple stations. This leads to inaccurate data and an ineffective rodent control plan.

Knowing the location of infestation, which stations are most frequented and which baits are old and need to be changed are factors crucial in controlling rodent population – and are important for meeting the requirements set by regulatory agencies. The U.S. Food and Drug Administration (FDA) rodent monitoring and corresponding record requirements are found in 21 CFR 118.4(c) and 118.10(a), respectively.

## Bell Sensing Technology

A number of rodent monitoring systems are available on the market, including those made by Motomco, which specializes in rodent control. Its parent company is Wisconsin-based Bell Laboratories, which calls itself the world's largest rodent control manufacturer.

Motomco sells trademarked products under its IQ line: Tomcat Titan iQ **(Figure 7),** Tomcat Bullet iQ **(Figure 8),** Tomcat Livecatch iQ **(Figure 9),** and Tomcat Rat Trap iQ **(Figure 10)**. According to the company, built-in sensing technology records rodent activity in a station **(Figure 6)**. That data can be accessed with a Bluetooth device and analyzed in a customized portal.
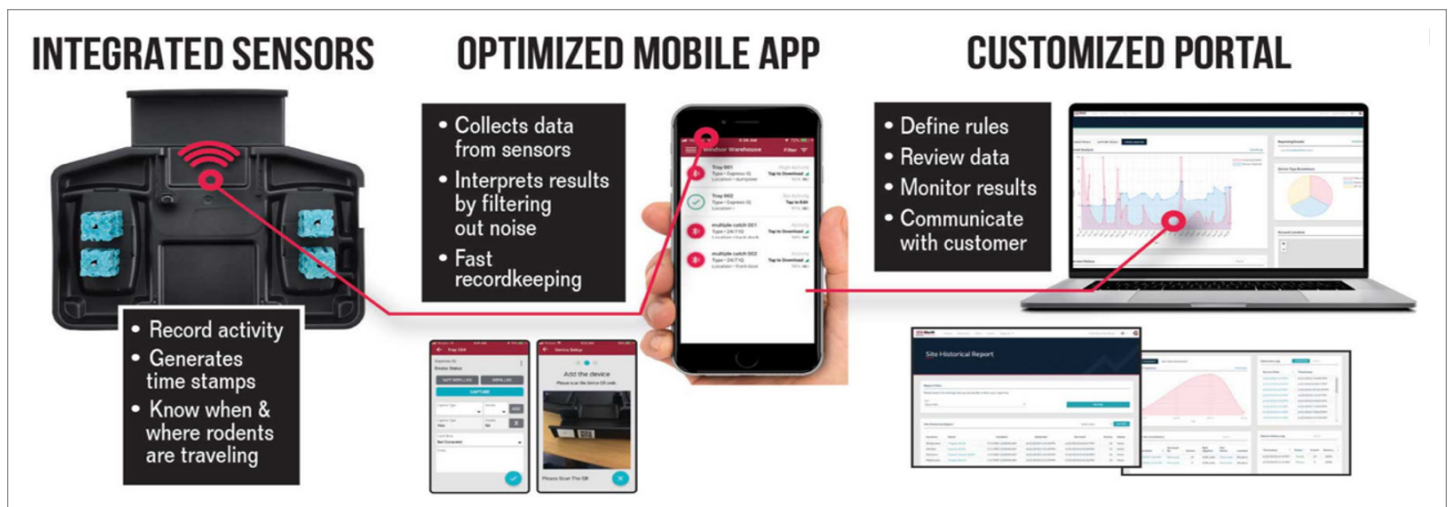


**Figure 6.** Bell Sensing Technology Information Flow

**Figure 7.** Tomcat Titan iQ



**Figure 8.** Tomcat Bullet iQ



**Figure 9.** Tomcat Livecatch iQ



**Figure 10.** Tomcat Rat Trap iQ

**1 mouse, 1 event: The sensor's role**

A Livecatch iQ records activity on top of the sensor as an "event." Once a mouse enters the trap and triggers an event, the sensor will not record another event for four hours. This prevents the same mouse from triggering multiple events and skewing the data.

## Case Study

A case study was performed at the Purdue University Animal Science Research and Education Center's (ASREC) poultry unit **(Figure 11).** The objective was to validate the use of Motomco iQ rodent monitoring products in poultry facilities. Twelve Tomcat Livecatch iQ traps were placed in the layer barn; 48 Tomcat Bullet iQ bait stations were placed across the Layer, Grower, and Management barns. This report will focus on results from the layer facility, which is labeled as Barn 1 in Figure 11. For a more in-depth look at the study, see the supplementary information. Data collected from the layer building includes two outputs: live-capture information and bait station activity. For both outputs, the focus is on comparing the accuracy and efficiency of traditional traps to the iQ traps.



**Figure 11.** Purdue University Animal Science Poultry Unit (1: Layer, 2: Management, 3: Grower)

## Layer Live Catch

The live catch study began on Oct. 20, 2021. Twelve Livecatch iQ rodent multi-catch traps and 12 traditional (non-iQ) multi-catch traps were placed and set up. During the next three months these 24 traps were checked every other week and serviced a total of nine times. The initial setup of the iQ live traps and connecting them to the iQ mobile app took 31 minutes.

Livecatch iQ traps record when a rodent enters and triggers the sensor. Once the sensor is activated, the activity is recorded by the trap as an "event." Once an event is recorded in the Livecatch iQ traps the sensor cannot record another event for four hours; this prevents the same mouse from continuing to record inaccurate events. A recorded event is not a 1:1 ratio in Livecatch iQ traps. If a mouse stays in a trap for more than four hours and avoids the glue trap, the same mouse can trigger a second event. On the other hand, if two mice enter at the same four-hour window, they will be recorded as just one event.

To service the trap, a technician walks through the building with a Bluetooth device that includes the Bell Sensing Technologies app. Once in range of

the Livecatch iQ trap, data will be downloaded. An example of a service report from a Livecatch iQ traps can be seen in **Figure 13.** The traps were set on 10/20/2021; the first service was not recorded until a week later (10/27/2021), as seen in **Figure 12.** On this date, the trend analysis highlights eight total events recorded across all 12 iQ traps.

The trend analysis shows a drop to just one event by the end of the trial. Figure 12 is looking at only the occurrence of events and not measuring true captures. A capture refers to any rodent stuck to the glue board within the traps. **Figure 14** shows the capture totals broken down by the individual trap. Each bar represents a date, and each color represents a different trap. We can see that layer live catch 002 (blue) was catching most of the mice in the last month of the trial. This information can be used to better target rodent populations. Once again, we see that the number dropped from the beginning to the end of the study. 10/27/2021 recorded six total catches; just one rodent capture was recorded on 1/27/2022.
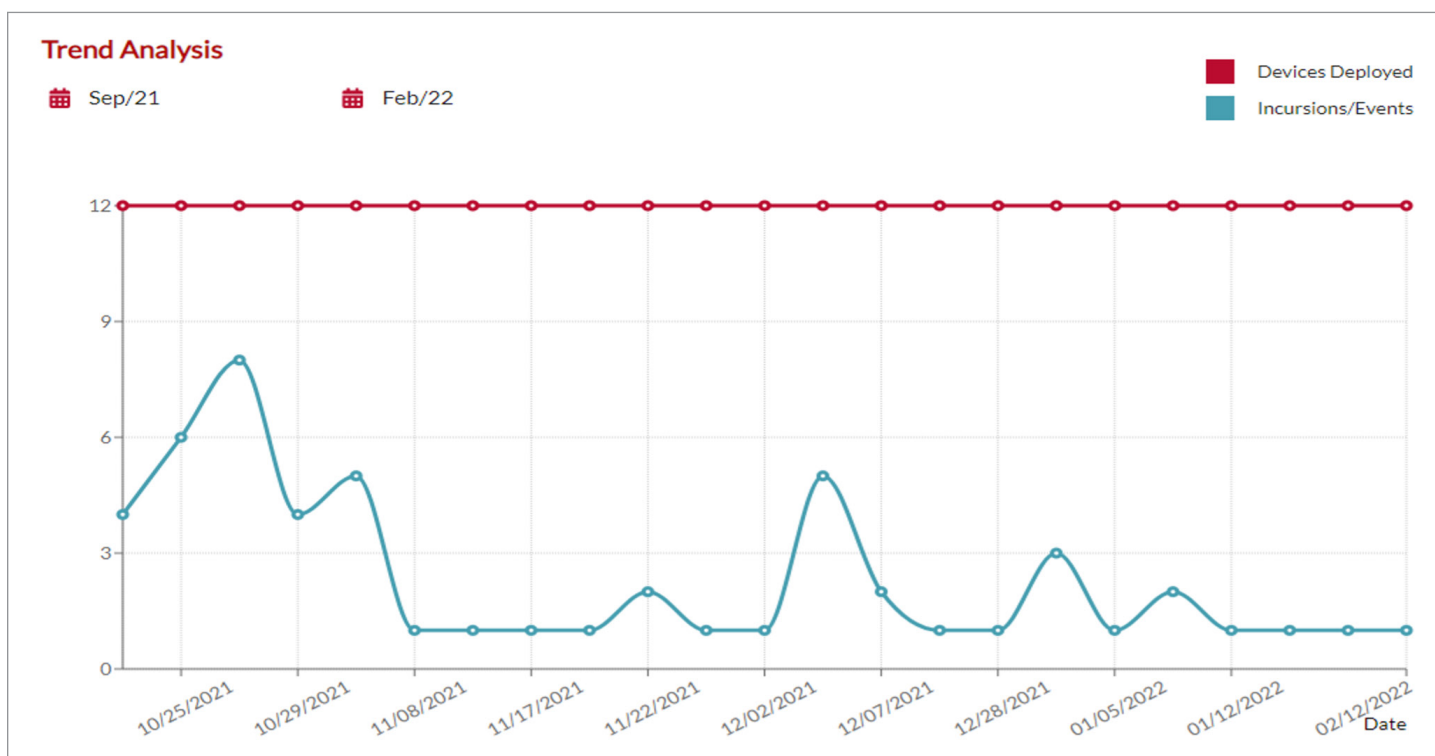


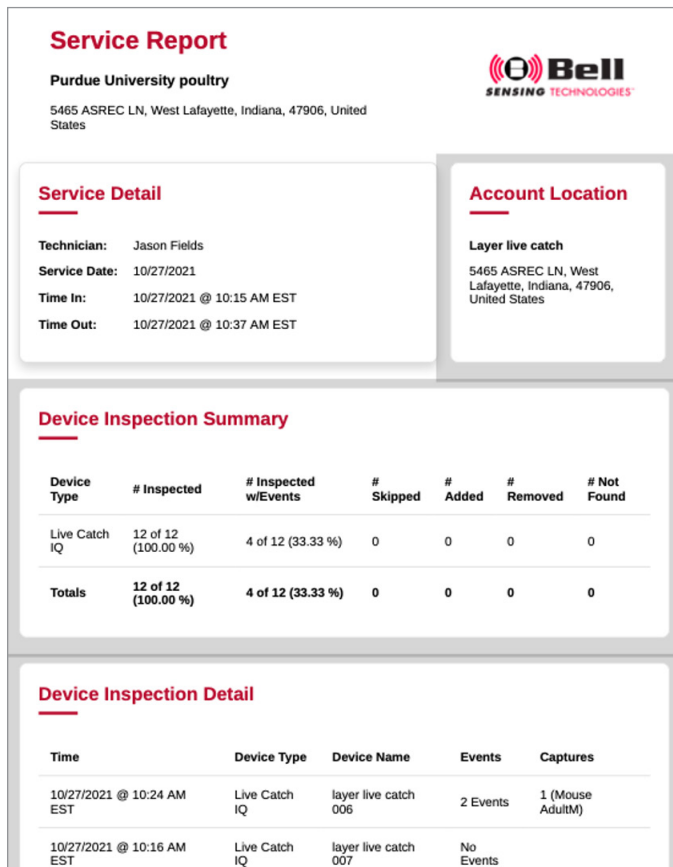**Figure 12.** Rodent Activity Layer Live Catch

**Figure 13.** Example Service Report

The Livecatch iQ traps provide more data than the traditional multi-catch live traps, but how do they compare when it comes to time savings? On average, the service time for 12 traditional manual traps was 10.5 minutes, compared to 5.4 minutes for Livecatch iQ **(Table 1)** – a time savings of roughly 49%. Also, total captures in the iQ traps were 20 compared to 5 in the traditional traps – a 400% increase in catch rate.

Overall, the Livecatch iQ traps provide more accurate data, which provides the ability to directly target the rodent population. The Livecatch iQ traps appear to save upward of 49% of maintenance time; in a facility with hundreds of traps, the saved time will add up quickly.

## Layer Bait Stations
The Bait Stations trial began on 10/06/2021. In this trial, 24 Bullet iQ Bait Stations (Figure 8) and 24 traditional bait stations (non iQ) were serviced 11 times over a four-month period. These traps were serviced every other week. The set-up of the Tomcat Bullet iQ Bait Station took 46 minutes. The set-up required 106 pieces of Hawk Bait Chunx, with an average bait application rate of 43.3 pieces per month. This data is recorded automatically by the Bullet iQBait Station. As seen in **Figure 15,** the iQ portal allows the user to record the bait name and active ingredient as well as the average bait refill per visit.
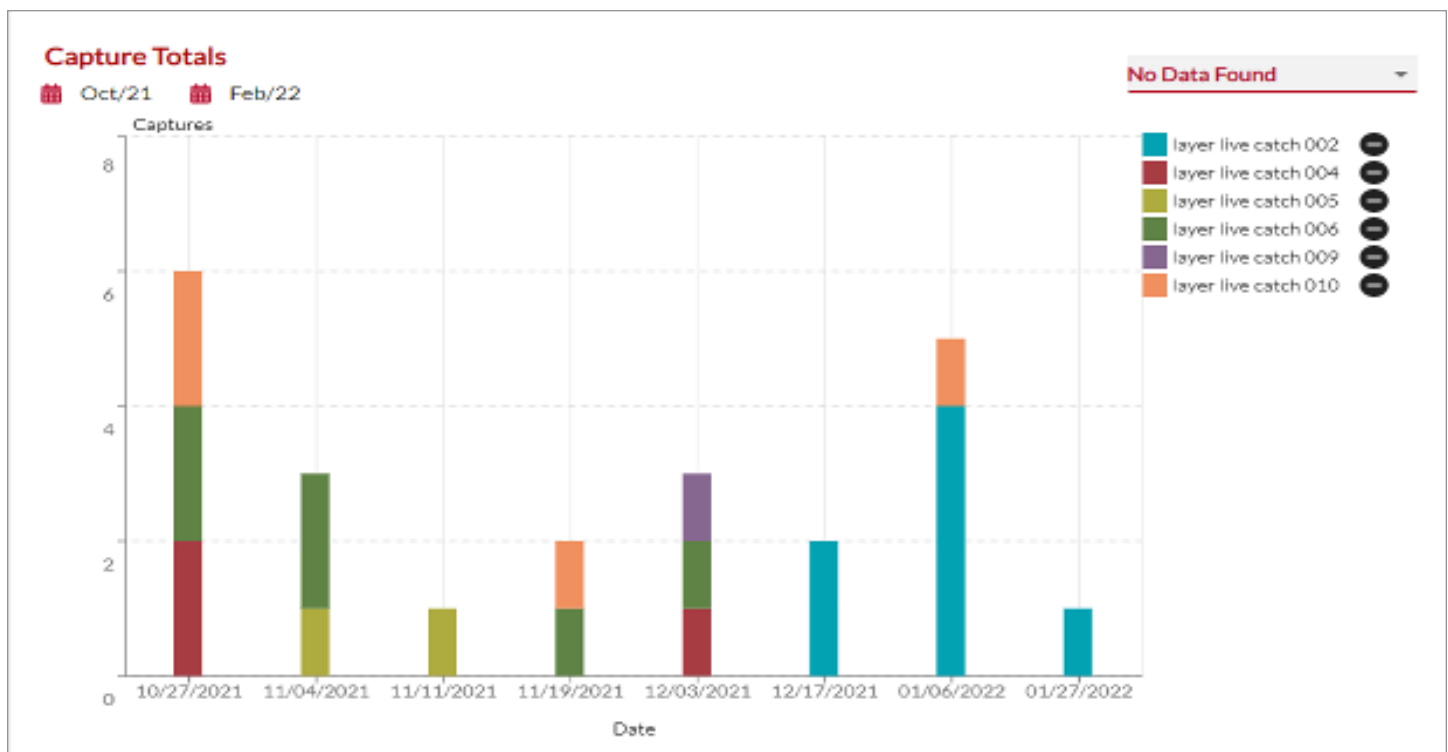


**Figure 14.** Rodent Activity Capture Totals Layer Live Catch

**Table 1.** Inspection time and capture totals: Layer live catch

| Date | Live Catch Unites Inspected | Manual Live Catch Inspection Time (mins) | Manual Captures | Livecatch iQ Inspection Time (mins) | iQ Captures |
|---|---|---|---|---|---|
| 10/27/2021 | 12 | 14 | 1 | 6 | 3 |
| 11/04/2021 | 12 | 6 | 1 | 4 | 3 |
| 11/11/2021 | 12 | 5 | 0 | 4 | 1 |
| 11/19/2021 | 12 | 13 | 1 | 6 | 2 |
| 12/03/2021 | 12 | 10 | 0 | 7 | 3 |
| 12/17/2021 | 12 | 11 | 0 | 4 | 2 |
| 01/06/2021 | 12 | 12 | 0 | 6 | 5 |
| 01/27/2021 | 12 | 13 | 2 | 6 | 1 |
| Average | 12 | 10.5 | Total: 5 | 5.4 | Total: 20 |



**Figure 15.** Layer Bait Used

**A 30-minute rule at bait station**

A Tomcat Bullet iQ Bait Station records activity on top of the sensor as an "event." If a mouse enters the trap and triggers an event, the sensor will not record another event for 30 minutes. This prevents the same mouse from triggering multiple events and skewing the data.
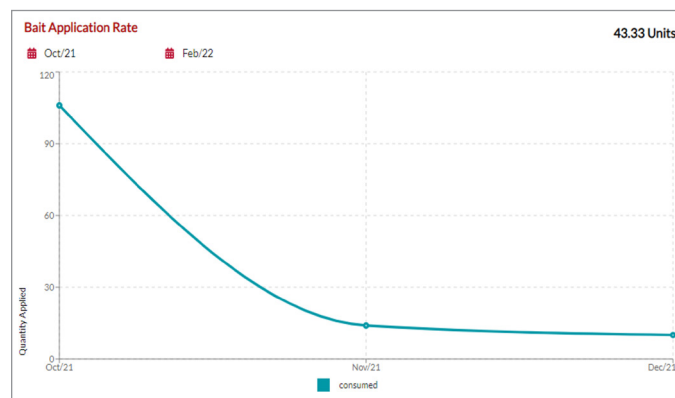
**Figure 16** shows the bait application rate in the iQ bait stations. The blue line represents the amount of bait consumed from October to December. Like the Livecatch iQ traps, the bait station records events. However, in a bait station an event looks a little different. An event in the Tomcat Bullet iQ Bait Station is defined by activity on top of the sensor every 30 minutes. The stations have a capacitive sensor at the entrance – a touch sensor that records an event each time a mouse crosses the sensor when entering the trap. Just as an event in the livetrap does not directly correlate to the number of captures, the number of events in the bait station does not directly correlate to the number of mice that enter. If multiple mice enter at once they will be recorded as the same mouse, and if a single mouse stays in the station for more than 30 minutes, the station will record this mouse multiple times.

**Figure 17** shows the trends of rodent activity over the course of the trial. On 10/07/2021, when the bait stations were first deployed, 96 events were recorded. By the end of the four months, only one event was recorded. Figure 17 shows the total number of stations deployed in red; two stations were removed on 10/20/2021 due to technical issues.



**Figure 16.** Layer Bait Application Rate
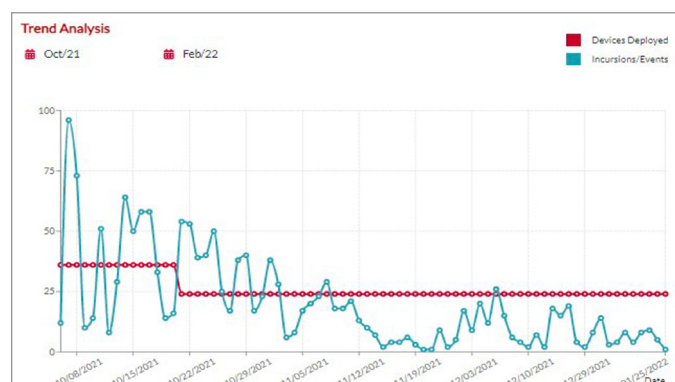


**Figure 17.** Trend Analysis of Rodent Activity

Just as with the iQ Live Catch trap, we can view the total number of events on an individual station basis. **Figure 18** shows the number of events by day. Each station is color coded for easy identification of which stations have the most activity. For example, the device "layer iQ hallway 3060" has a lot of event captures through October 2021 and an occasional event in December and February.

**Figure 19** highlights this to more detail as it pulls out the three most visited stations. The iQ portal allows the user to focus on the most active stations to develop appropriate baiting procedures.

Finally, what about inspection times? The average time to inspect all the traditional bait stations was 11.5 minutes; the average time for all the iQ bait stations was 10.8 minutes, a modest time savings of 6% **(Table 2).**

Manual inspections were available for only 8 of the 11 service visits completed, which highlights how inaccurate manual recording can be.

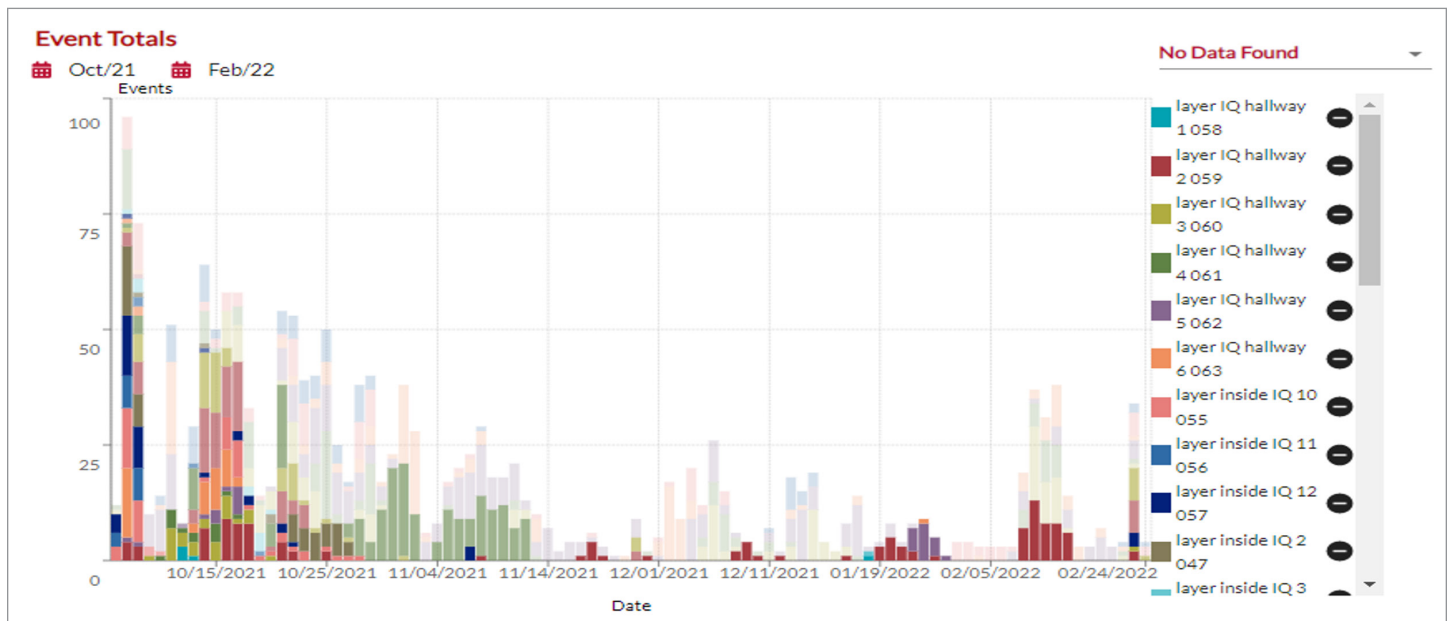For a deeper look at the Layer Bait Station Trial, see supplemental data in the appendix.



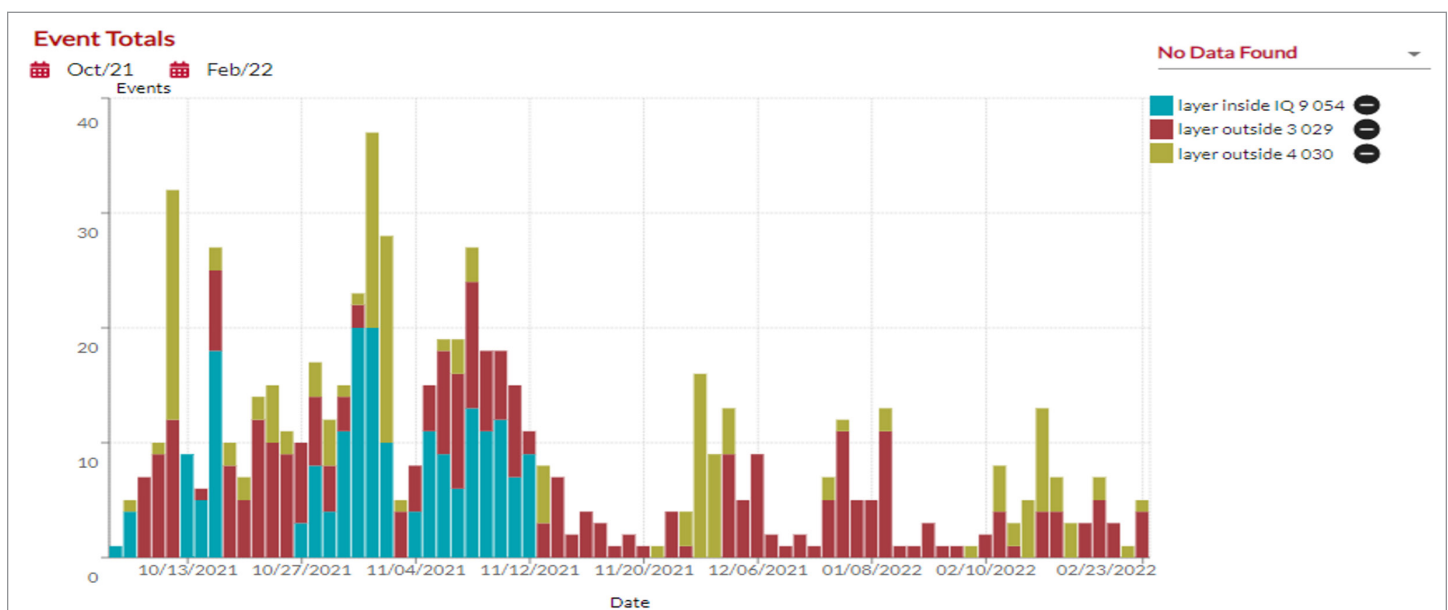**Figure 18.** Rodent Activity in Bait Stations



**Figure 19.** Three Most Active Bait Stations

**Table 2.** Comparison of inspection time of traditional vs iQ bait stations

| Date | Bait Stations Inspected | Manual Inspection Time (mins) | iQ Inspection Time (mins) |
|---|---|---|---|
| 10/27/2021 | 24 | 12 | 11 |
| 11/04/2021 | 24 | 5 | 11 |
| 11/11/2021 | 24 | 7 | 10 |
| 11/19/2021 | 24 | 19 | 8 |
| 12/03/2021 | 24 | 7 | 13 |
| 12/17/2021 | 24 | 19 | 14 |
| 01/06/2022 | 24 | 12 | 5 |
| 01/27/2022 | 24 | 11 | 14 |
| Average | | 11.5 | 10.8 |

## Trial Summary

In this study, use of Livecatch iQ traps reduced service time by 49% compared to traditional traps. Also, iQ traps resulted in a significant reduction of rodent activity across all locations, with an overall reduction in activity of 98.6% in three months. Newest updates to the iQ traps and bait stations portal provides the user information about hot spots in need of more traps and help identified where rodents were moving within each building. The iQ products pair with any Bluetooth-enabled smartphone or tablet and provides a report immediately after the service completion. One factor that could lead to the discrepancy in catching rate was that the iQ traps were brand new at the start of this study. New, clean traps would be more appealing to the rodents than the dirtier, well-used traditional traps. This case study was performed on a small facility with a relatively small rodent population, meaning these results could be skewed when applied to larger facilities. For a more detailed look at the entire trial, including a look at data from the other two buildings, see the appendix.

## Conclusion

Uncontrolled rodent populations can have negative effects on the welfare of a layer flock, weaken biosecurity practices, and cause costly deterioration to a facility's infrastructure. Traditional traps and baits stations have provided protection for many years but don't offer a time-stamped log of activity. In order to understand a facility's rodent infestation and to build a targeted rodent control plan, facility managers need ample time and accurate information. Newest advances in technology are bringing rodent control into the 21st century with Bluetooth rodent monitoring systems. Bluetooth-based traps/bait stations show promise in providing reduced service times and increased accuracy of data.

### FYI

**Q.** What types of devices do the iQ traps pair with?

**A.** Bluetooth technology-enabled cellphones or tablets interact with the fully integrated sensors and Bluetooth antenna in iQ bait stations and multi-catch units.

**Q.** How close must I be for the Bluetooth to connect?

**A.** 30-100 feet.

**Q.** What if a trap has no recorded events?

**A.** This trap will display as a green check mark in the app with a timestamp. This allows for additional time savings by allowing you to skip traps with no activity.

**Q.** Do I have to worry about losing any data?

**A.** All data collection while on site automatically saves and stores to the cloud/web portal. With iQ products, data cannot be changed after the service visit is complete. This verifies that the audit history is accurate for all baiting and trapping activity since the previous visit.

## Sources
Baker, Rex O, et al. Rodent-proof construction and exclusion methods, July 1994, https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1025&context=icwdmhandbook.

https://bellsensing.com/

https://extension.okstate.edu/factsheets/rodent-control-in-the-poultry-house.html

https://extension.entm.purdue.edu/publications/ADM-3.

https://www.hyline.com/Upload/Resources/RODENT%20ENG.pdf

https://www.fda.gov/media/86276/download

## Appendix

## Bell Sensing Technologies: Tomcat Bullet iQ & Tomcat Live Catch iQ Trial

### Summary:

- o Trial demonstrated a 49%-time savings when using iQ products vs manually checking live-catch traps in layer facilities
- o Trial demonstrated a significant reduction in rodent activity in all poultry buildings
- o Overall average reduction in rodent activity (events) across all four accounts found to be ~ 98.6%
  - Layer-Live Catch: 10 events down to 1 event over 3-month time-period
  - Grower: 45 events down to 1 event over a 4-month time-period
  - Layer: 96 events down to 1 event over a 4-month time-period
  - Management 2: 130 events down to 1 event over a 4-month time-period
- o Trial identified significantly higher catch rates using iQ products in live catch devices over a 3-month period. Live Catch iQ trap had 18 captures vs 5 captures with manual inspection
- o iQ products identified the need for more placements to reduce rodent populations vs. not using iQ products
- o Trial identified where rodents were moving in each building
- o System provides automated data collection during weekly checks at layer facilities
  - Ease of use of the system
    - Use with any Bluetooth enabled smartphone or tablet
    - Automated service reports sent immediately with email upon service completion
  - Proof of service: Automated timestamps when traps are reviewed by technician that cannot fake a Bluetooth connection
  - Accurate reporting: data collected in the web portal provided more efficient than using pen and paper
- All four barn locations showing significant reduction in rodent activity over course of the trial
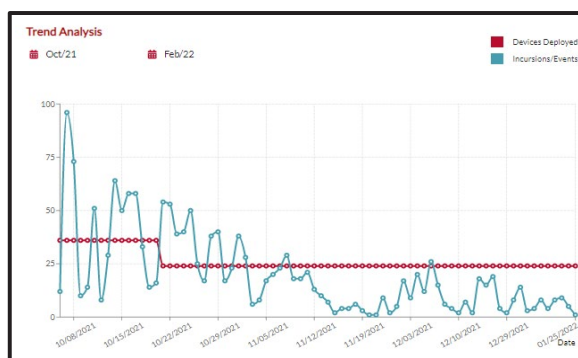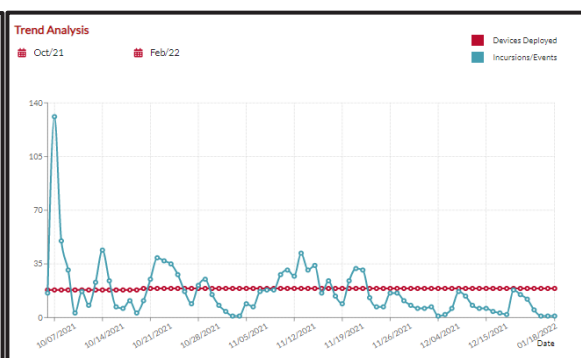
## Grower
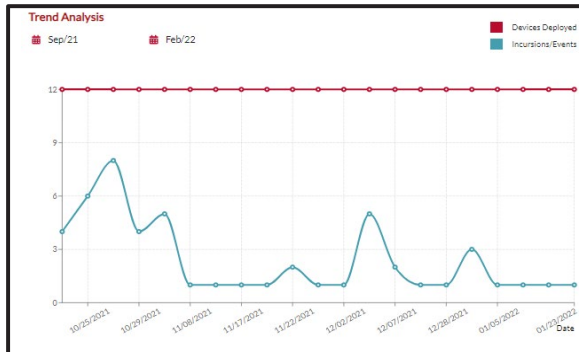


## Layer Live Catch
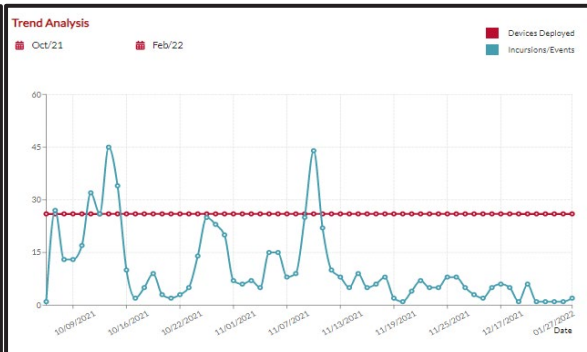


## Layer



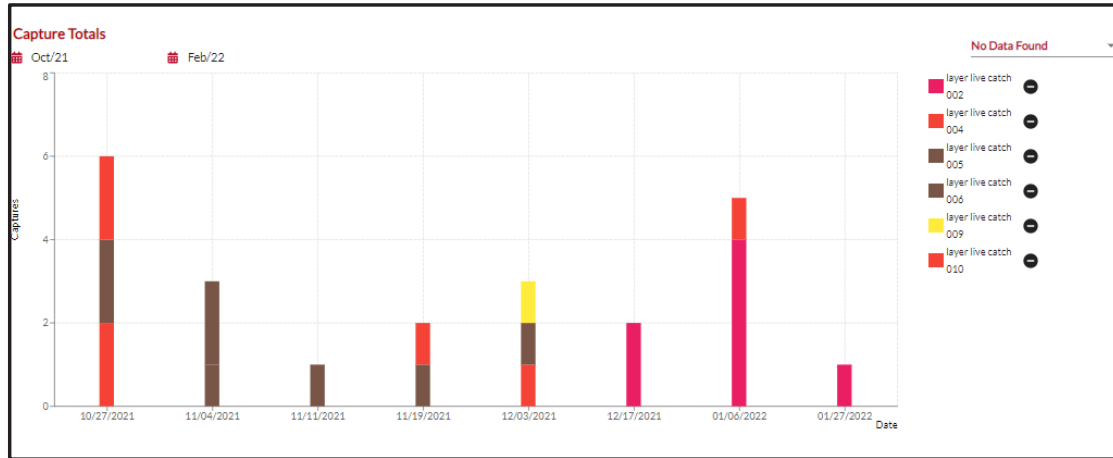## Management 2



- Overall reduction in bait applied in all three baiting accounts correlates with overall reduction in rodent activity, replacing less bait

*Each of the following four locations study detail and tracking/trending functions available through the Bell Sensing Technologies portal can be found on the proceeding pages:*

1. *Layer Live Catch*

2. *Layer*

3. *Grower*

4. *Management 2*

## Account: Layer Live Catch

**Protocol:** 12 Live Catch iQ Rodent multi-catch traps serviced 9 times over 3-month period

- 12 Live Catch iQ rodent multi-catch traps serviced 9 times over 3-month period
- 12 traditional (non-iQ) multi-catch traps serviced 9 times over 3-month period to compare service time against using iQ

### Study Detail:

**Deployment/First Service Visit:** 10/20/2021

- 12 Live-Catch iQ deployed and fully setup in iQ mobile app in 31 minutes

**Final Service Visit:** 1/27/2021

### Findings:

**List of all Service Visits: Layer Live Catch**

- Showing service date, technician, total event (rodent activity), bait applied and linked PDF service visit summary report on account homepage:



### Rodent Activity Trend Analysis: Layer Live Catch



- 8 events across all 12 traps on 10/26/21, down to 1 event 1/23/22

**Rodent Activity Capture Totals: Layer Live Catch**



- 6 captures on 10/27/22, spike of 5 captures on 1/6/22, down to 1 capture 1/27/22
- Events and captures not always a 1:1 ratio in Live Catch iQ traps
  - 1 capture can result from multiple events (if mouse stays on sensor side of trap away from glue board) for more than 4 hours
  - If 2 captures result from 1 event, you can assume both mice entered the trap within the 4-hour sensor lock out period

- Sort the device list by lifetime events to see devices with most activity, easily download into Excel
  - The below list is sorted by events to show devices with highest lifetime events first
  - Allows for further inspection of heavier mouse prone areas



| Device Name | Serial Number | Device Type | Location | Last Serviced | Lifetime Events ↓ | Battery |
|---|---|---|---|---|---|---|
| layer live catch 011 | C28430E20A68 | Live Catch IQ | west hallway | 1/27/2022 @ 12:59 pm | 21 | Medium(65%) |
| layer live catch 002 | F7F632E20A68 | Live Catch IQ | room 7 | 1/27/2022 @ 1:04 pm | 17 | Good(82%) |
| layer live catch 005 | 052647BD1BEC | Live Catch IQ | room 10 | 1/27/2022 @ 1:04 pm | 13 | Good(70%) |
| layer live catch 006 | FBFBAEBD1BEC | Live Catch IQ | manure room | 1/27/2022 @ 1:05 pm | 10 | Medium(55%) |
| layer live catch 004 | CF0F2EE20A68 | Live Catch IQ | room9 | 1/27/2022 @ 1:04 pm | 7 | Good(82%) |
| layer live catch 009 | C92347BD1BEC | Live Catch IQ | overhead door | 1/27/2022 @ 1:05 pm | 5 | Medium(60%) |
| layer live catch 010 | 7D112EE20A68 | Live Catch IQ | feed area | 1/27/2022 @ 1:05 pm | 4 | Good(79%) |
| layer live catch 003 | F7F732E20A68 | Live Catch IQ | room 6 | 1/27/2022 @ 1:01 pm | 1 | Good(78%) |

10 ▾   1-10 of 12   ‹   ›

## Inspection Time & Capture Totals: Layer Live Catch

| Date | Live Catch Units Inspected | Manual Live Catch Inspection Time (mins) | Manual Captures | Live Catch iQ Inspection Time (mins) | iQ Captures |
|---|---|---|---|---|---|
| 10/27/2021 | 12 | 14 | 1 | 6 | 1 |
| 11/4/2021 | 12 | 6 | 1 | 4 | 3 |
| 11/11/2021 | 12 | 5 | 0 | 4 | 1 |
| 11/19/2021 | 12 | 13 | 1 | 6 | 2 |
| 12/3/2021 | 12 | 10 | 0 | 7 | 3 |
| 12/17/2021 | 12 | 11 | 0 | 4 | 2 |
| 1/6/2021 | 12 | 12 | 0 | 6 | 5 |
| 1/27/2021 | 12 | 13 | 2 | 6 | 1 |
| Average | 12 | 10.5 | Total: 5 | 5.4 | Total: 18 |

- Average time to service 12 stations with iQ was 5.4 minutes vs 10.5 minutes with manual inspection = ~49% time savings
- 18 total captures in iQ Live Catch traps vs 5 total captures in traditional non-iQ multi-catch units

## Account: Layer

### Protocol:

- 24 Bullet iQ Rodent Bait Stations serviced 11 times over 4-month period
- 24 traditional bait stations (non-iQ) serviced 11 times over 4-month period in every other barn to compare service time against using iQ
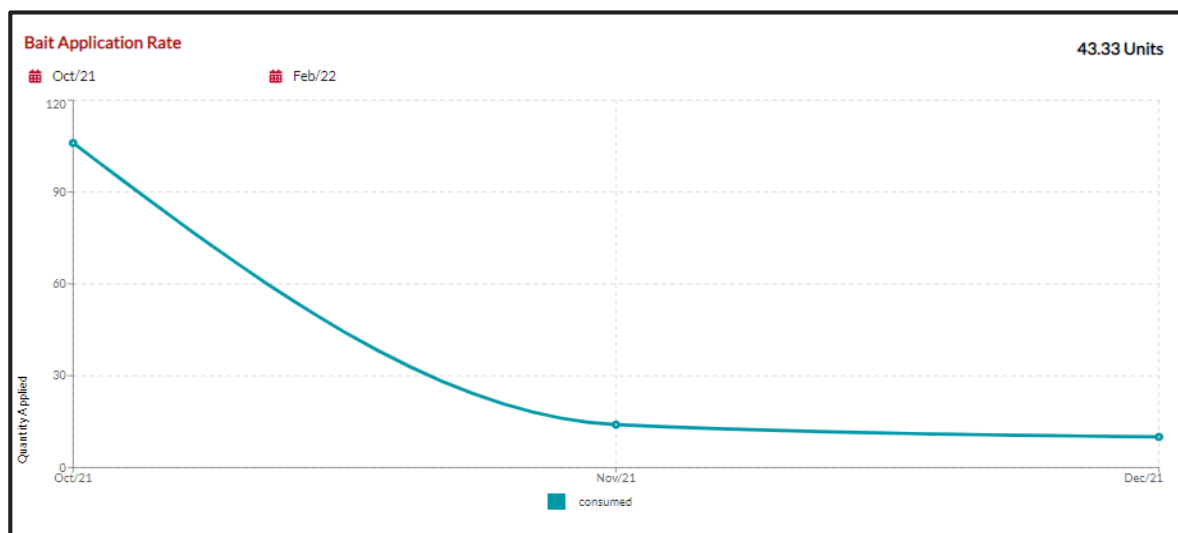
### Study Detail:

**Deployment/First Service Visit:** 10/06/2021
- 26 Bullet iQ stations initially deployed in 46 minutes, removed 2 stations on 10/20/21

**Final Service Visit:** 1/27/2021

### Findings:
### Bait Application Tracking: Layer





- Overall reduction in bait placement charted automatically by software
- 106 pieces of Hawk Bait Chunx placed out in October during deployment, 14 pieces placed in November, and 10 pieces placed in December
  - Average bait application rate of 43.33 units per month

**List of all Service Visits: Layer**
- Showing service date, technician, total event (rodent activity), bait applied and linked PDF service visit summary report on account homepage:

**Service History**

Search Bar...

Sep/21    Feb/22

| Service Date ↓ | Serviced By | Events | Bait Applied | Branch | Account | Notes | PDF |
|---|---|---|---|---|---|---|---|
| 1/27/2022 @ 12:46 pm | Jason Fields | 65 | 0.00 Units | Purdue University poultry | Layer | | VIEW |
| 1/06/2022 @ 12:44 pm | Jason Fields | 60 | 0.00 Units | Purdue University poultry | Layer | | VIEW |
| 12/17/2021 @ 6:43 am | Jason Fields | 127 | 6.00 Units | Purdue University poultry | Layer | | VIEW |
| 12/03/2021 @ 9:57 am | Jason Fields | 43 | 4.00 Units | Purdue University poultry | Layer | | VIEW |
| 11/19/2021 @ 12:21 pm | Jason Fields | 53 | 8.00 Units | Purdue University poultry | Layer | | VIEW |

10 ▾     1-10 of 16     < >

DOWNLOAD

Excel (.xlsx) ▾

**Rodent Activity Trend Analysis: Layer**
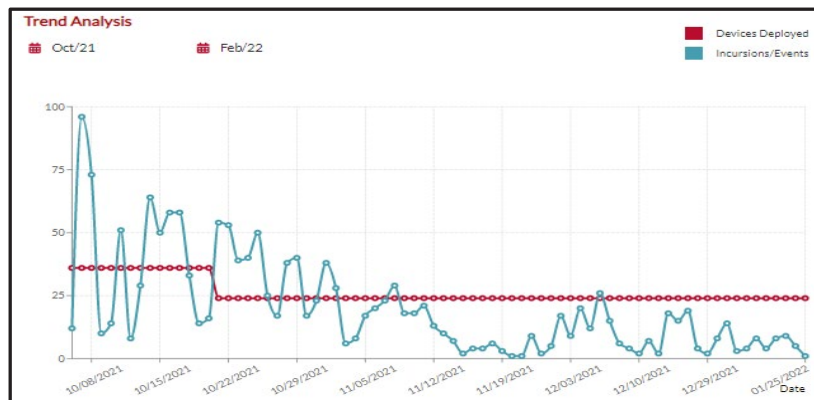


- Steady reduction in rodent activity
  - 10/7/21 registered 96 events across all 26 devices
  - 1/26/21 registered 1 single event across all 24 devices

17

## Rodent Activity Event Totals: Layer
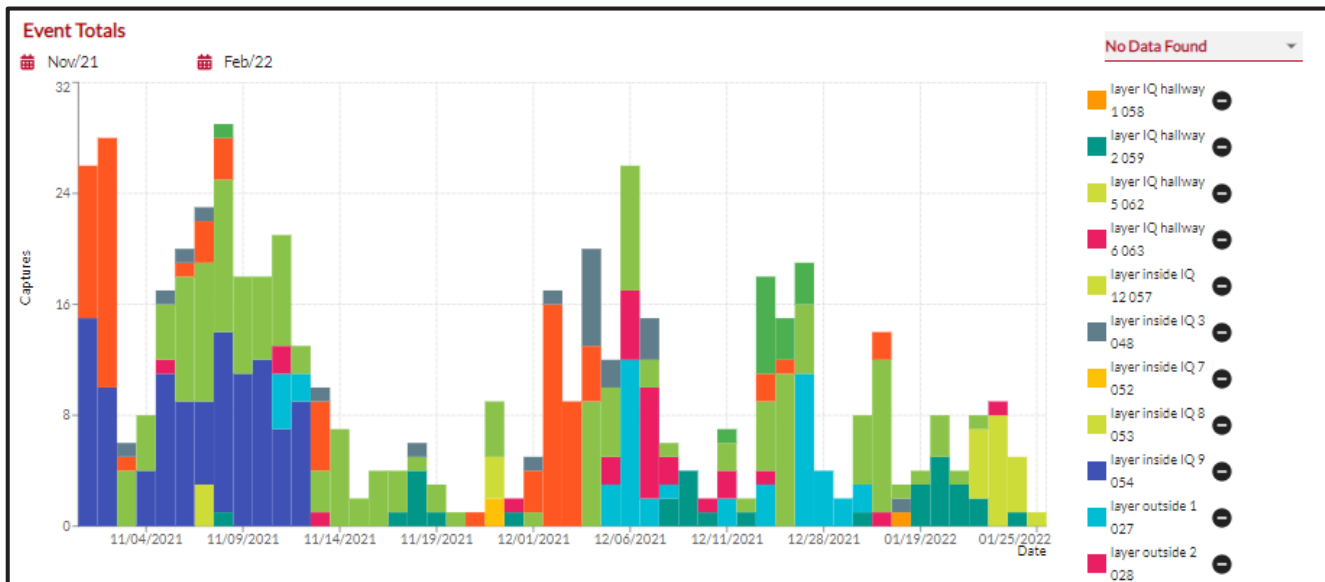


- Quickly select and compare rodent activity from station to station
  - Event registered every 30 minutes for bait stations due to skittish nature or rodents going in and out of the station. The max events recorded per day per station is 48

- Sort the device list by lifetime events to see devices with most activity, easily download into Excel
  - The below list is sorted by events below to show devices with highest lifetime events first
  - Allows for further inspection of heavier mouse prone areas

### Device List

| Device Name | Serial Number | Device Type | Location | Last Serviced | Lifetime Events ↓ | Battery |
|---|---|---|---|---|---|---|
| layer outside 3 029 | DC9371E20A68 | Bullet IQ | | 1/27/2022 @ 12:49 pm | 268 | Good(83%) |
| layer inside IQ 9 054 | A6A171E20A68 | Bullet IQ | | 1/27/2022 @ 12:52 pm | 195 | Good(89%) |
| layer outside 4 030 | C9EC30E20A68 | Bullet IQ | | 1/27/2022 @ 12:47 pm | 132 | Good(80%) |
| layer outside 1 027 | 39EC30E20A68 | Bullet IQ | | 1/27/2022 @ 12:50 pm | 111 | Good(78%) |
| layer outside 2 028 | D3DD30E20A68 | Bullet IQ | | 1/27/2022 @ 12:49 pm | 105 | Good(77%) |
| layer outside 5 033 | E97170E20A68 | Bullet IQ | | 1/27/2022 @ 12:47 pm | 87 | Good(82%) |
| layer outside 6 032 | F75270E20A68 | Bullet IQ | | 1/27/2022 @ 12:46 pm | 86 | Good(82%) |
| layer inside IQ 7 052 | 0A7B71E20A68 | Bullet IQ | | 1/27/2022 @ 12:51 pm | 83 | Good(78%) |

10 ▾   1-10 of 24   < >

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- Select and focus on stations with the most activity for appropriate baiting procedures: Bait stations *layer inside IQ 9*, *layer outside 3* and *layer outside 4* registering highest event counts, displayed in chart below:
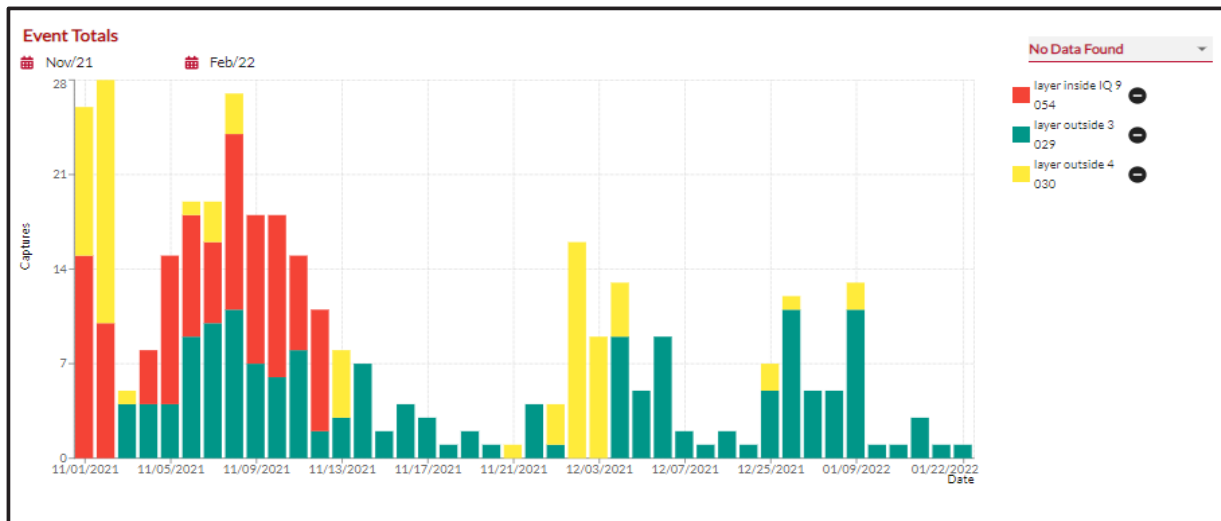


## Inspection Time: Layer

| Date | Bait Stations Inspected | Manual Inspection Time (mins) | iQ Inspection Time (mins) |
|---|---|---|---|
| 10/27/2021 | 24 | 12 | 11 |
| 11/4/2021 | 24 | 5 | 11 |
| 11/11/2021 | 24 | 7 | 10 |
| 11/19/2021 | 24 | 19 | 8 |
| 12/3/2021 | 24 | 7 | 13 |
| 12/17/2021 | 24 | 19 | 14 |
| 1/6/2021 | 24 | 12 | 5 |
| 1/27/2021 | 24 | 11 | 14 |
| | Average | 11.5 | 10.8 |

- Manual inspection data logs only available for 8 of the 11 service visits completed
- Average time to service 24 stations 11.5 mins vs 10.8 mins with iQ

## Account:Grower

### Protocol:

- 26 Bullet iQ Rodent Bait Stations serviced 11 times over 4-month period
- 26 traditional bait stations (non-iQ) serviced 11 times over 4-month period in every other barn to compare service time against using iQ
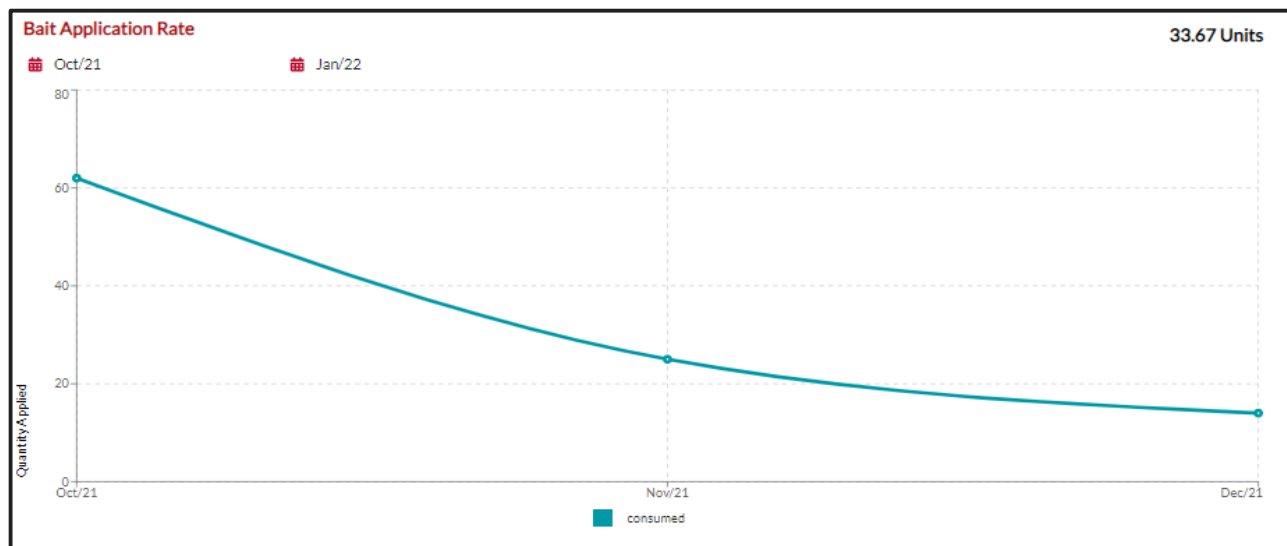
### Study Detail:

**Deployment/First Service Visit:** 10/6/2021
- All 26 Bullet IQ Stations added to system and bait applied in 58 mins
- See *Grower 10/6/2021* service report attached for more detailed information on deployment

**Final Service Visit:** 1/27/2022

### Findings:

### Bait Application Tracking: Grower





- Overall reduction in bait placement charted automatically by software
  - 62 pieces of Hombre mini blocks placed out in October, 25 pieces placed in November, and 14 pieces placed in December
  - Bait applied three separate dates over study with an average bait application rate of 33.67 units per month

## List of all Service Visits: Grower

- Showing service date, technician, total event (rodent activity), bait applied and linked PDF service visit summary report on account homepage:

**Service History**                                                                                          DOWNLOAD

Q  Search Bar...                                                                                             Excel (.xlsx) ▾

📅 Oct/21          📅 Jan/22

| Service Date ↓ | Serviced By | Events | Bait Applied | Branch | Account | Notes | PDF |
|---|---|---|---|---|---|---|---|
| 1/06/2022 @ 12:56 pm | Jason Fields | 17 | 0.00 Units | Purdue University poultry | Grower | | 🟥 VIEW |
| 12/17/2021 @ 6:35 am | Jason Fields | 22 | 0.00 Units | Purdue University poultry | Grower | | 🟥 VIEW |
| 12/03/2021 @ 9:32 am | Jason Fields | 48 | 14.00 Units | Purdue University poultry | Grower | | 🟥 VIEW |
| 11/19/2021 @ 12:39 pm | Jason Fields | 58 | 9.00 Units | Purdue University poultry | Grower | | 🟥 VIEW |
| 11/11/2021 @ 7:17 am | Jason Fields | 134 | 8.00 Units | Purdue University poultry | Grower | | 🟥 VIEW |

10 ▾   1-10 of 13   ‹   ›
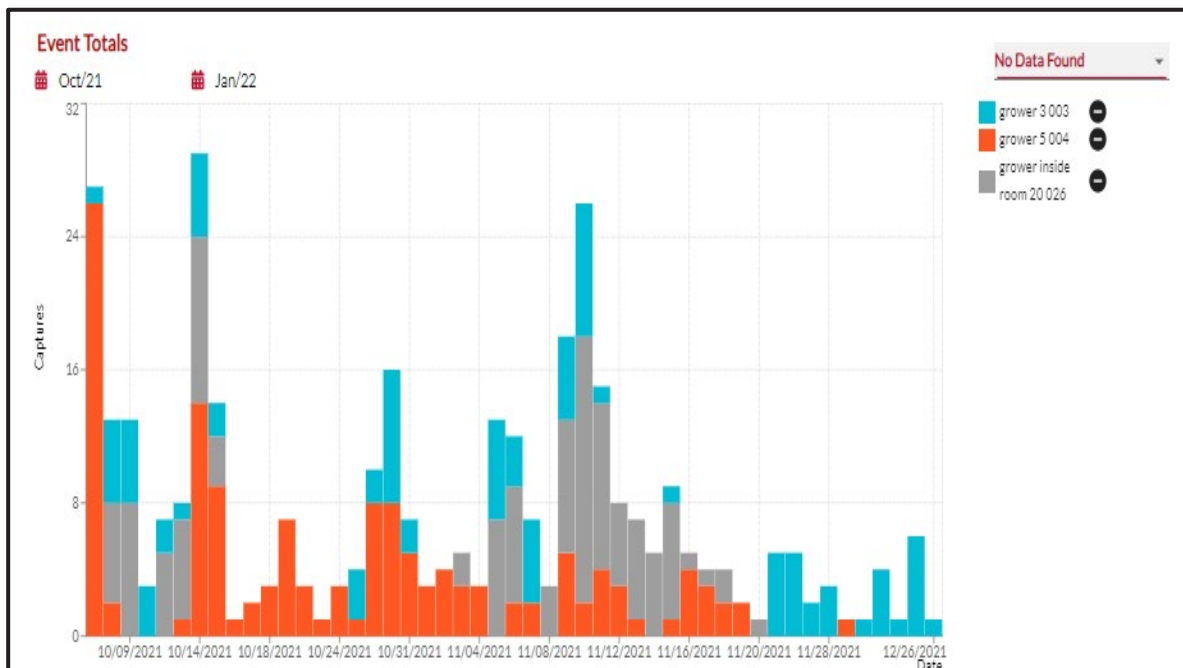
## Rodent Activity Trend Analysis: Grower
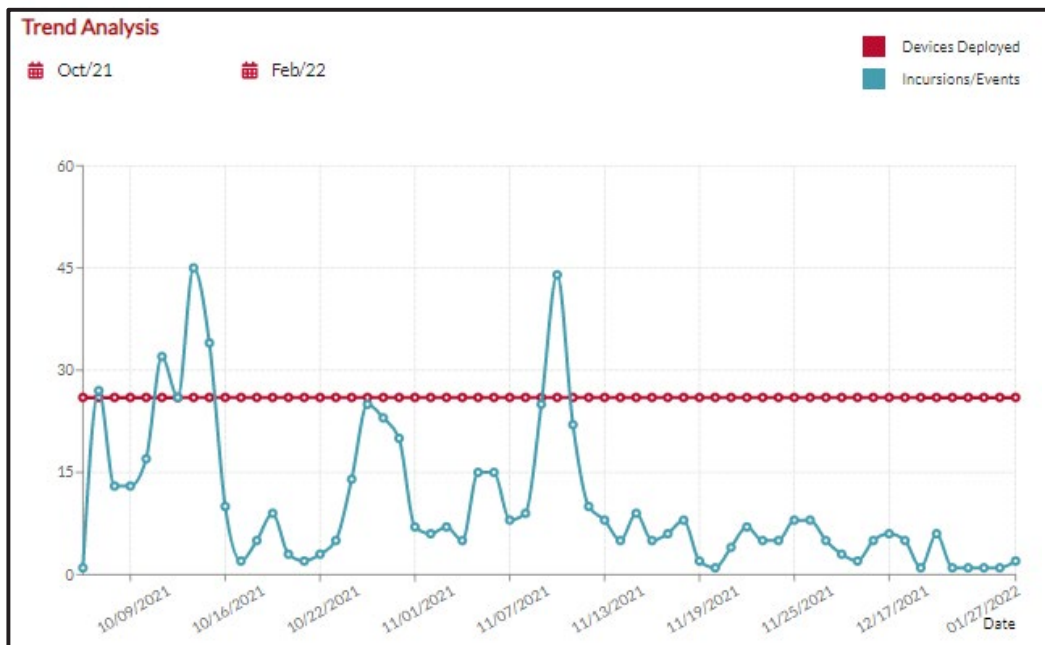


- From service visit to service visit, the system automatically trends rodent activity over time
- Spike in rodent activity on 10/14 (45 events) and 11/10 (44 events), overall reduction shown into January (2 events registered 1/27/22)

## Rodent Activity by Device Event Totals: Grower Account
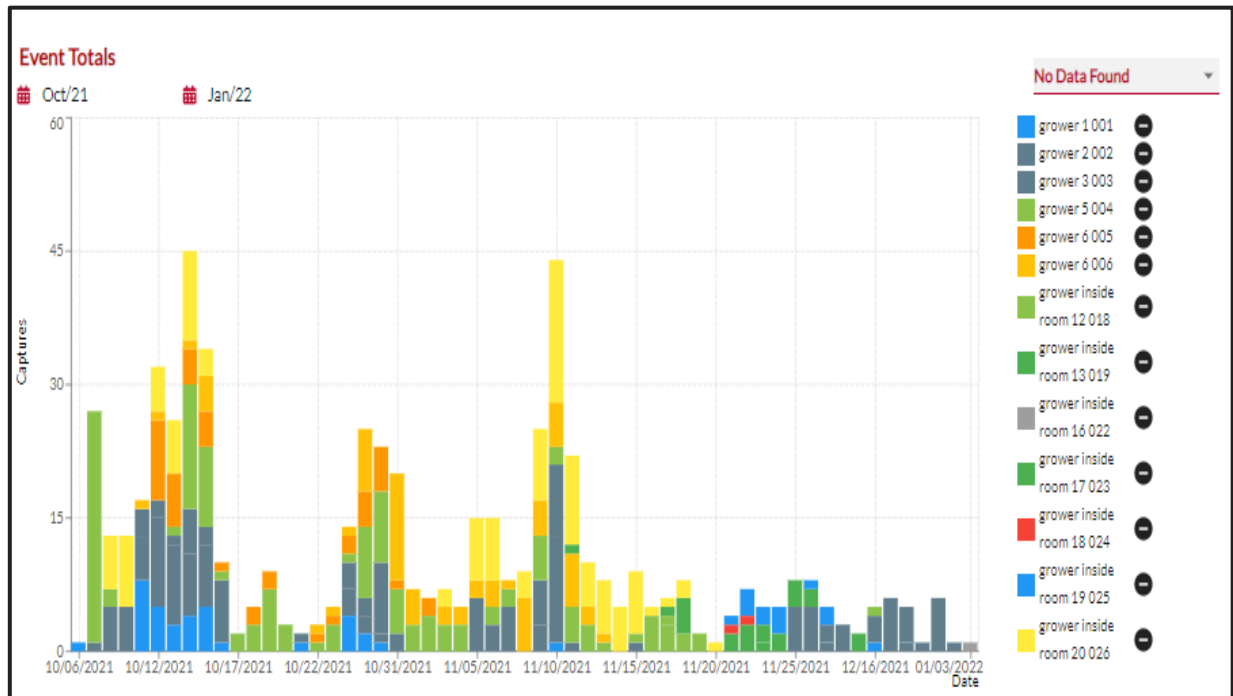


- Quickly select and compare rodent activity from station to station

- Select and focus on stations with the most activity for appropriate baiting procedures: Bait stations *grower 3 003, grower 5 004* and *grower inside room 20 026* showing the most activity:

- Sort the device list by lifetime events to see devices with most activity, easily download into Excel
  - The below list is sorted by events below to show devices with highest lifetime events first
  - Allows for further inspection of heavier mouse prone areas



### Inspection Time: Grower

- Technician serviced all 26 iQ devices in 6-14 minutes – Tech gets 2x faster over the four-month study



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## Service Detail

**Technician:** Jason Fields
**Service Date:** 10/27/2021
**Time In:** 10/27/2021 @ 9:29 AM EST
**Time Out:** 10/27/2021 @ 9:41 AM EST

## Account Location

**Grower**

5465 ASREC LN, West
Lafayette, Indiana, 47906,
United States

### Device Inspection Summary

| Device Type | # Inspected | # Inspected w/Events | # Skipped | # Added | # Removed | # Not Found |
|---|---|---|---|---|---|---|
| Bullet IQ | 26 of 26 (100.00 %) | 6 of 26 (23.08 %) | 0 | 0 | 0 | 0 |
| Totals | 26 of 26 (100.00 %) | 6 of 26 (23.08 %) | 0 | 0 | 0 | 0 |

## Service Detail

**Technician:** Jason Fields
**Service Date:** 11/4/2021
**Time In:** 11/4/2021 @ 10:39 AM EST
**Time Out:** 11/4/2021 @ 10:49 AM EST

## Account Location

**Grower**

5465 ASREC LN, West
Lafayette, Indiana, 47906,
United States

### Device Inspection Summary

| Device Type | # Inspected | # Inspected w/Events | # Skipped | # Added | # Removed | # Not Found |
|---|---|---|---|---|---|---|
| Bullet IQ | 26 of 26 (100.00 %) | 7 of 26 (26.92 %) | 0 | 0 | 0 | 0 |
| Totals | 26 of 26 (100.00 %) | 7 of 26 (26.92 %) | 0 | 0 | 0 | 0 |

## Service Detail

**Technician:** Jason Fields
**Service Date:** 12/17/2021
**Time In:** 12/17/2021 @ 7:35 AM EST
**Time Out:** 12/17/2021 @ 7:42 AM EST

## Account Location

**Grower**

5465 ASREC LN, West
Lafayette, Indiana, 47906,
United States

### Device Inspection Summary

| Device Type | # Inspected | # Inspected w/Events | # Skipped | # Added | # Removed | # Not Found |
|---|---|---|---|---|---|---|
| Bullet IQ | 26 of 26 (100.00 %) | 4 of 26 (15.38 %) | 0 | 0 | 0 | 0 |
| Totals | 26 of 26 (100.00 %) | 4 of 26 (15.38 %) | 0 | 0 | 0 | 0 |

## Service Detail

| | |
|---|---|
| **Technician:** | Jason Fields |
| **Service Date:** | 1/6/2022 |
| **Time In:** | 1/6/2022 @ 1:56 PM EST |
| **Time Out:** | 1/6/2022 @ 2:02 PM EST |

## Account Location

**Grower**

5465 ASREC LN, West Lafayette, Indiana, 47906, United States

## Device Inspection Summary

| Device Type | # Inspected | # Inspected w/Events | # Skipped | # Added | # Removed | # Not Found |
|---|---|---|---|---|---|---|
| Bullet IQ | 26 of 26 (100.00 %) | 3 of 26 (11.54 %) | 0 | 0 | 0 | 0 |
| **Totals** | **26 of 26 (100.00 %)** | **3 of 26 (11.54 %)** | **0** | **0** | **0** | **0** |

## Service Detail

| | |
|---|---|
| **Technician:** | Jason Fields |
| **Service Date:** | 1/27/2022 |
| **Time In:** | 1/27/2022 @ 11:10 AM EST |
| **Time Out:** | 1/27/2022 @ 11:17 AM EST |

## Account Location

**Grower**

5465 ASREC LN, West Lafayette, Indiana, 47906, United States

## Device Inspection Summary

| Device Type | # Inspected | # Inspected w/Events | # Skipped | # Added | # Removed | # Not Found |
|---|---|---|---|---|---|---|
| Bullet IQ | 26 of 26 (100.00 %) | 4 of 26 (15.38 %) | 0 | 0 | 0 | 0 |
| **Totals** | **26 of 26 (100.00 %)** | **4 of 26 (15.38 %)** | **0** | **0** | **0** | **0** |

### Account: Management 2

**Protocol:**
- 18 Bullet iQ Rodent Bait Stations serviced 11 times over 4-month period
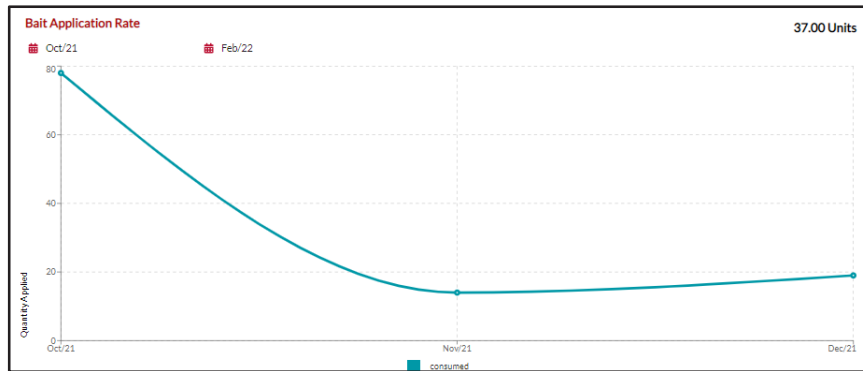
**Study Detail:**

**Deployment/First Service Visit:** 10/6/2021
- All 18 Bullet IQ Stations added to system and bait applied in 20 minutes
  - See *Management 2 10/6/2021* service report attached for more detailed information on deployment

**Final Service Visit:** 1/27/2022

**Findings:**

**Bait Application Tracking: Management 2**



Bait Application Rate — 37.00 Units — Oct/21, Feb/22 — Quantity Applied — consumed



Most Used Bait

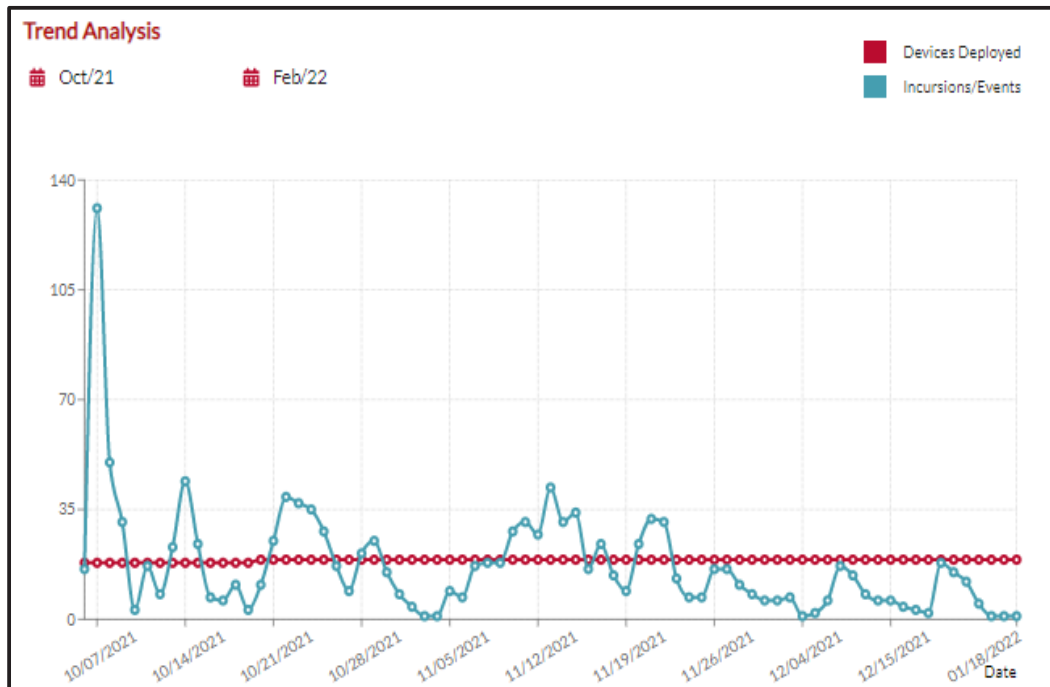| | |
|---|---|
| Bait Name | Hawk Bait Chunx |
| Active Ingredient | Bromadiolone |
| Average Bait Refill Per Visit | 2.36 |

- 78 pieces of Hawk Bait Chunx placed out in October, 14 pieces placed in November, and 19 pieces placed in December
  - Bait applied three separate dates over study with an average bait application rate of 37 units per month

**List of all Service Visits: Management 2**

- Showing service date, technician, total event (rodent activity), bait applied and linked PDF service visit summary report on account homepage:

| Service Date ↓ | Serviced By | Events | Bait Applied | Branch | Account | Notes | PDF |
|---|---|---|---|---|---|---|---|
| 1/27/2022 @ 10:17 am | Jason Fields | 3 | 0.00 Units | Purdue University poultry | Management 2 | | VIEW |
| 1/06/2022 @ 12:33 pm | Jason Fields | 53 | 0.00 Units | Purdue University poultry | Management 2 | | VIEW |
| 12/17/2021 @ 7:03 am | Jason Fields | 82 | 11.00 Units | Purdue University poultry | Management 2 | | VIEW |
| 12/03/2021 @ 9:02 am | Jason Fields | 186 | 8.00 Units | Purdue University poultry | Management 2 | | VIEW |
| 11/19/2021 @ 12:04 pm | Jason Fields | 229 | 10.00 Units | Purdue University poultry | Management 2 | | VIEW |

Service History — Search Bar... — Oct/21 — Feb/22 — DOWNLOAD — Excel (.xlsx) — 10 ▼ — 1-10 of 12 < >

**Rodent Activity Trend Analysis: Management 2**

Trend Analysis — Oct/21 — Feb/22 — Devices Deployed — Incursions/Events

- Registered 131 events on 10/7/2021
- Registered 1 single event on last service 1/27/2022

### View Rodent Activity by Device Event Totals: Management 2
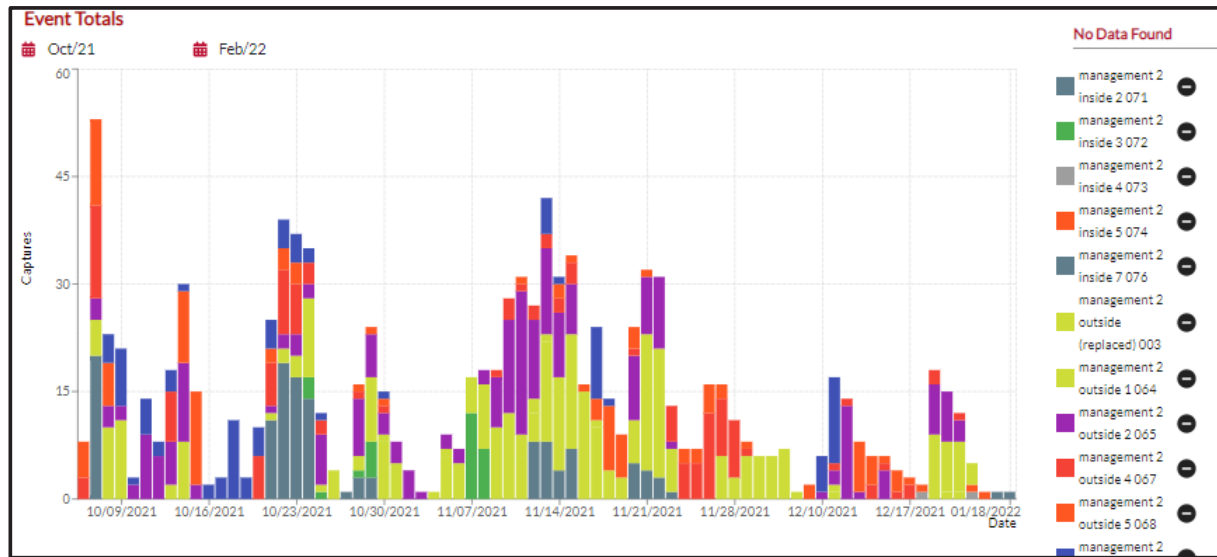


- Quickly select and compare rodent activity from station to station

- Select and focus on stations with the most activity for appropriate baiting procedures: Bait stations *management 2 outside 2*, *management 2 outside 1 and management 2 inside 2* devices with most activity:
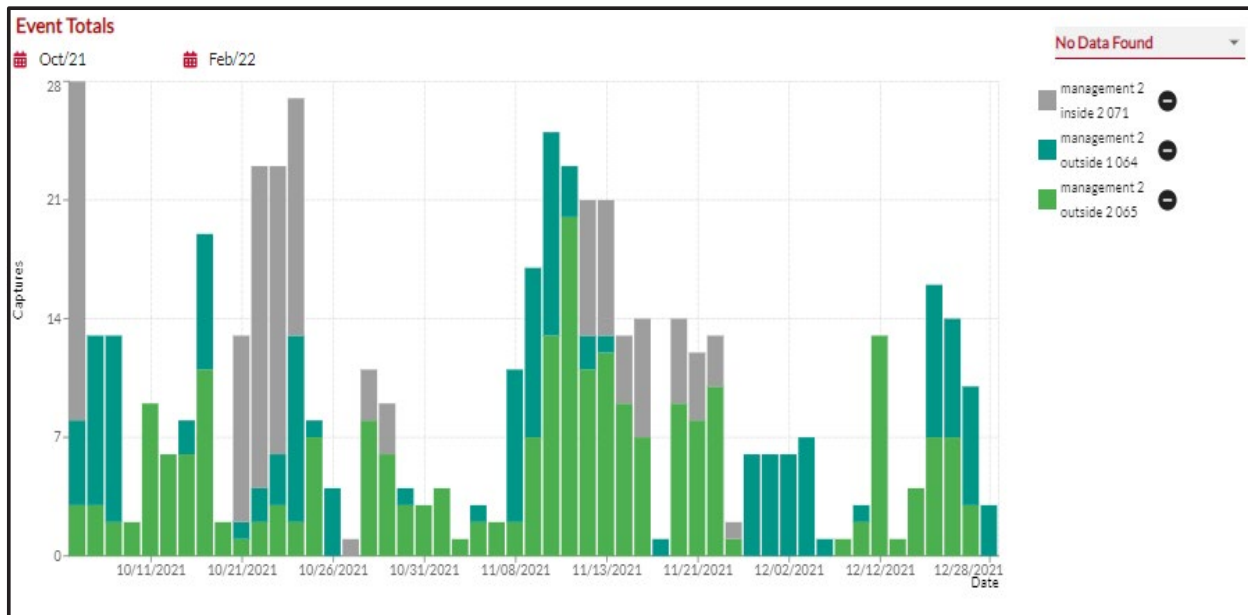
- Sort the device list by lifetime events to see devices with most activity, easily download into Excel
  - Allows for further inspection of heavier mouse prone areas



| Device Name | Serial Number | Device Type | Location | Last Serviced | Lifetime Events ↓ | Battery |
|---|---|---|---|---|---|---|
| management 2 outside 2 065 | 936D71E20A68 | Bullet IQ | | 1/27/2022 @ 10:18 am | 235 | Medium(65%) |
| management 2 outside 1 064 | 229A71E20A68 | Bullet IQ | | 1/27/2022 @ 10:18 am | 151 | Good(82%) |
| management 2 inside 2 071 | 956030E20A68 | Bullet IQ | | 1/27/2022 @ 10:20 am | 128 | Good(86%) |
| management 2 outside 4 067 | 77E230E20A68 | Bullet IQ | | 1/27/2022 @ 10:19 am | 128 | Good(79%) |
| management 2 outside 5 068 | B7002EE20A68 | Bullet IQ | | 1/27/2022 @ 10:19 am | 113 | Good(80%) |
| management 2 outside 6 069 | E2EA30E20A68 | Bullet IQ | | 1/27/2022 @ 10:18 am | 97 | Good(79%) |
| management 2 inside 11 080 | 2A6870E20A68 | Bullet IQ | | 1/27/2022 @ 10:21 am | 68 | Good(86%) |
| management 2 inside 12 081 | 259F71E20A68 | Bullet IQ | | 1/27/2022 @ 10:22 am | 64 | Good(88%) |

## Inspection Time: Management 2

- 10/13/21 iQ inspection took 26 minutes to service all 18 devices

- 1/27/22 iQ inspection took 8 minutes to service all 18 devices

- Technicians will tend to get faster over time servicing iQ devices as they get more accustomed to using the system. Technicians will also maneuver through a facility more strategically using the iQ system as a guide to connect to devices more quickly over time.

## Heat Map Feature

For all exterior iQ stations, a heat map will be generated to clearly identify stations with most activity.



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