



cat Cove



## Problem

Feral cat populations have grown uncontrollably. The system created to tame them (Trap, Neuter, Return) is woefully outdated and ill-equipped to manage the cat population.

## Solution

Create an AI-driven system that incorporates the caretakers, traps, and cats that standardizes the TNR process.



## Key Features

### Trap

Designed with the caretaker and cat's best interest in mind, the catCove trap incorporates a smart camera in a comfortable environment for cats.

### DIY Kit

For the caretakers that already have their own traps, the DIY Kit alternative allows them to have access to the same AI features and mobile app as the full trap.

### App

The mobile app automates tracking, logging, trapping, and organizing with TNR groups.

# Modernizing Trap Neuter Return

# Team Beanz



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# Our mission

With pet cats as some of the hidden members of our team - we decided to look at an issue that interested in us all. As cats are an invasive species, they are often put in certain areas to keep other species from growing. Because of this, their numbers skyrocket.

TNR ( Trap, Neuter, Return) is the process for helping control and decrease these population numbers.

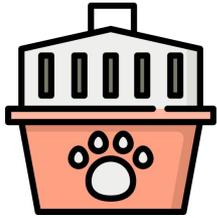
Our interest is to... improve the TNR process for cat colony caretakers.

# What is TNR?

Trap, Neuter, Return (TNR): a program implemented as a humane solution to feral cat colonies affecting communities.

It aims to **decrease the feral cat population** without use of lethal or inhumane techniques.

# TNR step-by-step



Trap

trap all the cats in  
a humane trap



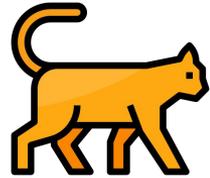
Neuter

neuter or spay all  
cats in the cat  
colony



(Vaccinate)

prevent spread of  
feline diseases in  
the colony



Return

return all cats  
back to their  
colony after  
recovery



## Secondary & Primary Research

# Goals for TNR

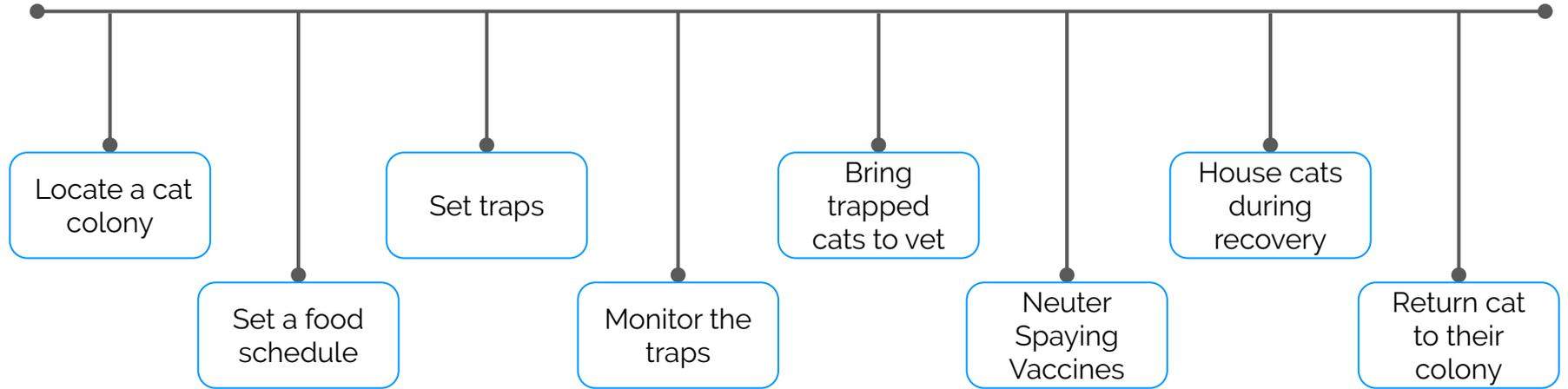
## COLONIES

- Population stabilization or reduction
- Reducing shelter admissions and overcrowding
- Lessen nuisance behaviors
- Controlling predation on wildlife

## CATS

- Improving overall welfare
- Reducing cat deaths from the risks of living outdoors

# TNR Process: **View of a Caretaker**



# Case Study A

In an experiment of 9 cat colonies

“All sterilized colonies showed consistent decreases from their peak sizes”

Cat population of a colony went from **27 to 16 within 7 years** of TNR

**75-80%** of cat population needs to be sterilized at regular intervals

# Case Study B

**LOW INTENSITY** TNR is almost as **ineffective** as leaving population unchecked

**31** fold decrease in preventable deaths with TNR

# Cat colonies are an invasive species.

- Have hunted bird and critter populations into extinction
- Cat overpopulation is a human created problem



## The only other alternative – Euthanization.

- Trap and euthanize not nearly as effective as (high) intensity TNR
  - Cat removal leads to new cats in area
- Euthanasia is inhumane
  - Creates more preventable cat deaths



## It only works if executed properly!

- Cats breed extremely fast
- Low intensity TNR almost as ineffective as leaving the cat population unchecked
- 75-80% of cat population must be sterilized at regular intervals



## Many traps are not humane so, big DIY Process.

- Drop traps lead to pinched paws and injured tails
- Wire made cages can be uncomfortable
- Loud, distressing experience for cats
- Cats are able to injure themselves trying to escape
- High end traps very expensive; most can't afford





# Secondary & Primary Research

TNR Participant Survey

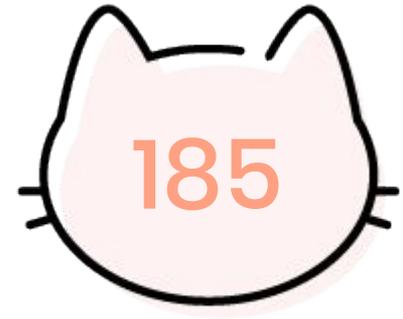
# Our goals were...

To understand the target audience

- i. Who are they?
- ii. What do they do?

Discover major touch points

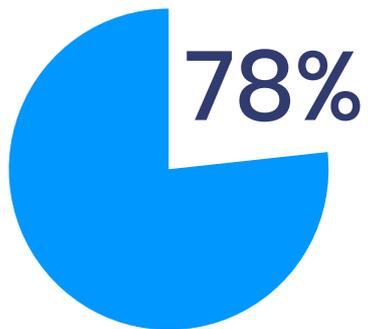
Discover pain points



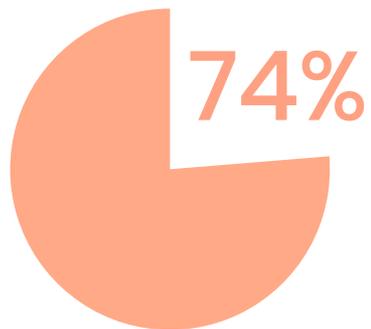
responses

# Survey Results

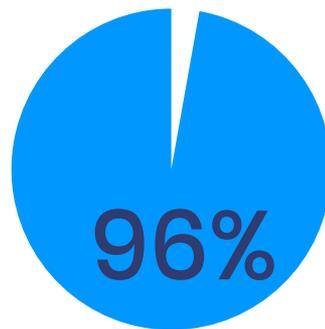
## General Demographics



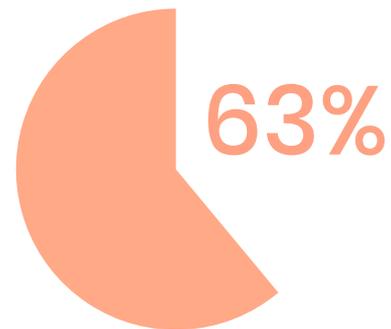
40-60+  
years old



cat colony  
caretakers



unpaid  
volunteers

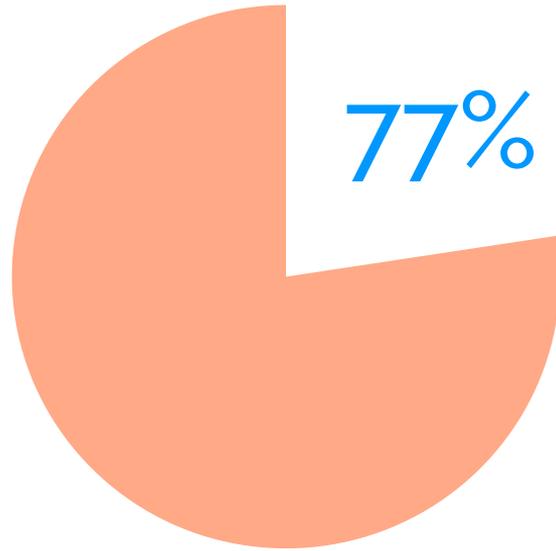


work on  
their own

What kinds of **injuries or disabilities** have you encountered?

Is there a solution that we could come up with to aid cats and their injuries or disabilities?

# Survey Results: **Cat Injuries**



surveyed participants have trapped an  
animal with an injury or disability

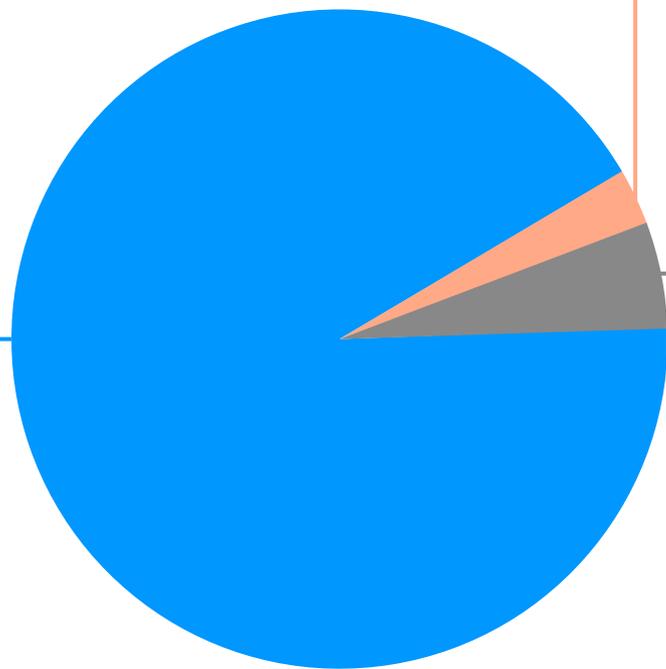
# Survey Results: Cat Injuries

Of that 77%....

90%

Physical injuries

- Bites
- Broken Limbs
- Scratches
- Blindness



3.2%

Symptoms of injuries

- Seizures
- Deafness
- Stroke
- Starvation/dehydration

6.1%

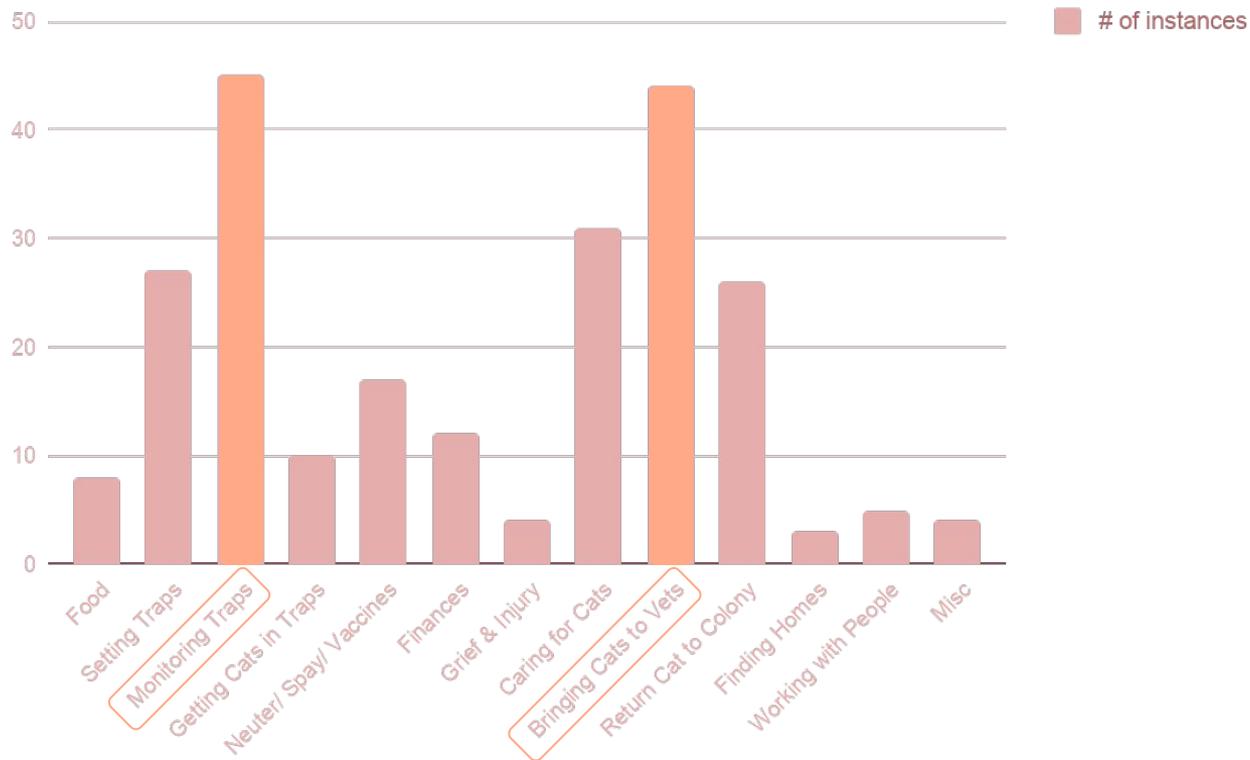
Ailments & Illnesses

- CH, FIV, FELV
- Tumors
- General infection
- Parasites

Which steps are the **most difficult** in the TNR process?

Is there a solution that we could come up with that makes the difficult steps more convenient or less impactful on the user?

# Difficult Steps: **Area of Opportunity**





## Narrowing Design Area

# Our Research Process



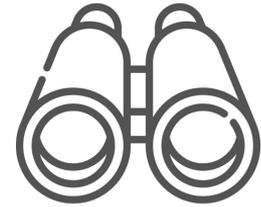
Secondary  
Research



Survey

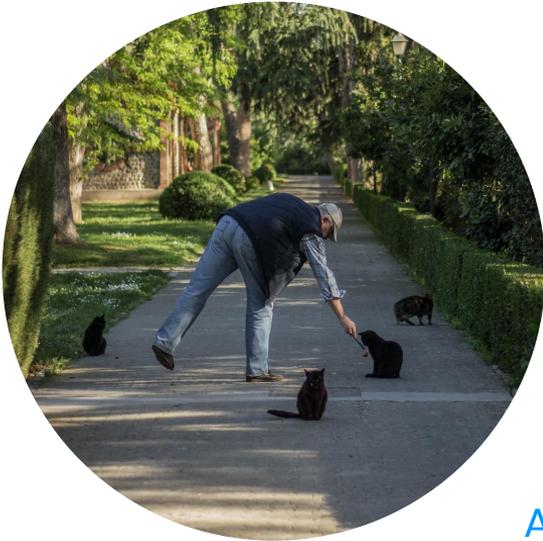


Interview



Observation

# Target Audience



Ages 40-60

TNR Volunteer Colony Caretakers



Colony Cats

## UX Problem

Colony caretakers struggle to **monitor** traps, **transport** trapped cats to the vet, and handle **aftercare** during recovery.

## Desired Outcome

Creating an AI-driven service or product that *streamlines* the TNR process and *decreases the work* for cat colony caretakers

# Future Research Questions

Why do users **struggle** to monitor the traps?

Why do users **struggle** to take trapped cats to the vet?

What factors increase their **difficulty** with these steps?

How do injured cats **affect** the trapping process?

# Interview Logistics

## Research Goals

- Learn about user's personal experiences with cat colonies and TNR
- What resources do users have access to?
- Understand how COVID-19 is affecting their work
- Discover more specific pain points



interviewees

\*Most interviewees were caretakers with few exceptions of vet tech and animal control specialist

# Observation Logistics

## Research Goals

- Understand the cat caretaking process
- Learn about the caretaker's personal interaction with the cats
- Discover the types of environments these cats are in
- Gain more insight into the importance of routine



observation

# Observation Session

## Methods

- The cats are fed at the same time regularly to build routine
- A wet and dry mix is best for health
- The cats are fed in a sheltered area away from humans
- Picking up trash from previous day is an important step
- Depending on socialization level, the caretaker may interact more



# Observation Session

## Insights

- TNR has currently halted due to COVID-19
- Greater areas of visibility make feral cats more vulnerable
- Working in groups is vital
  - The cats are a big commitment
  - A feeding schedule eases stress for caretakers



# Affinitization

350+  
data points

67  
"I statement"  
groups



8  
How might we  
statements

# Minor Insights

We are designing for a ***primarily older population*** of unpaid volunteer colony caretakers

A majority of participants worked ***alone***

A large majority of participants have trapped a cat with an ***injury or disability***

The most ***difficult steps reported*** were...

- monitoring the traps
- bringing the cats to the vet
- aftercare for cats

## Caretakers have varying opinions about TNR, even though they all do it.

- Some caretakers are passionate about TNR while others do it because they feel they have no other choice
- TNR's inconsistent success rate makes the community question its usage

“

*I'd prefer cats to be euthanized; it's more humane. I don't believe it [TNR] works, but there is no choice.*

”

**It is far safer for cats to be homed, but not all cats can be socialized.**

- Unfortunately, not all cats can just be taken to shelters
- It is less stressful to keep feral cats with their colony and territory

“

*There are three types of feral cats you encounter: true ferals that want nothing to do with humans, socially awkward, and extremely friendly. ”*

## Caretakers inconsistency spans everything from the trapping itself to documentation.

- Trapping often involves a level of DIY
- How and if progress should be documented is dependent on each situation

“

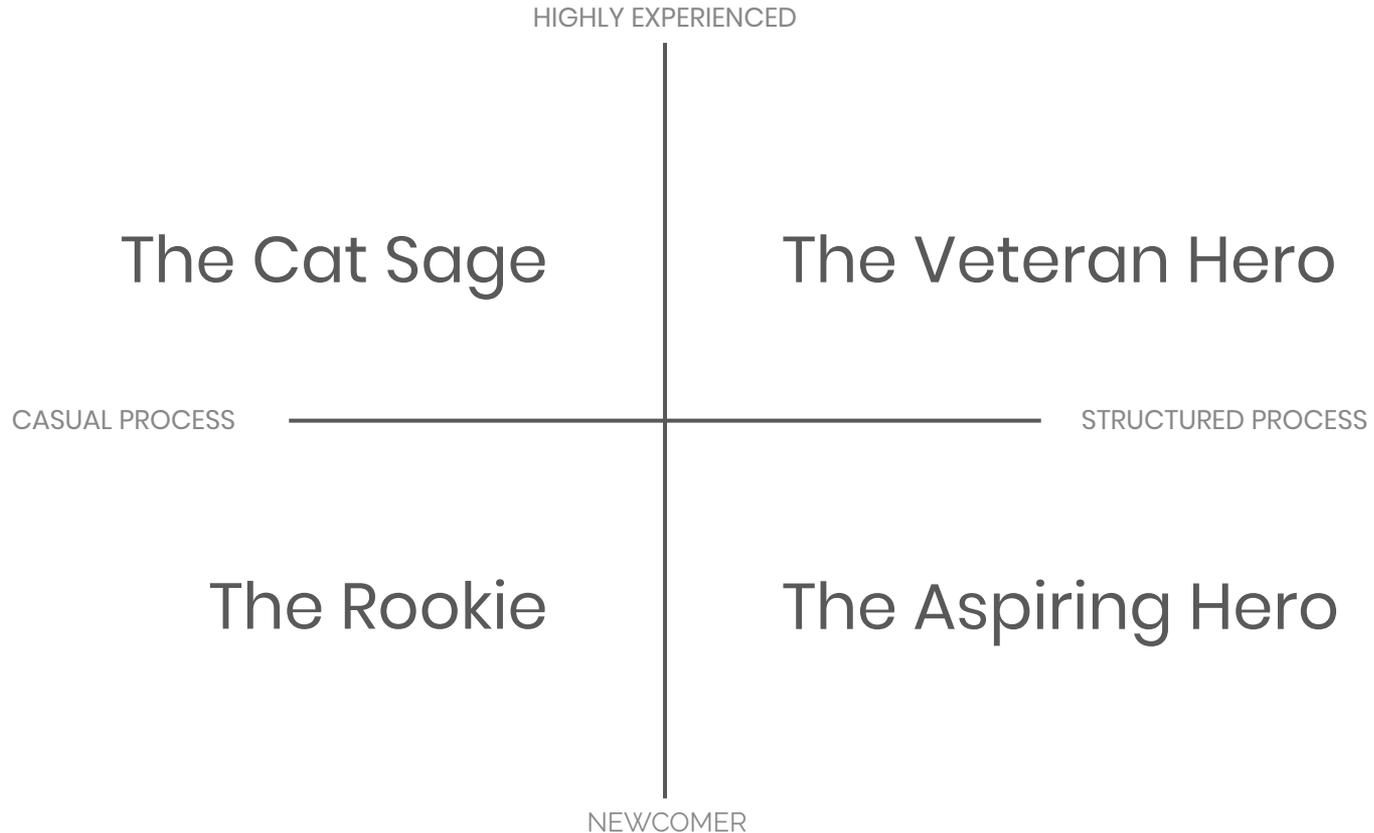
*I have started to journal recently, but i never did it before. Last year I homed close to 65 cats, I wish I could have kept that data.* ”

## The involvement of animal control is questioned within the TNR community.

- Various states and counties have different regulations for cat colonies
- Some animal control organizations will euthanize any cats that they get while others will help with the trapping and TNR

“ *DON'T CALL ANIMAL  
CONTROL* ”

# Target Audience Mindsets



# Target Audience Mindsets

2/9  
of our  
interviewees



- Recently started to practice TNR
- Has 1 trap, or traps very few cats at a time
- Will foster cats at home in the colder months

CASUAL PROCESS

**The Rookie**

*"I'm not typically a cat person, but my neighbor was feeding a colony and I just took over when she moved out for the winter months."*

NEWCOMER

# Target Audience Mindsets

1/9

of our  
interviewees

HIGHLY EXPERIENCED



- Has been involved in TNR for a good amount of time
- Has built TNR firmly into their schedule
- Self educated in TNR

CASUAL PROCESS

*“I have an entire room in my house dedicated to them, what do you think?”*

STRUCTURED PROCESS

**The Aspiring Hero**

NEWCOMER

# Target Audience Mindsets

4/9

of our  
interviewees

HIGHLY EXPERIENCED



## The Veteran Hero

CASUAL PROCESS

*"I have 12 of my own traps currently, so I am a master trapper"*

STRUCTURED PROCESS

- Is typically part of an established TNR organization or group
- Commonly involved in mass trapping
- Has run into a wide variety of TNR-related situations

NEWCOMER

# Target Audience Mindsets

2/9

of our  
interviewees

HIGHLY EXPERIENCED

## The Cat Sage



CASUAL PROCESS

STRUCTURED PROCESS

*“People are human beings and need to understand that it’s their duty to respond to animal suffering”*

- Has been involved in the TNR scene for years
- Is more involved with the people-side of TNR than trapping
- Active member of TNR community

NEWCOMER



# Ideations & Concepts with Further Research

# How Might We...

Assist caretakers  
in **caring** for a  
large number of  
cats?

Balance the cats'  
**well being and  
comfort**?

Introduce  
**standardization**  
to the caretaker  
community?

**Automate** the  
trapping process  
for volunteers?

Help **spread  
knowledge**  
between the  
colony caretaker  
community?

Create a **support  
system** for TNR  
when in a crisis?

Maintain or  
increase the  
**success** of TNR?

Make the TNR  
process more  
**cost-effective**?

# TNR Traps



## Box Trap

- Most common trap
- Spring loaded doors



## Drop Trap

- Manual
- Potentially dangerous



## Roundhouse Trap

- New design
- More portable



## Feral Cat Den

- Used to give trapped cats comfort

# “DIY Setups”



Participant 1 uses cat carriers to trap.



Participant 2 uses the blanket burrito technique.



Participant 3 shows us her set up; she also puts ac or heater depending on the weather

# TNR System Issues

Each TNR caretaker has their own way of doing TNR.

Most of the way cats are logged, is by hand.

Sometimes the injuries and lifestyle of the cats are quite severe.

# Current Solutions

Commonly used Traps can be difficult to use.

- Having to revisit the traps
- Having to go to multiple locations for multiple colonies
- Having to physically stay with the traps for long periods of time

Information is found on social media.

- Lack of communication
- Lack of community

# Current Solutions

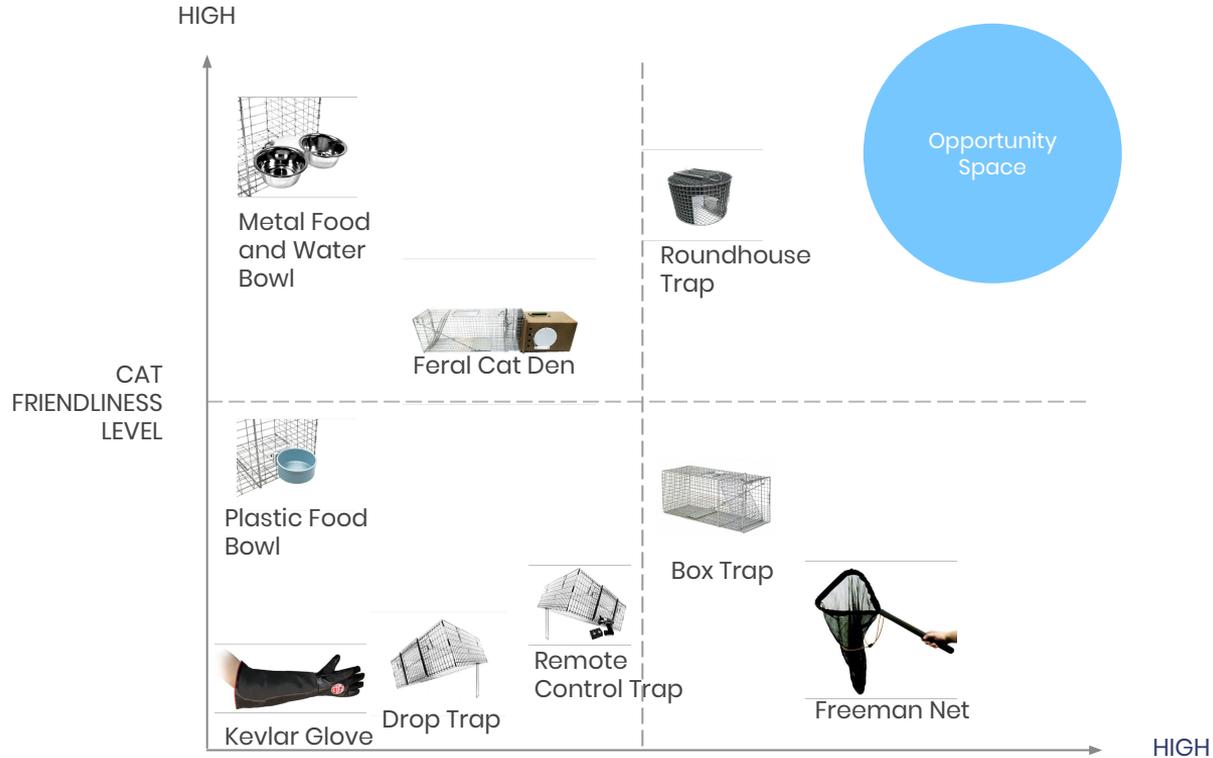
Journaling is done by hand.

- Paper and pencil
- Some video and pictures
- Often underutilized

The process is rooted in dated ways of doing things.

- Use of facebook
- Lack of commonly known info
- Traps use little technology

# Competitor Opportunity Map





# Ideations & Concepts with Further Research

## 3 Main Concepts

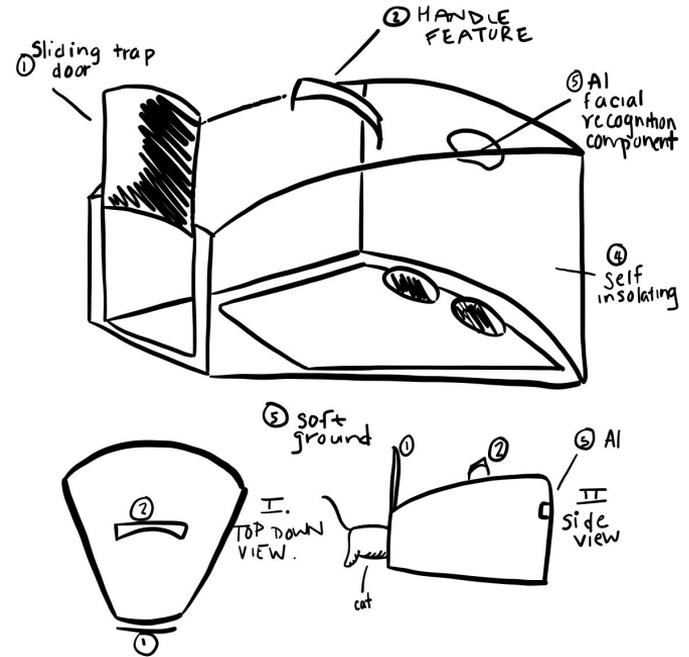
# Preliminary Concept 1: Safe Space

A safe space for cats that is comforting for them and keep them warm in the winter and cool in the summer

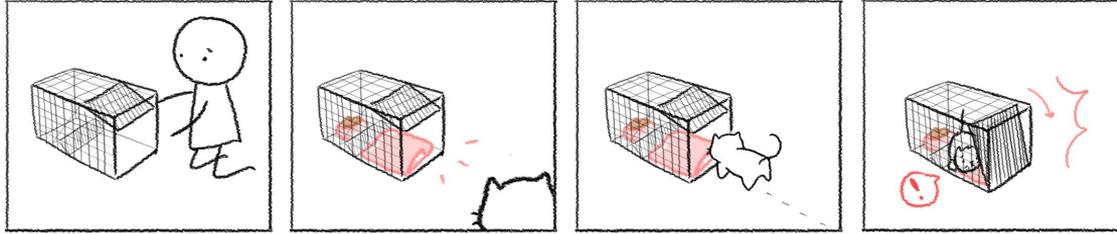
Uses AI for facial recognition of the cats

Is able to safely trap cats in a place they are already comfortable

Notifies caretakers

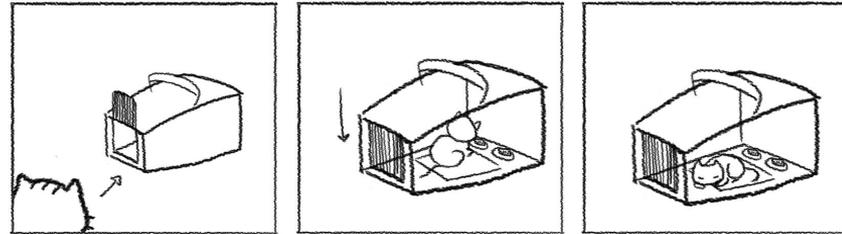


# Preliminary Concept 1: Safe Space



The Cat Sage is worried about the cats that she traps. She doesn't believe that current cat traps are humane.

She feels the need to add more to the trap to make the experience more comfortable for the cat, but the danger and loud noise of the trap door is still a stress factor.



With Safe Space's AI technology, the trap recognizes the new cat's face and gently closes the door. Safe Space is lined with insulation and soft material, so the Cat Sage is confident that the cat is safe and comfortable in the trap.

# Preliminary Concept 2: SHARE

A sharing economy for TNR participants

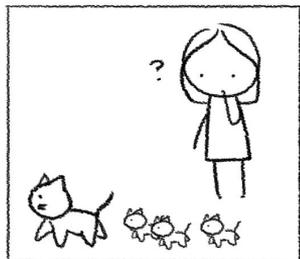
Restricted to avoid becoming a social media platform

Encourage sharing of info between colony caretakers and vets/vet techs

Resources for new participants



# Preliminary Concept 2: SHARE



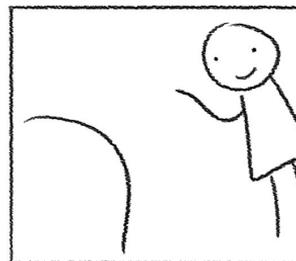
The Rookie doesn't know too much about TNR, but often sees feral cats around her neighborhood and wants to help.



She downloads Share, a resource on cat education and a place for the TNR community to share information.



The Rookie sees a post looking for extra help in taking care of a cat colony.



She responds to the post and is quickly becoming a part of the TNR community.



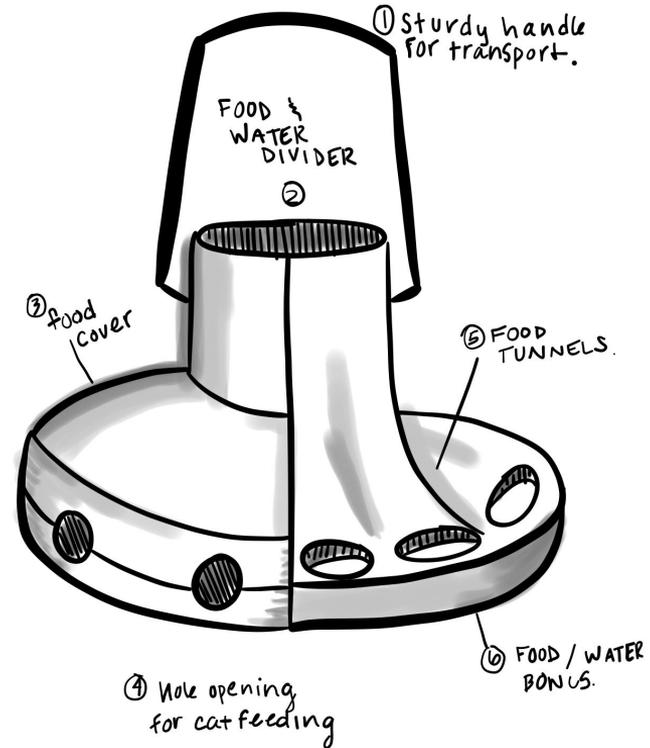
# Preliminary Concept 3: Robo Care

A feeder for cat colonies to feed multiple cats at once

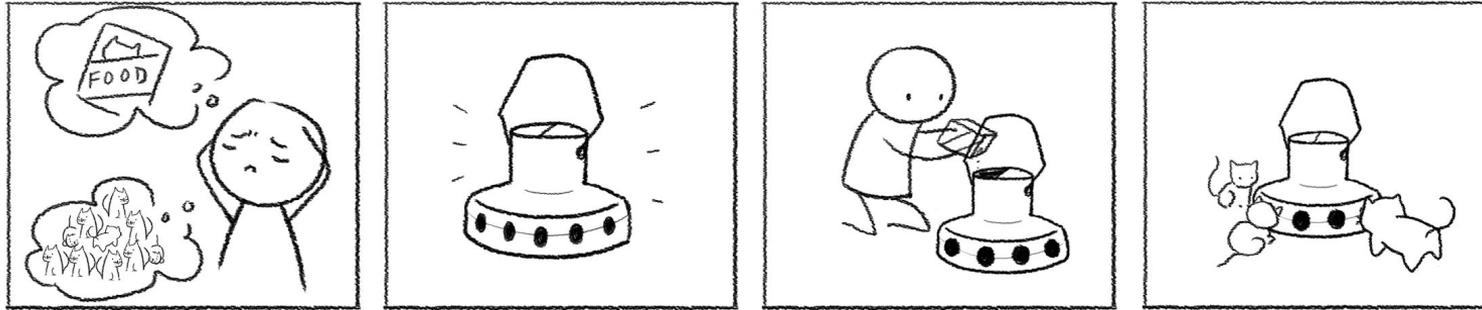
Also provides clean water

Uses AI to make sure to only feed cats

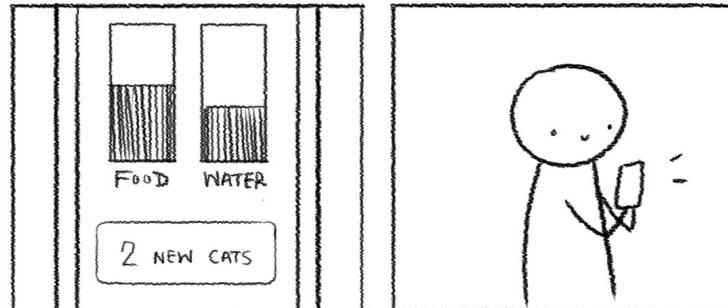
Tracks colony health and numbers



# Preliminary Concept 3: Robo Care

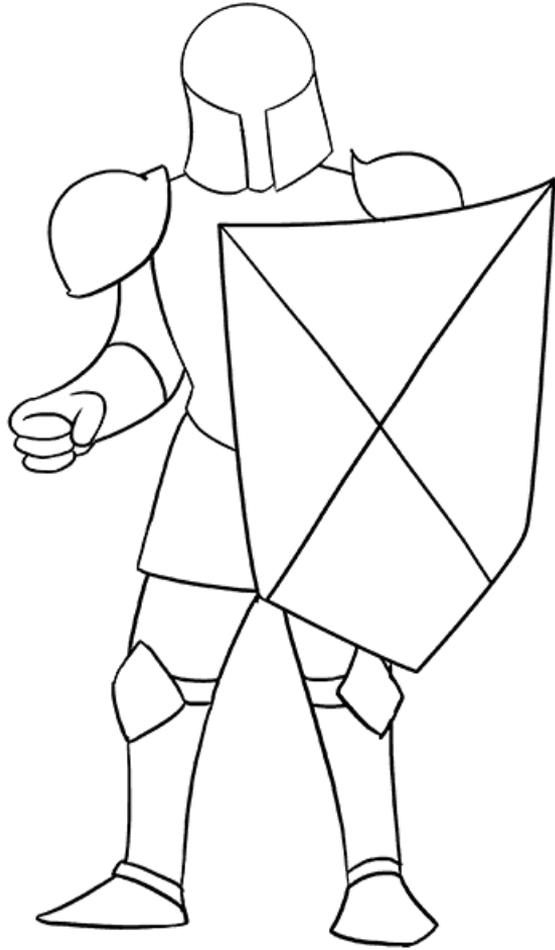


The Veteran Hero cares for 3 large cat colonies. It is difficult to come back every day for feeding in different locations. She recently purchased Robo Care, an automatic cat feeder.



With the Robo Care app, the Veteran Hero is able easily to automate feeding.

She is able to check on and care for her cats from anywhere she pleases.



## **Quote from our Interviewee**

*“If you’re going to pick up an injured feral, **dress for battle**. Put on protective gear and use a towel. Grab them by the scruff of the neck, wrap them up like a burrito then put them in a closed space to get them to the vet. In a fight or flight situation, **they will choose fight.**”*

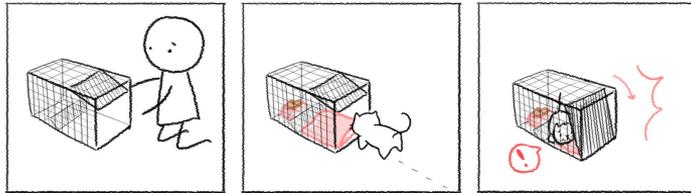


## Refining Concept Pool

## Current Solutions: Pain points

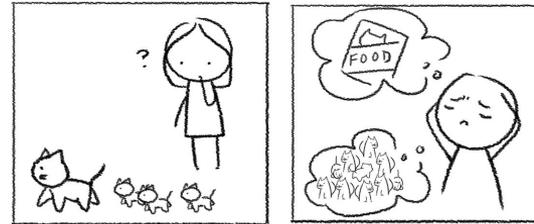
Common traps can be difficult work with.

- DIY comfort for cats
- Safety of the cat
- Babysitting the traps



Journaling is done by hand.

- Paper and pencil
- Some video and pictures
- Too much of a hassle



**The TNR process is outdated**

## Design Questions

# How Might We...

Assist caretakers  
in **caring** for a  
large number of  
cats?

Balance the cats'  
**well-being and  
comfort**?

Introduce  
**standardization**  
to the caretaker  
community?

How can we create the biggest **impact** on the TNR process with our solution?



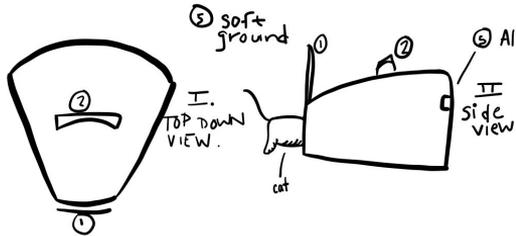
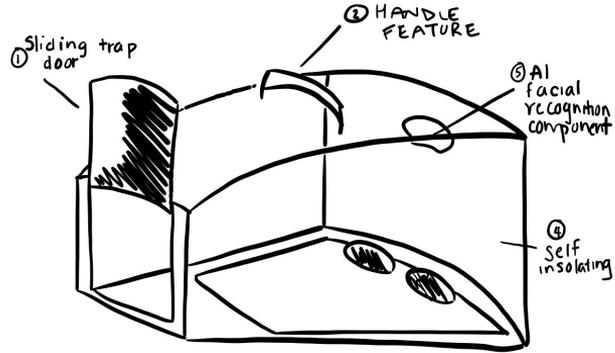
Feral Cat

## A Feral Cat's Journey Through the TNR Process

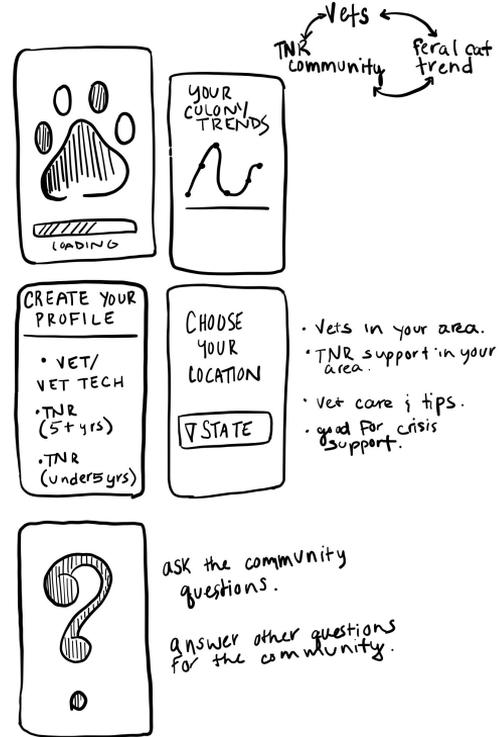


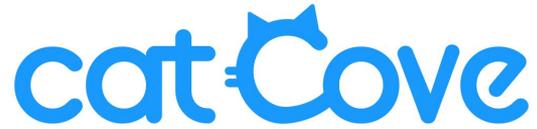
For more than 50% of the TNR process, the cat is in a trap.

# Refining Concepts



+





## Modernising Trap Neuter Return

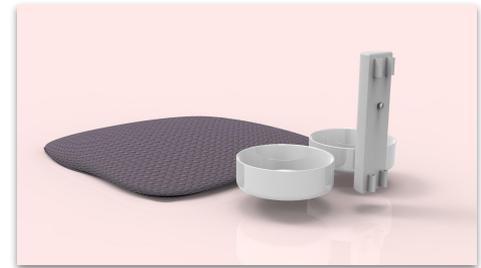
Offering a complete system to TNR caretakers that will streamline their colony management while keeping each cat's comfort in mind.



Trap design with cats in mind

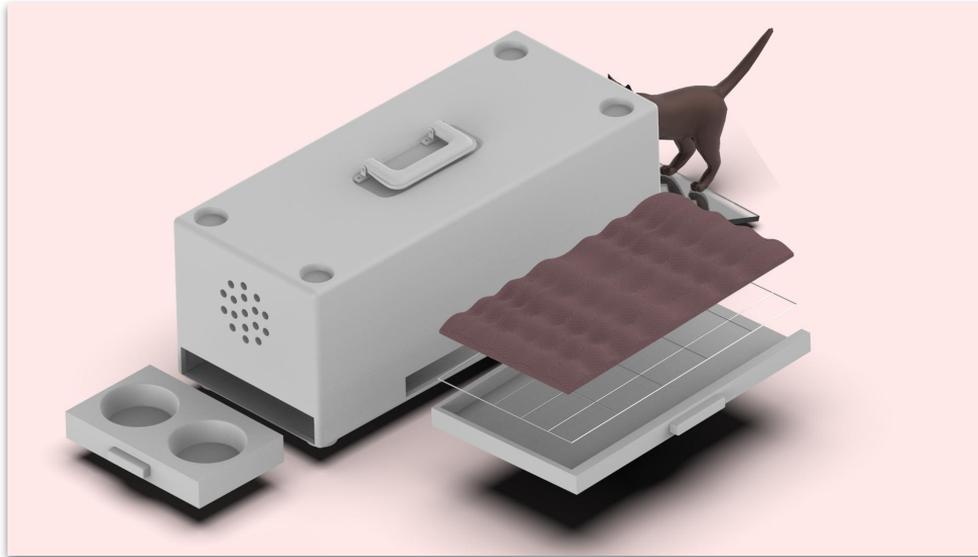


Smart Colony Logging



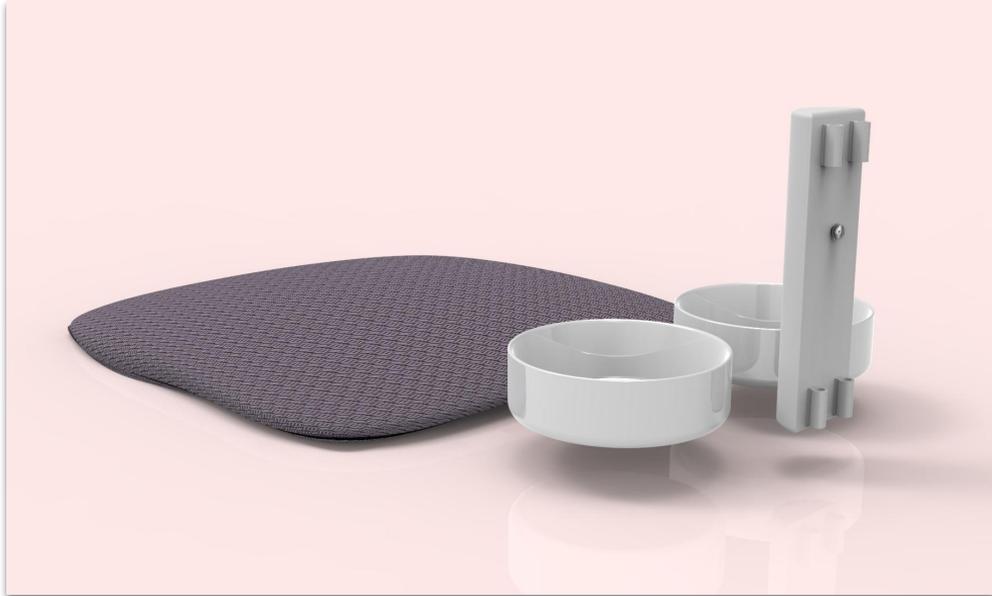
Advanced DIY Kit

## Trap design with cats in mind



- Trap has built in comfort pad and food bowls
- Upward closing trap door will ensure no paws get caught
- Facial & Species recognition

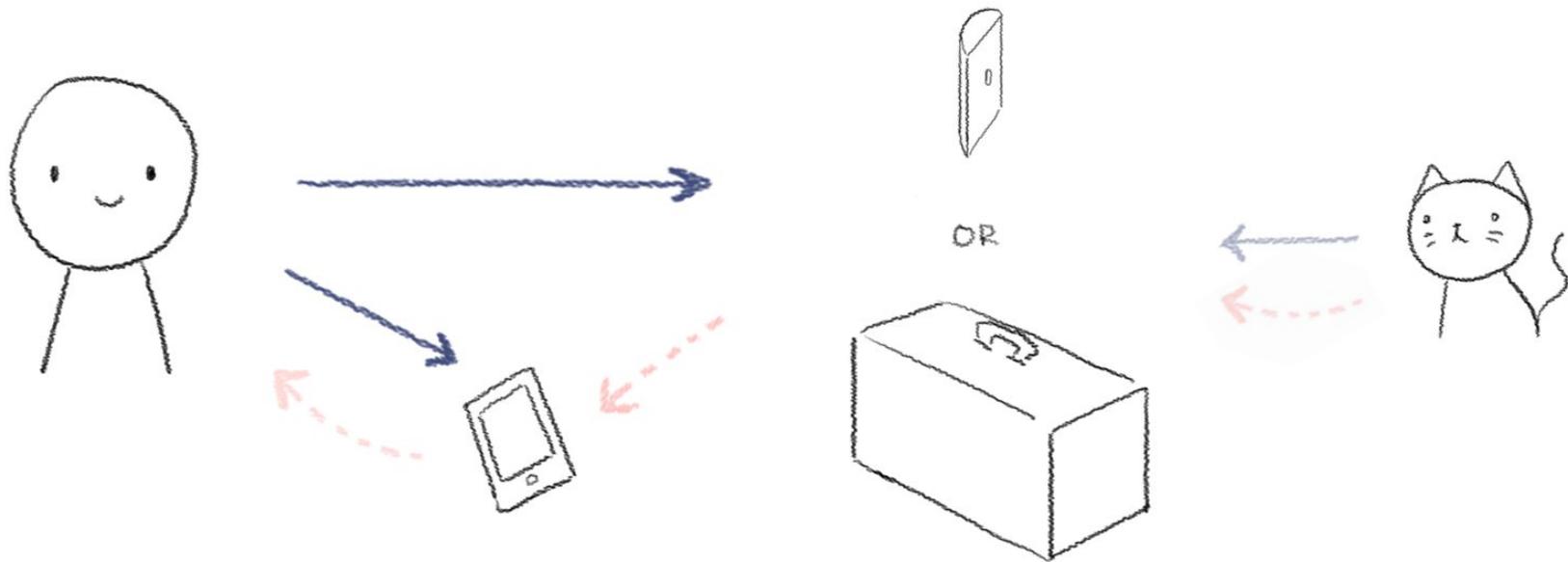
## Advanced DIY Kit with AI trap attachment



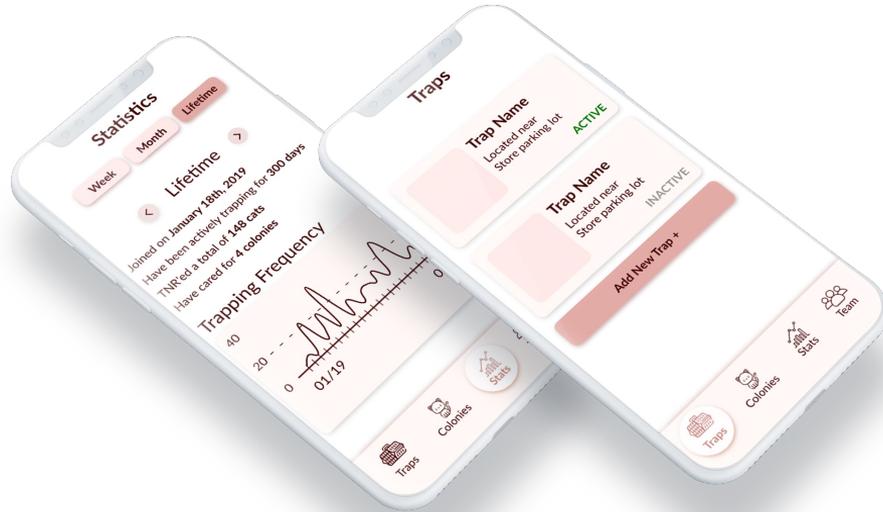
### DIY Kit Includes:

- AI powered camera clip-on
- Food and water bowls
- Washable pad for existing traps

## Interaction Model



## Auto colony logging with AI-powered app

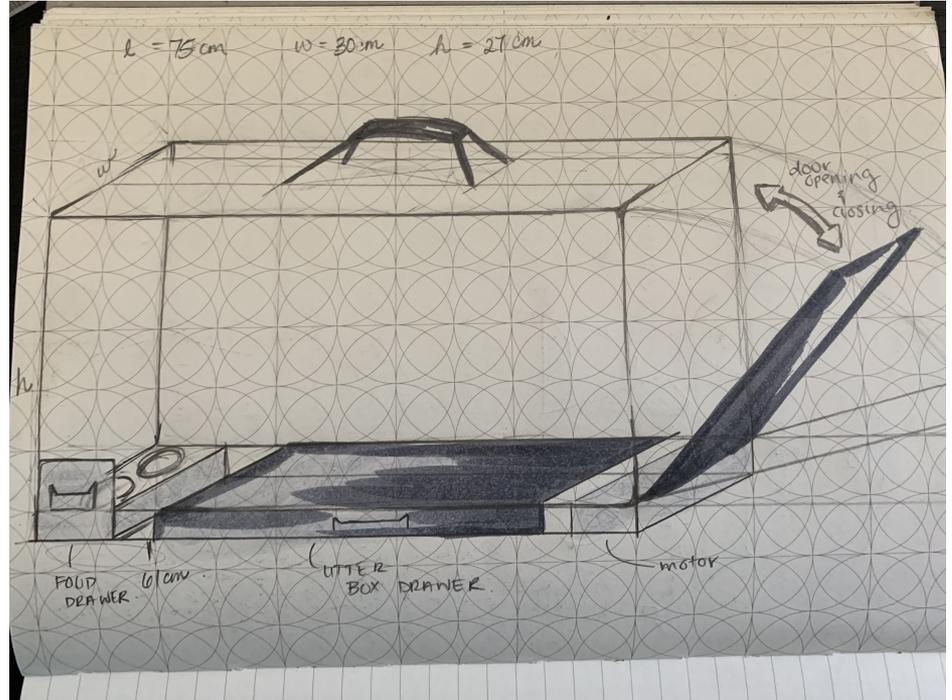
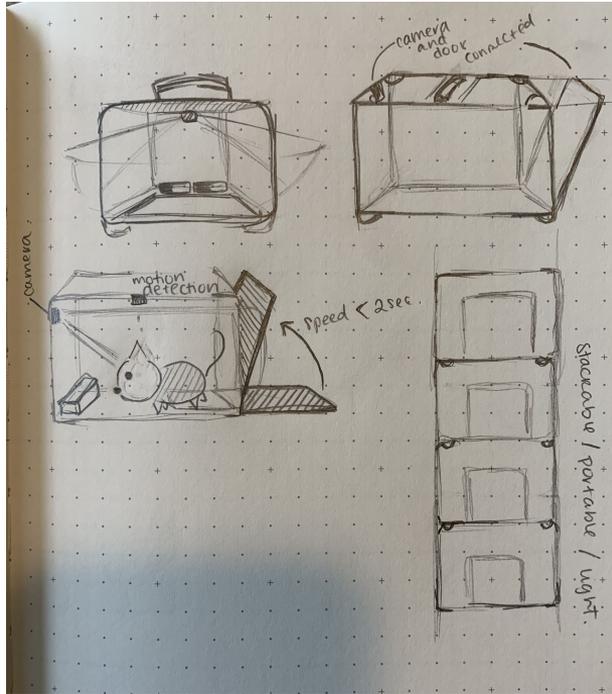


- Automatically log every cat captured
- Keep track of what step in the process each cat is at
- Be alerted if pregnant or injured cats are found



# Physical Product: Modernizing the T in TNR

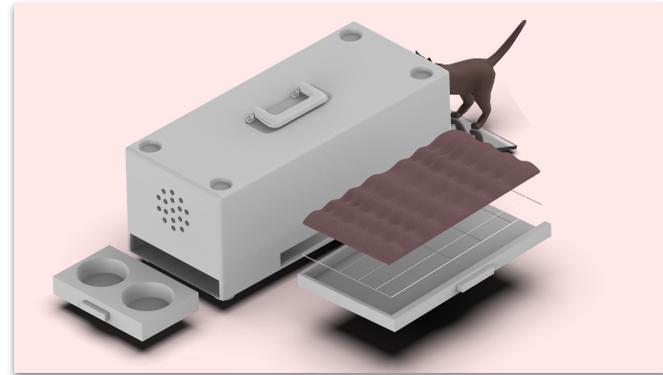
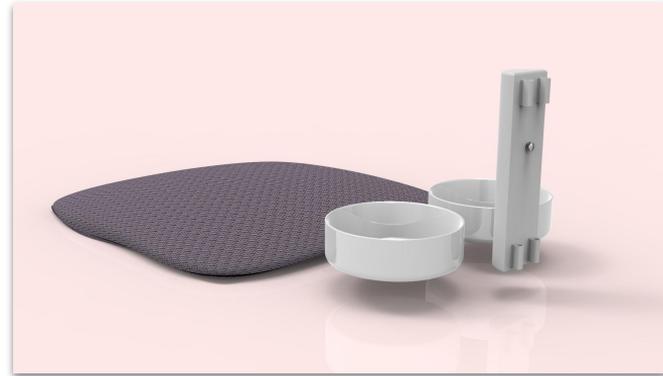
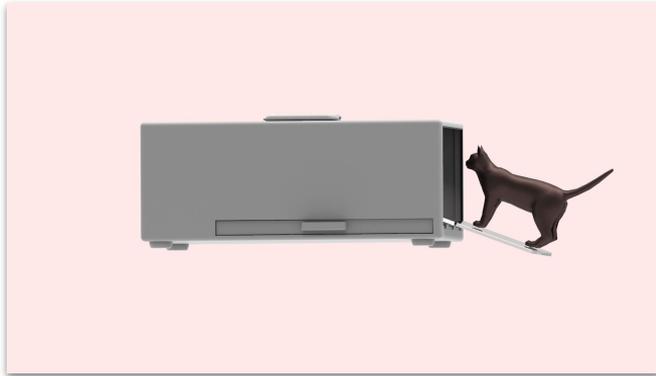
# Physical Product Development



## Physical Product Development (Low-Fi)



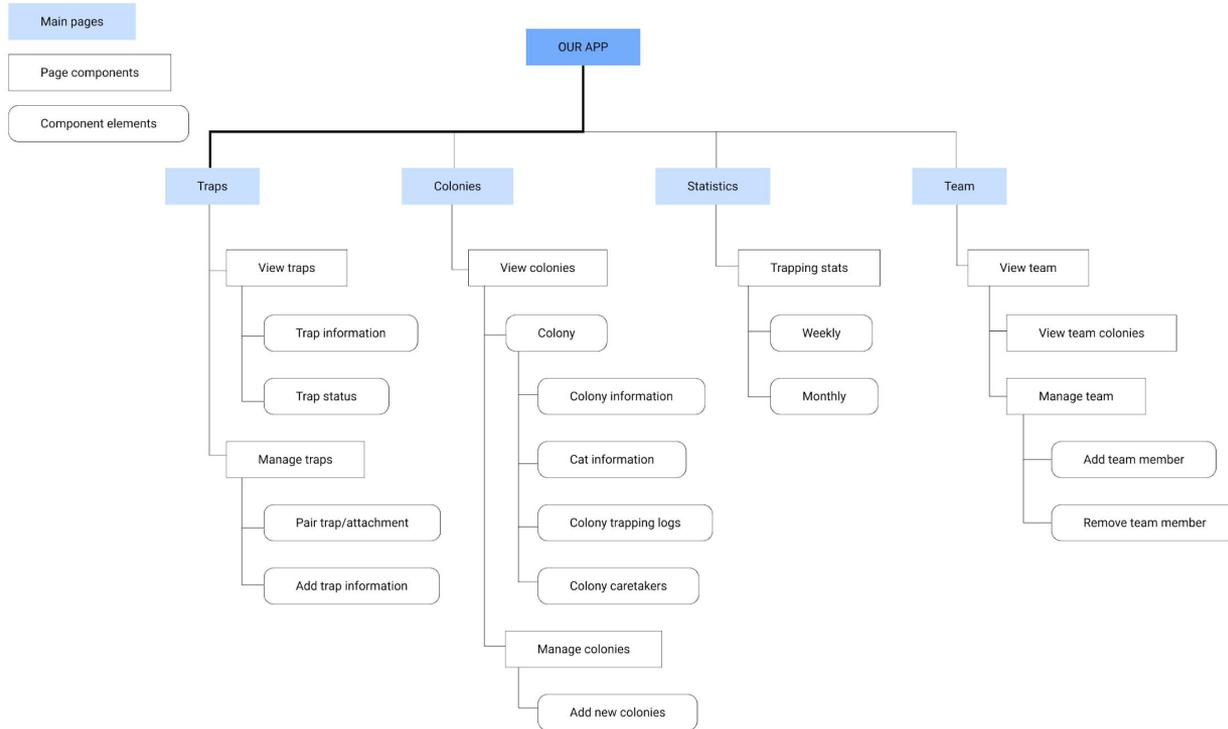
## Physical Product Development (Mid-Fi & Renders)



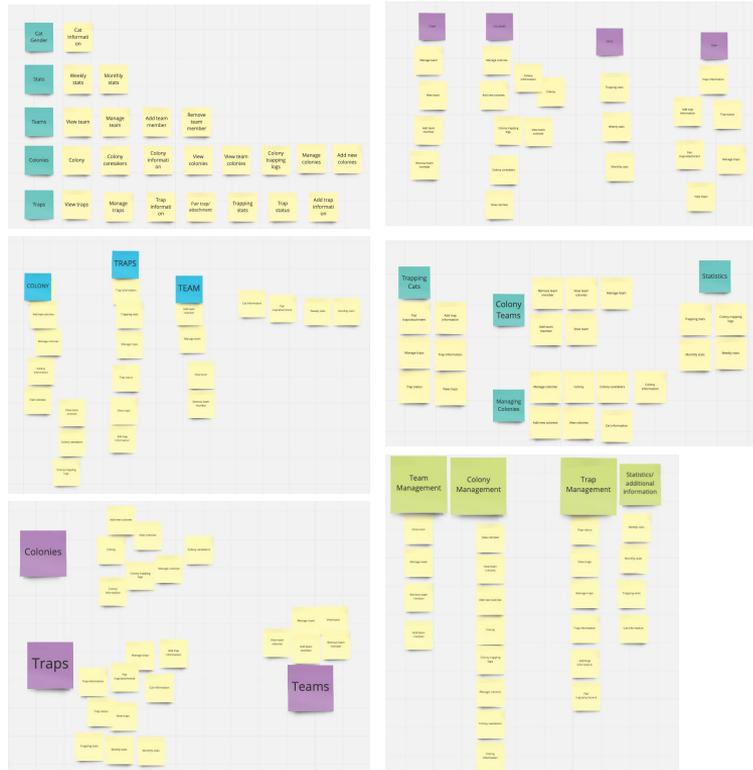


# **Ecosystem: Companion App Development**

# Initial Sitemap



# App Development

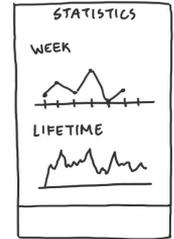
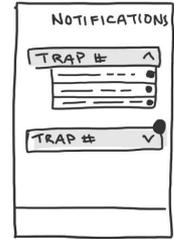
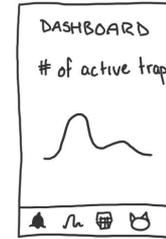
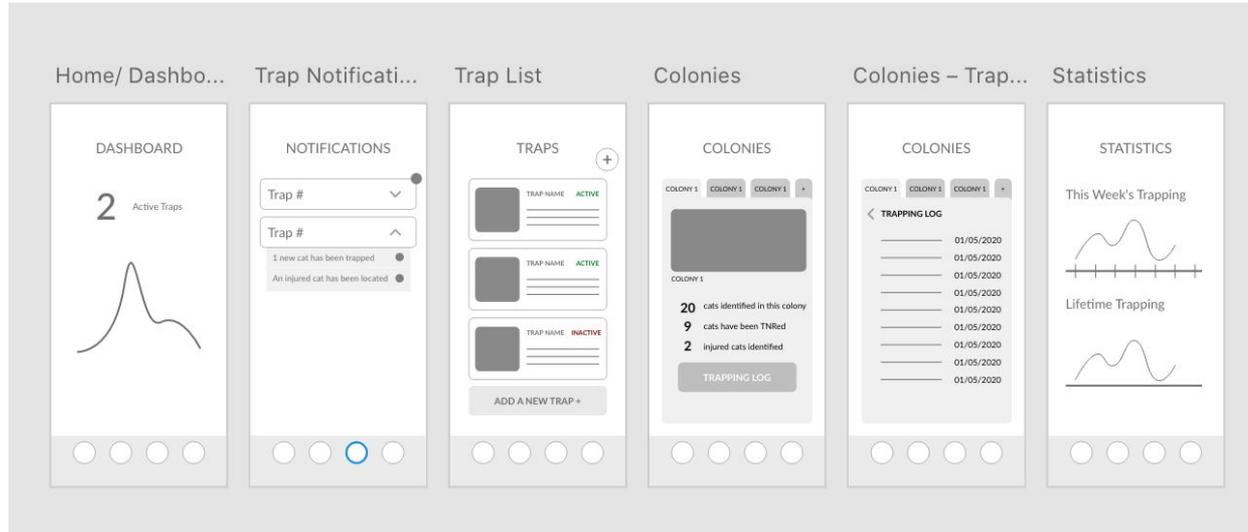


**Traps, colonies, stats, and teams** are the four most easily created groups, with few exceptions.



Open card  
sorting

# App Development (Low-fi)



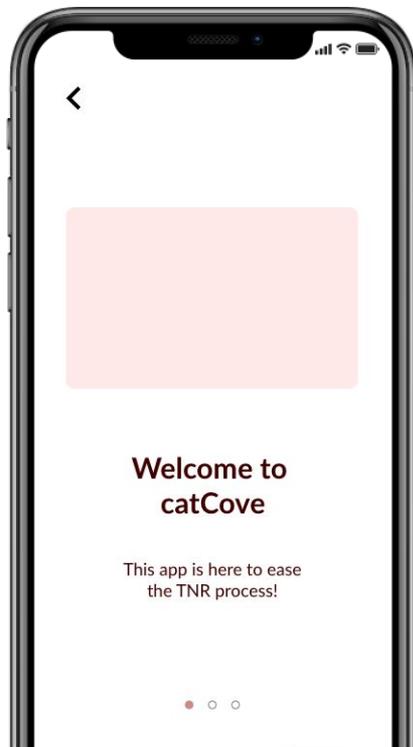
# Onboarding

Greets new users

Creating an account or logging in

Walk through of the features of the Trap/Trap attachment

Explaining connection between trap features and the app

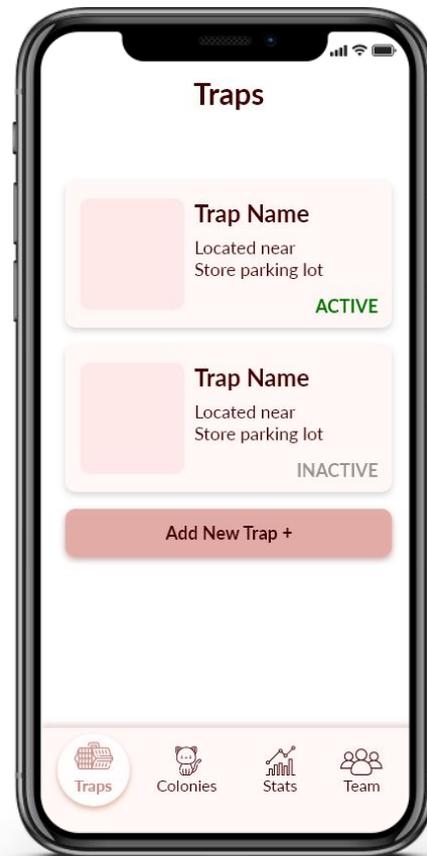
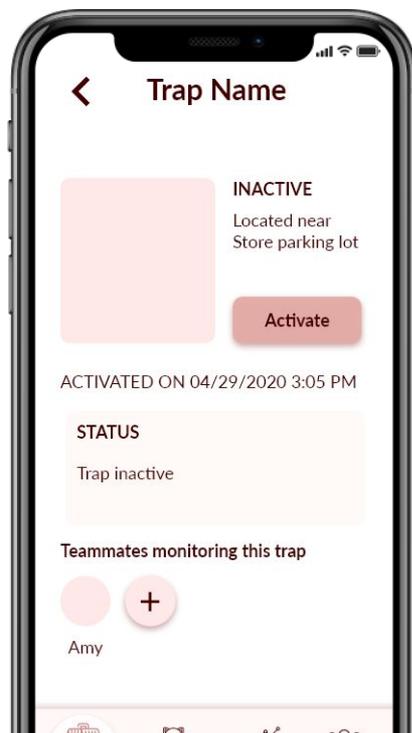


# Traps

Pair traps and trap attachments to our app

Activate/Deactivate traps on the go

View who is monitoring the trap and where in the process the cats are



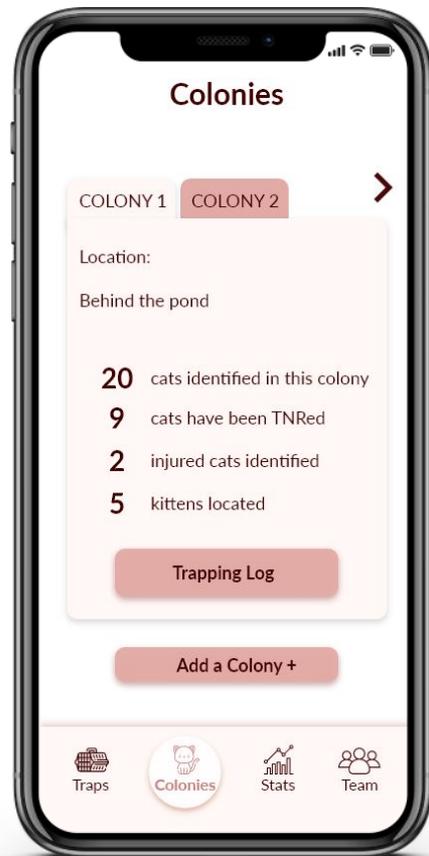
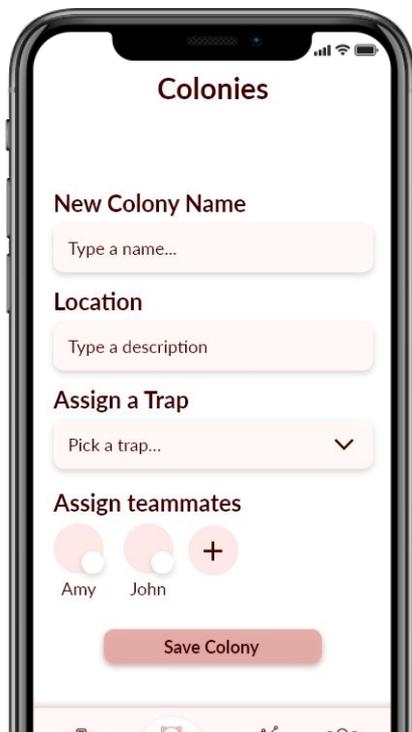
# Colonies

Creating a new colony

Keep tabs on what is going on in each colony

Trapping log with specific information per trapping

Add teammates and contacts for anyone working with you

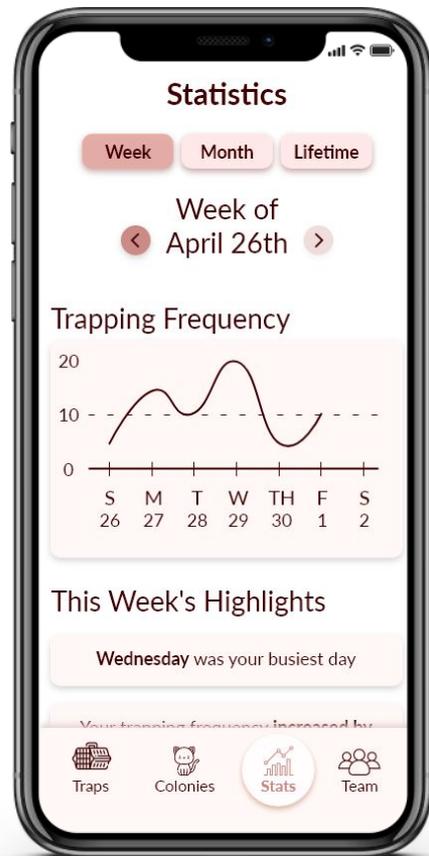
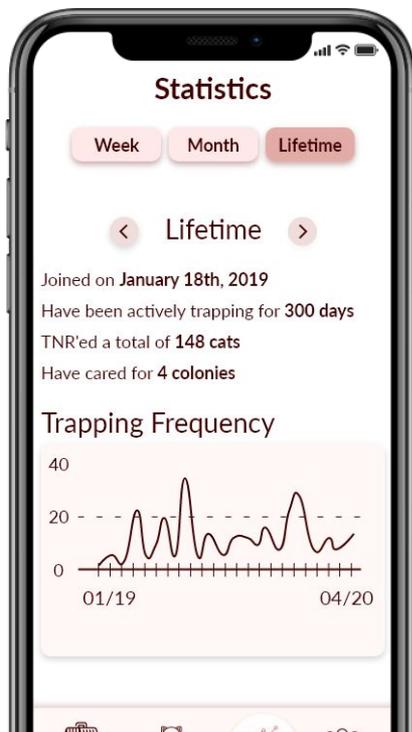


# Statistics

Week, Month, Lifetime views

Statistics that notify the busy days and percentages of increase

Overall cat statistics, colony numbers and days active



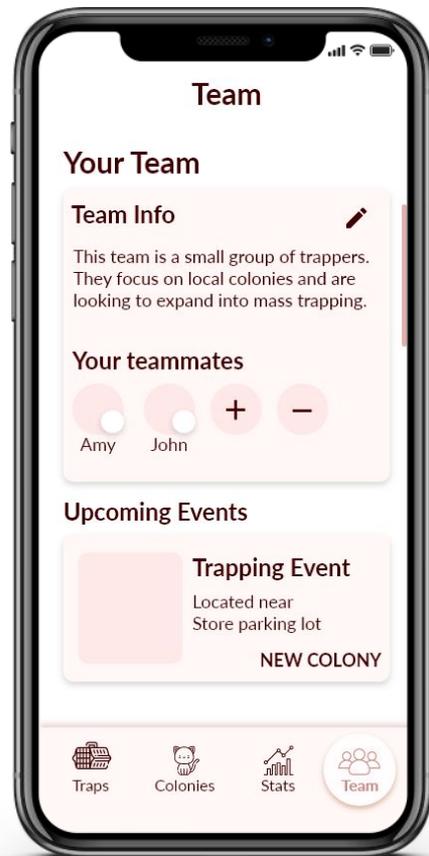
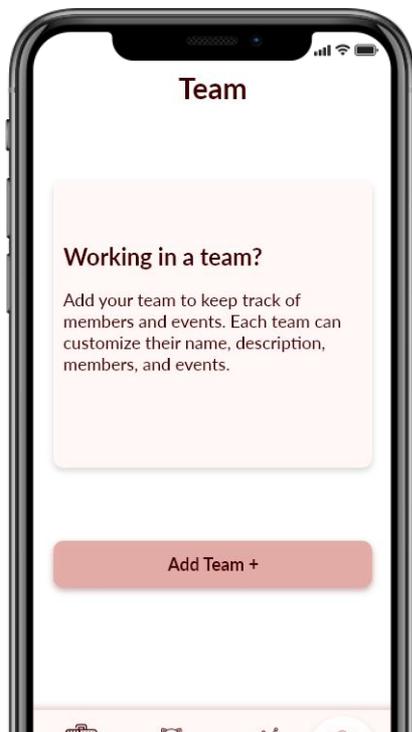
# Teams

Create a team profile

Join or create multiple teams

Know which teammate is trapping and where the colony is

Allow entire team to have the same information to help streamline communication





# User Testing 1: App and Physical Product Review

# User Testing

1

Expert User  
Testing

3

TNR  
Participant  
Testing  
Sessions

# Quasi Empirical: Evaluation Questions

Is the smart trap easy to understand and use?

Is each feature of the physical product necessary and feasible?

Is the app intuitive?

Are the labels accurate and clear?

## Expert User Testing



**Dan Lipe**

User Experience Manager

Radio Systems - PetSafe

“

You're heavily relying on red/green shades which is difficult for contrast and for people with color blindness

You can serialize the products with a QR code that can just be scanned to the app

Pay attention to things you're creating relationships between - visual grouping

More playful wording for the application

”

## Modern Trap - Feedback

Plastic cover needs more holes for breathing and visibility

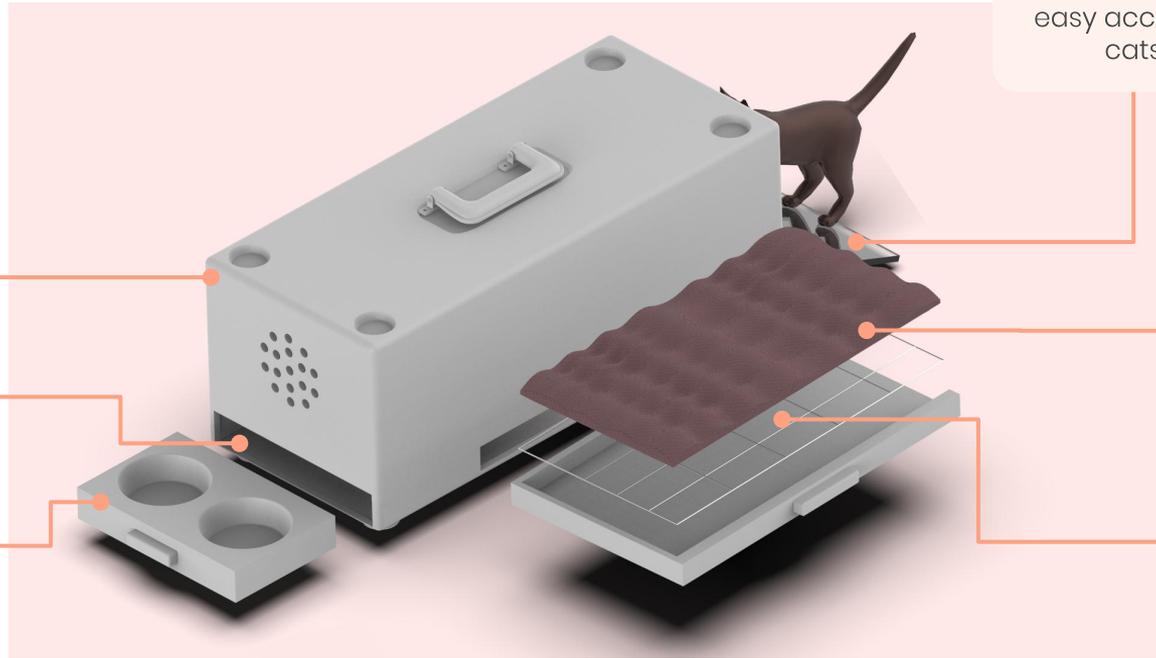
Food bowls must not pull out- risk cat escape

Food bowls need to be raised

Vets don't have easy access to cats

The pad needs to be regularly changeable

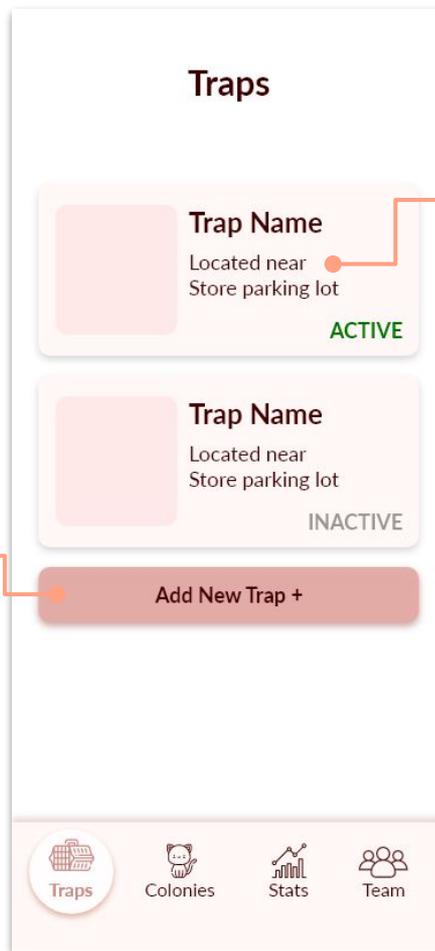
Any metal grates need to be smaller so kittens can't escape



## App Feedback

Caretakers utilize the same trap for multiple different colonies, even within the same day.

QR code scanning might make pairing easier

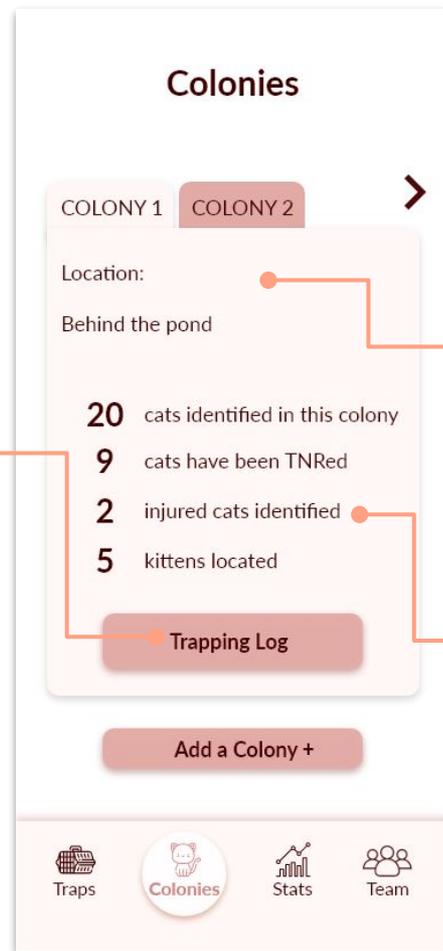


Need a way to organize where the traps are as they move throughout the day

## App Feedback

Caretakers have a lot of cats to keep track of which can be confusing and difficult.

Need to know which cat is where in the process

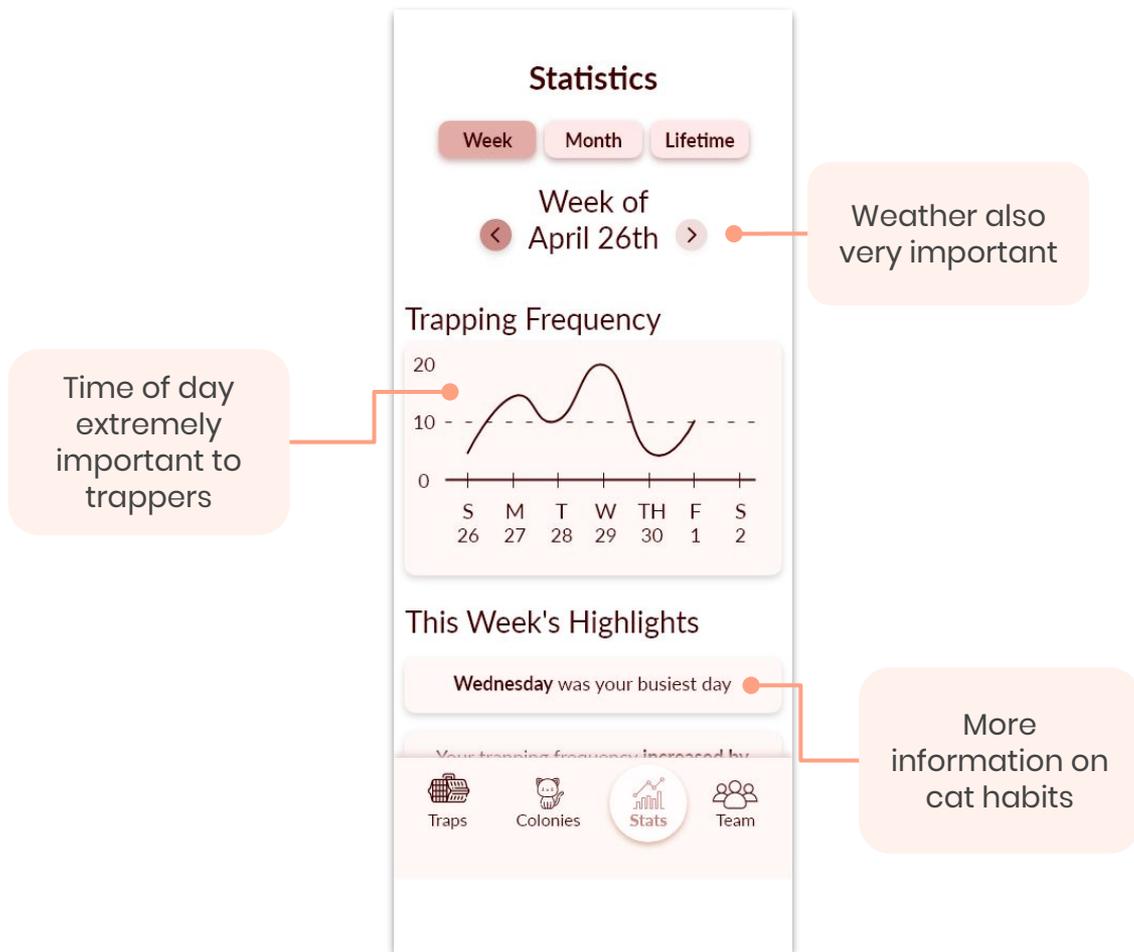


Include caretaker's contact information

Information like whether or not cats need meds or special care

## App Feedback

Caretakers value information they can use to understand cat behavior over productivity information.



## App Feedback

Caretakers struggle to keep teams organized and keep track of a lot of data and contact information.

Need to be able to see who is caring for what colony

Scheduling might be helpful

Contact information of caretakers and trappers necessary



## Ecosystem Feedback

AI is **not readily understood** by the target audience.

Caretakers are less focused on documenting the past than what can **aid them in the future** with trapping.

# User Testing: Insights Summary

## Physical Trap

- Plastic cover needs more holes for breathing and visibility
- Food bowls need to be raised & not detachable
- Vets need to have easy access to cats

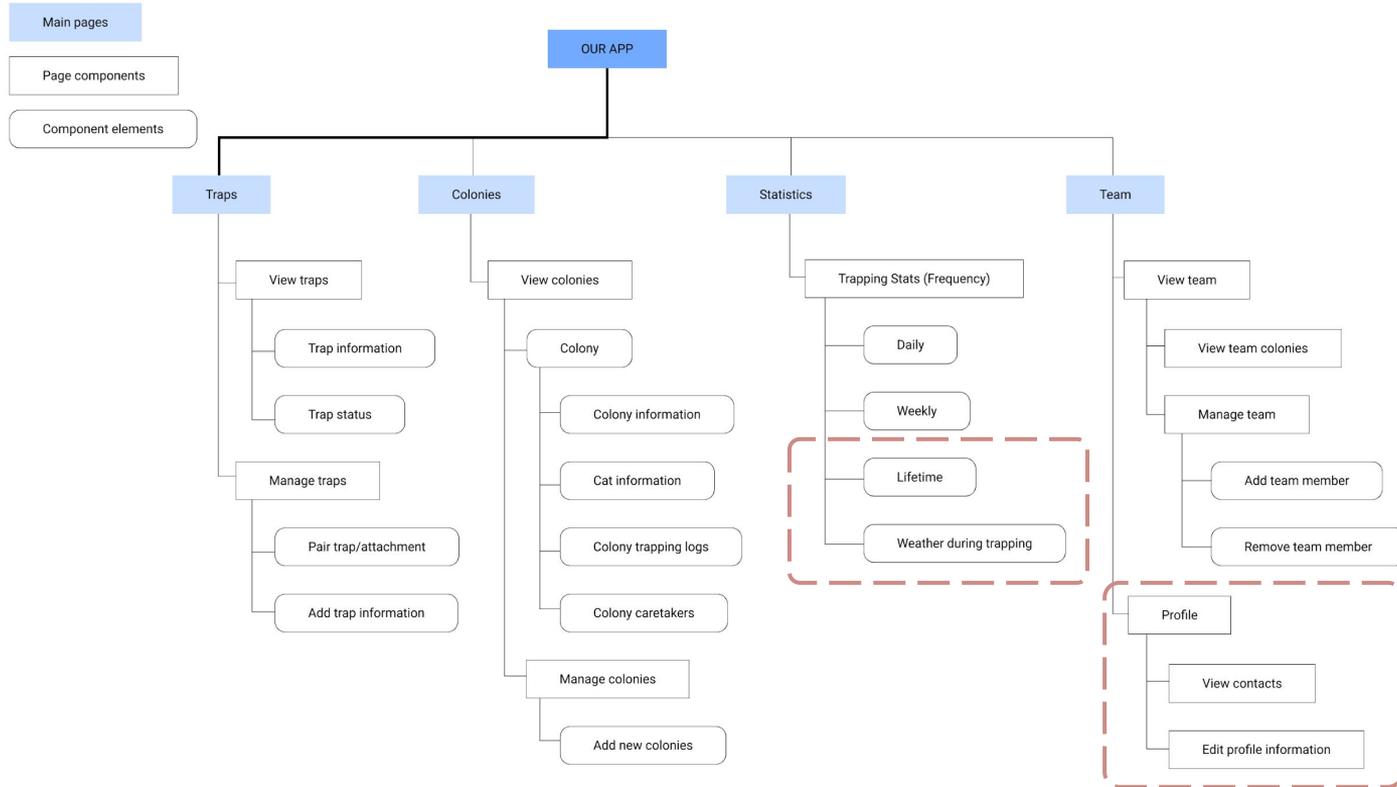
## App

- Time of day is extremely important to trappers
- Team member profiles & contact information
- Cat profile and stage in the process (separate from trap)

## System

- More introduction to the AI in the onboarding
- Serialization for identifying each individual trap/ trap attachment

# Stage 2 SiteMap

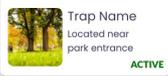
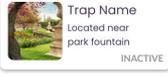
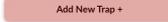
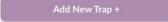
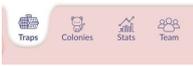
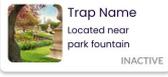
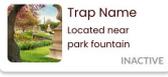
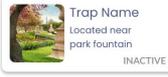
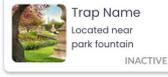
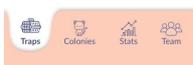
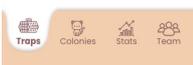




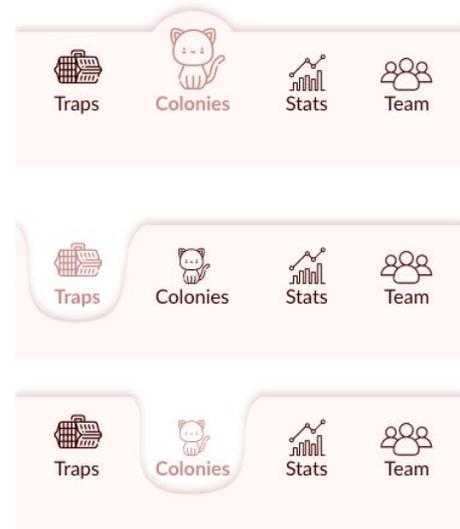
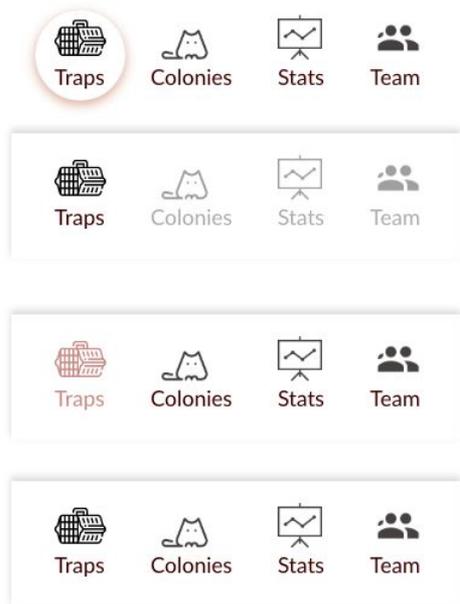
# Refining Concept Pool

## App Iterations

# Color Tests

# Navigation Bar Tests





## User Testing 2: App and Physical Product Review

# User Testing



# Quasi Empirical: Evaluation Questions

Is the smart trap easy to understand and use?

Is each feature of the physical product necessary and feasible?

Is the app intuitive?

Are the labels accurate and clear?

# User Testing: Insights Summary

## Physical Trap

- DIY-kit food bowls should attach to trap wires as well
- Branding on all DIY-kit products

## App

- Day and week view are equally important for trapping info
- Having an admin for each team to add/remove members
- More hierarchy for pages

## System

- Sending notifications to confirm if a cat is trapped
- Notifications for prime trap times



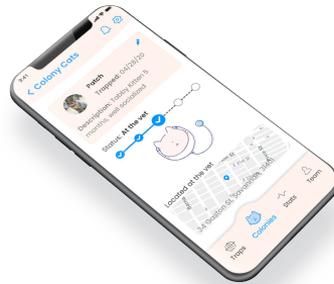
# Deliverables: Final App and Trap Designs

## Modernizing Trap Neuter Return

Offering a holistic system to TNR caretakers that will streamline their colony management while keeping each cat's comfort in mind.



Trap design with cats in mind



Smart Colony Logging



Advanced DIY Kit

# Physical Trap

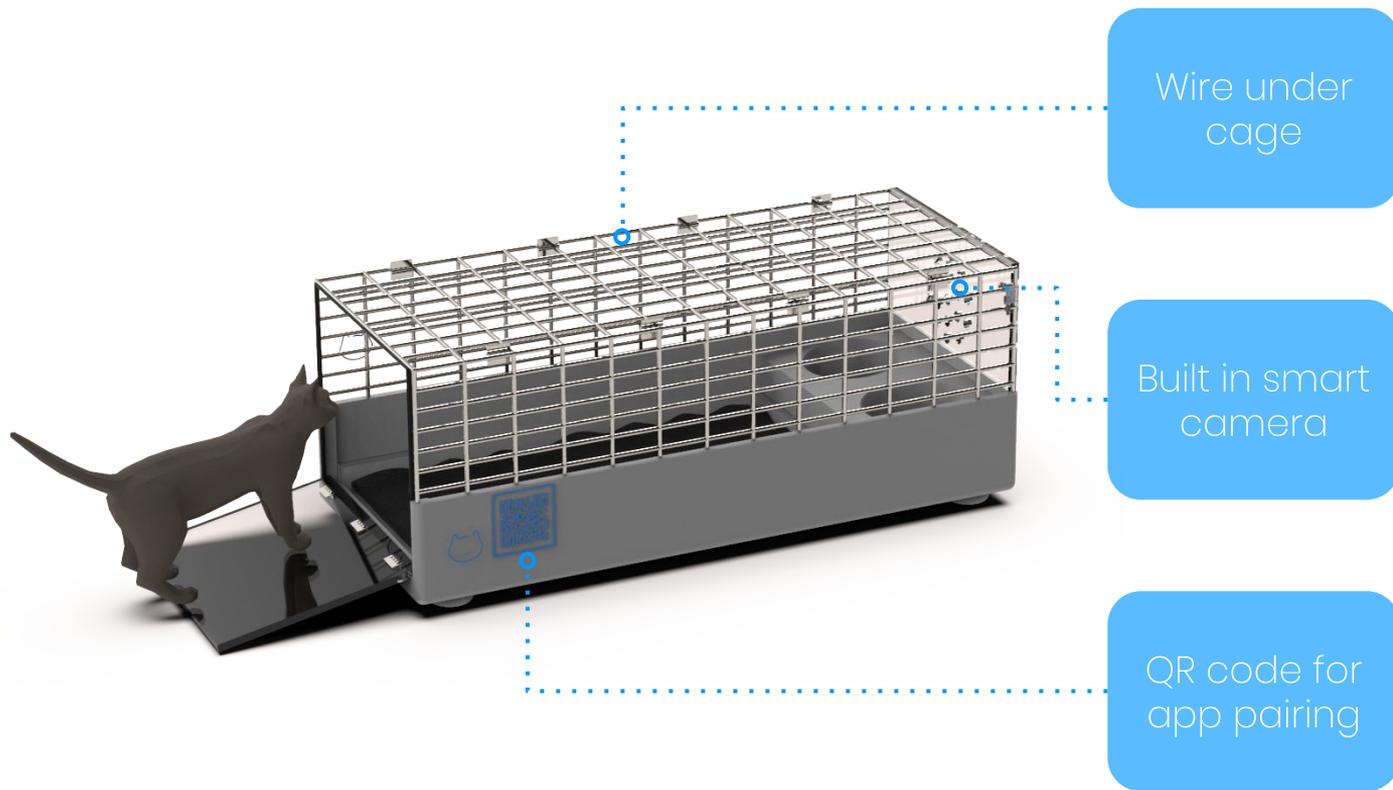


Collapsible  
cover against  
weather

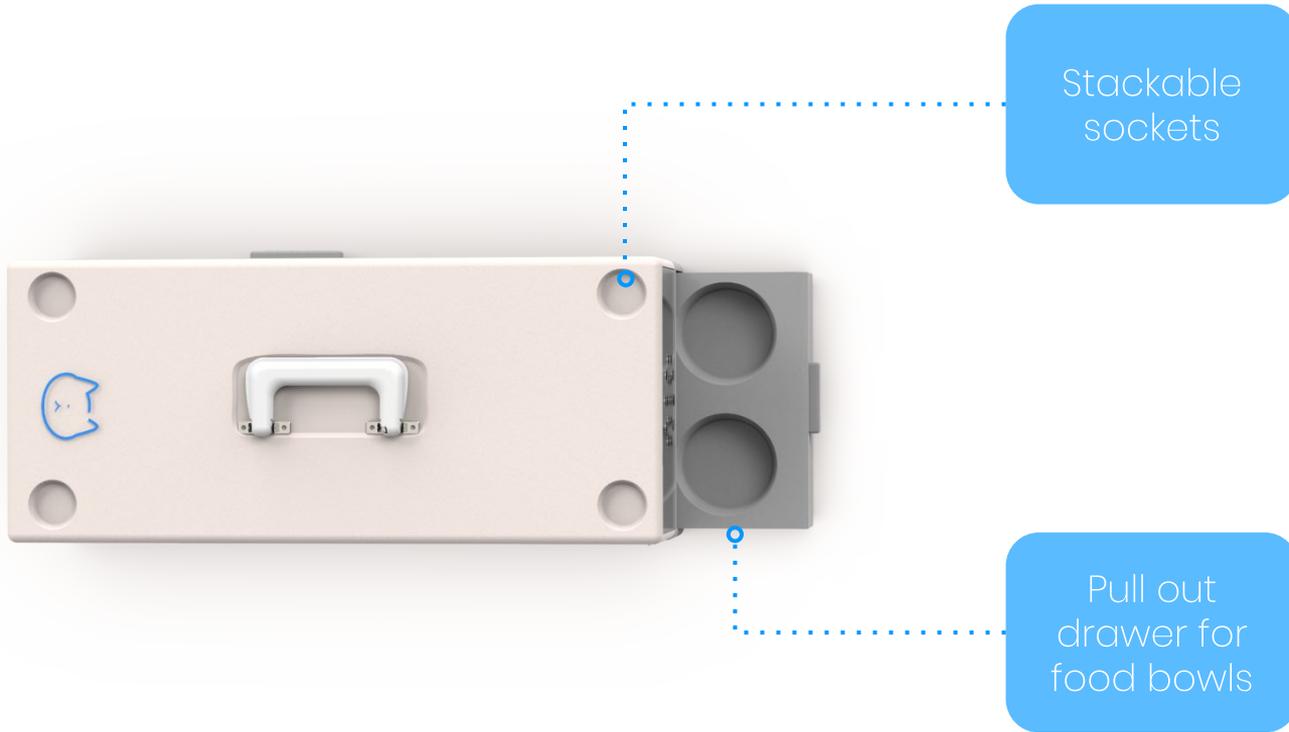
Bottom up  
trap door

Pull Out  
drawer for  
pad cleaning

# Physical Trap



# Physical Trap



# DIY Kit



Cat-Friendly  
food bowls

Clip-on  
smart  
camera

Waterproof  
padding

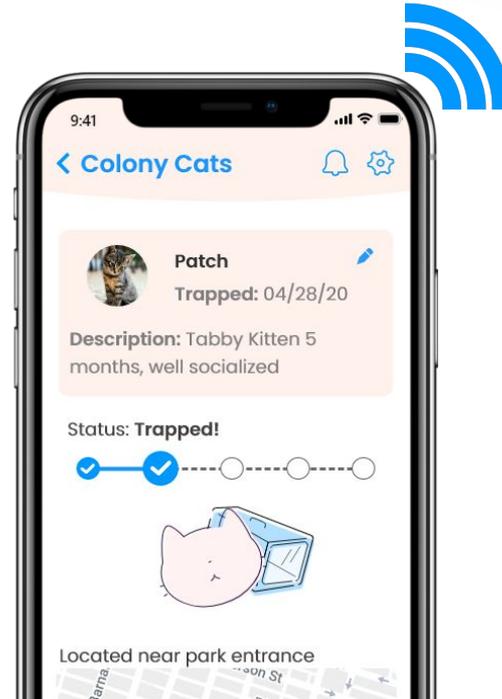
# AI-controlled trapping

Impact: Caretakers can interact with their traps from any location

Manage traps through the app

Get notified when they're activated

Release non-target cats remotely



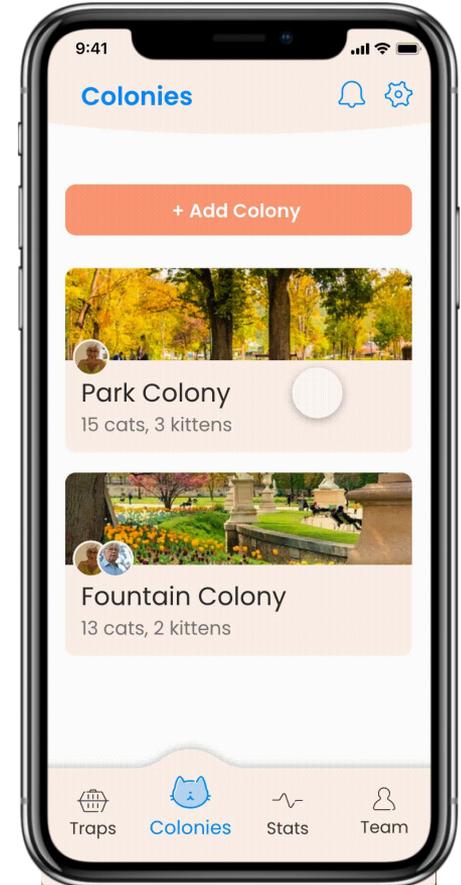
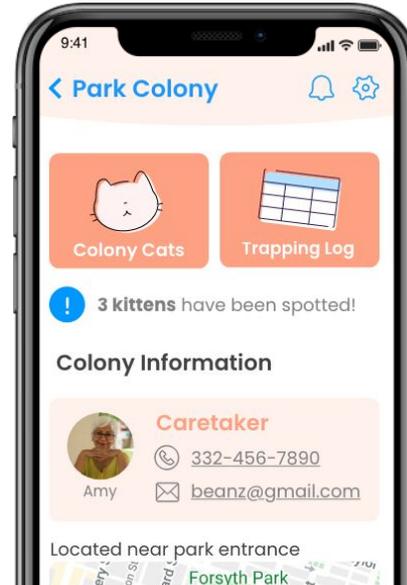
# Colony Tracking

Impact: Automates and standardizes cat colony logging

Colony cat list updates automatically

Track which cats have been TNRed

Track a cat through the process



# Colony Statistics

Impact: Reflect on past trappings to plan for future trapping sessions

Get alerted when it is prime trapping time

Discover your colonies' habits

View your TNR progress



# Organize your TNR Team

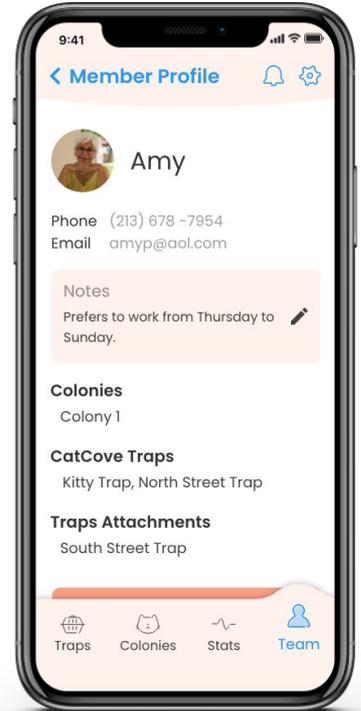
Impact: Standardize the system:  
Keep teammates accountable for their  
schedule and equipment

Set a schedule

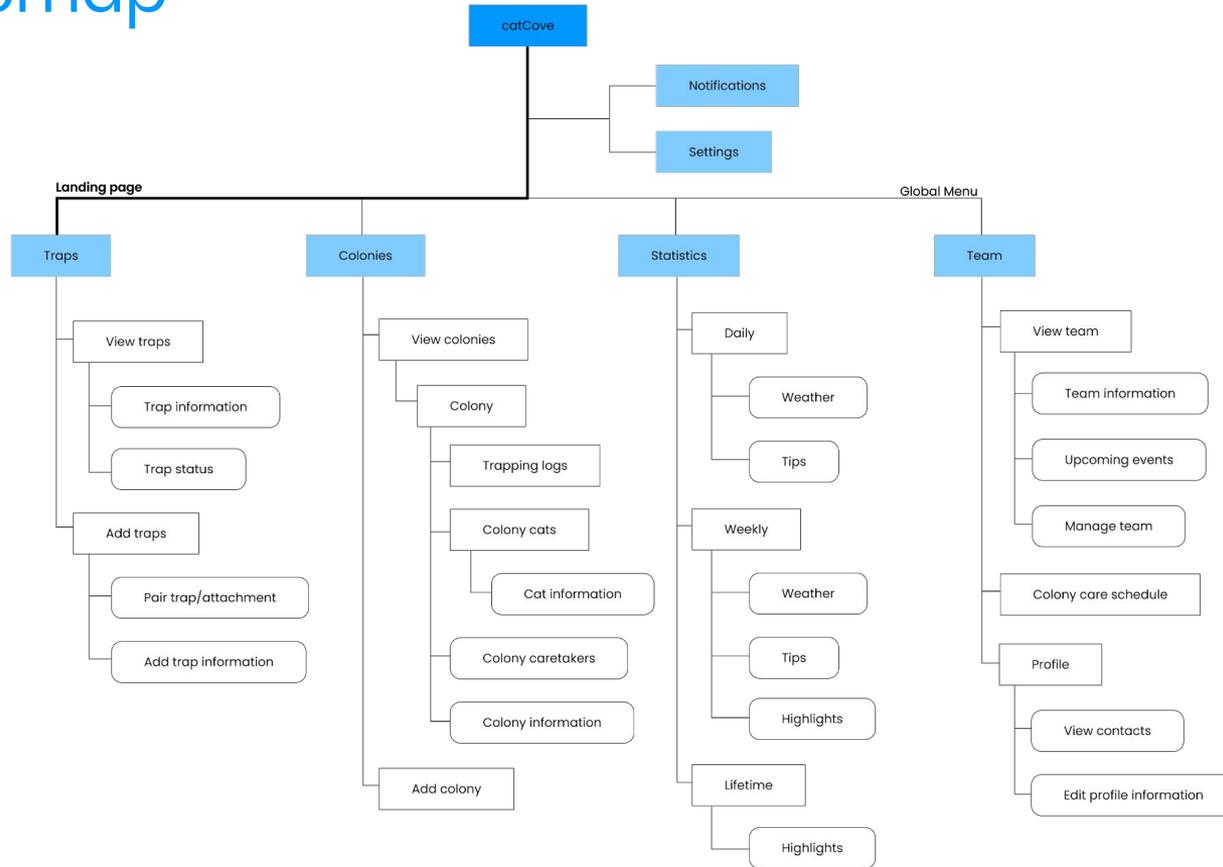
Organize trapping events

Manage catCove equipment

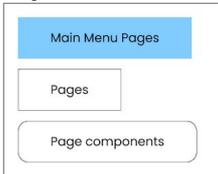
Access contact information



# Final Sitemap



## Legend



# Overall Impact

By effectively **modernizing** the TNR process, catCove helps caretakers execute TNR more effectively, **increasing the success rate**, without needing to sacrifice the cats' well being and comfort





## Poster & Visuals



UXDG 330 | Prof. Yoon

Daniela Gomez-Quintero | Cherie Chen | Madison Jason | Jasmine Attanasio | Kelly Pobgee

# catCove

Modernizing Trap Neuter Return

# Poster



## Modernizing Trap Neuter Return

Feral cat numbers can quickly get out of hand, making TNR a necessity, but the process lacks standardization for the caretakers and comfort for the cats. catCove is an all inclusive system designed with these goals in mind.



Current cat traps run the risk of injury and are extremely uncomfortable for feral cats, but catCove is a smart trap designed with both cats and caretakers in mind.

### AUTOMATED DOOR

Automatic, upward closing trap door so no paws or tails get caught

### POWERED BY AI

Facial and species recognition tells if cats are injured or pregnant

### BUILT IN COMFORT

Included changeable waterproof comfort pad and built in food drawer

## ADVANCED DIY KIT

### TRAP ATTACHMENT

All of the recognition features of the trap in a small, affordable, clip-on camera, powered by AI.

### BOWLS AND PAD

Augmented wire trap comfort with waterproof pad and ergonomic bowls



### Traps

Keep track of trap locations and activate and deactivate them remotely

### Colonies

Smart colony logging tracks the cats and their wellbeing, generating care suggestions

### Stats

Compiled data is analyzed for patterns and informs trapping and care suggestions

### Team

Organize caretaker contact information and scheduling all in one place