

Recovering a Texas Native Species – Attwater's Prairie Chicken Presentation Notes for Slides

2) APC Description

There are three subspecies of *Tympanuchus cupido* – the greater prairie chicken found throughout the Midwest states, the extinct heath hen and the Attwater's prairie chicken who is now endemic to southern Texas. There is also a second species of prairie chicken called the lesser prairie chicken *Tympanuchus pallidicinctus* that can be found in the central great plains region around Oklahoma. Male vs Female APC: Males are more showy during their breeding season. They will have yellowish orange air sacs and eyebrows and longer black pinnae feathers that are raised above their heads. Adult males will have black tail feathers where females have a brown barred tail. Females will not have any of the orange colorations and only males make booming sounds and do a foot stomping behavior. The foot stomping and booming behaviors can be seen in young chicks. Adult birds will range in size from 600-900g.

3) APC Habitat and Historic Distribution

APC are native to coastal prairie environments that once extended across Texas and Louisiana from the Nueces River to Bayou Treche. This coastal prairie used to be a vast area of 6 million acres. Now there is only 1-2% of the original coastal prairie habitat remaining. Back in the 1800s there were over one million birds across the coastal prairie and that has been severely reduced to two populations in Texas. One population can be found at the Attwater Prairie Chicken NWR just west of Houston and a second on a private ranch in Goliad Co.

The coastal prairie habitat consists of well drained soils that have several types of bunch grasses including little & big blue stem, Indian grass, switch grass, etc. These areas also have prairie pot holes that hold ephemeral water ponds and untilled "virgin" areas will have small mounds of substrate called mima mounds. The areas should consist of taller and shorter vegetation heights. 1 APC can be supported on 10 acres of optimal habitat.

Home range sizes can vary greatly with each bird. An annual range for females is around 1470 acres and 889 acres for males.

4) APC Diet

APC are crepuscular feeders and can be found as solitary birds or in large groups.

An adult's diet is primarily plant based. They will forage for a variety of soft forbs especially in recently burned areas, seeds, grasses and flowers. Day flowers and small asters are among their favorites.

A chick's diet looks very different in that they need 90% protein content. Chicks will try and catch any type of insect on their own and will consume some plant material.

5) APC Breeding

APC breeding season will begin end of February and last through the first part of May. Males may start to congregate as early as the end of January but do not start vocalizing till later. Peak booming season is in March. During the breeding season, males congregate in leks on booming grounds between 5am-8:30am. Booming grounds can be any shorter vegetation area or man-made structures like dirt roads or fire breaks where the males can be easily seen. Females will fly to different booming grounds each day and may make an appearance to a single area for several days in a row before courting with a male. Males have loose territory areas within these booming grounds and there will typically be a dominant

male that does most of the breeding. Males will try and court the females by a neat dancing display that involves kackling, foot stomping and creating a booming call by inflating/ deflating their orange air sacs. The female APC will have preselected her nest site prior to visiting with the males and these are typically within 1 mile of the booming areas she is visiting. A female is the sole provider for the eggs and chicks. She will lay between 7-16 eggs in one clutch and incubate those eggs for 26 days. If her first nest is not successful and she still has time during the season she will attempt to re-nest. Birds in the wild live on average for 2 years though some have lived as long as 5. Birds in captivity live much longer with an average 5 years and up to 10 years.

6) Historic Booming Ground at NWR

The Reichardt windmill plot is a historic booming ground at the APC NWR. We have seen 1-19 birds here over the few years we have interned/ volunteered. Having fencing and manmade structures like stock tanks and windmills provide extra areas for predators to perch but the APC will also use them for roosting or when trying to show off more.

I personally have not done much reading on it, but it would be interesting to see if males who live past a year old if they have any site fidelity to booming grounds. I have seen some site fidelity when doing observations for greater prairie chickens in Wisconsin.

7) Booming Videos

First YouTube video: male APC at FRWC. Here you can see the whole process a male goes through for his courtship dance. <https://www.youtube.com/watch?v=6glxGDzFN3Q>

Second YouTube video: this is of greater prairie chickens in the wild. It shows a little more interaction between males on a booming ground. <https://www.youtube.com/watch?v=ttXjKXYAZ2E>

8) Predators of APC

APC have lots of different predators throughout every part of their life history.

Predators consist of mesocarnivores such as raccoons, skunks, opossums to larger carnivores like bobcat, coyote and domestic dogs/ cats. The mesocarnivores are primarily egg predators. There are lots of different aerial predators that use the refuge. Some of the more common ones are northern harriers and white tailed hawks. We have seen several attempted and successful predation events with harriers on birds on the booming grounds. Snakes are a common predator to eggs in a nest or even young birds. We had a few snakes get into our acclimation pens before birds were released. The snakes never consumed the whole chick but attempted. Fire ants are considered predators to newly hatched chicks but they also deplete the wild insect source chicks need for developmental nutrition.

I have also observed coyotes going through booming grounds with males present. The male APC will stop all dancing/ vocalizing and will squat closely to the ground or duck into tall vegetation. If the birds feel threatened enough they may try to fly away. APC are burst flyers where they can go short distances at quick speeds and can launch off the ground from a single point.

APC have various ecosystem roles from being an indicator species for coastal prairie environments, helping with seed dispersal and being a food source for secondary/ tertiary animals.

9) Reasons for APC Decline

There are many reasons why APC populations have declined over the years.

The biggest contributing factor is habitat changes: loss and fragmentation of coastal prairie. Urbanization, oil drilling, ranching, rice cultivation. The habitat has also been changed with the suppression of fires and encroachment of woody plants, invasive/ unwanted plants such as Chinese tallow and Macartney rose bushes.

With fragmentation of habitat, the remaining populations have become separated from each other and this causes less exchange of genetics.

APC were historically hunted in the 1800s for sport. Many people did not consume the birds.

Different diseases and parasites can affect both wild and captive birds.

Weather events throughout the 2000s have been the biggest challenges for the APC from drought years to excessive rains and flooding events during nesting and release seasons.

Poor brood survival has been documented for the APC and this is largely contributed to the introduction of red imported fire ants across the range.

10) APC Population Trends

The APC population is censused every spring during peak booming season in March. Booming grounds are observed every morning and we record the number of males/ females seen on these areas. The population is estimated to be a 1:1 ratio of male: females. Biologists will then double the number of males seen at this time to estimate the total population. Many of the drastic declines in population size since 2011 are due to drought, flooding and hurricanes. The APC population however is showing improvement since 2018 with successful reintroduction seasons and improved habitat.

11) Population Trends and Events Cont.

The 2017 Hurricane Harvey directly killed 32 APC. The Houston Zoo was able to help recover some birds that had not been released yet from acclimation pens on the refuge prior to the hurricane hitting. Only 4 radio collared females could be found after the hurricane on the APC NWR.

12) Flooding at the APC NWR Spring of 2016

These are some pictures taken on the APC NWR after the spring floods of 2016 while I was an intern.

The headquarters buildings were basically on an island. Many of the nests we tracked were under 2 ft of water. These eggs became water logged and bacteria infested killing the embryos. Most hens abandoned their nests those other chose to still try and incubate them having rotten eggs explode under them. Refuge managers chose to remove the rotten eggs in hopes that females would attempt to second clutch. With the flooding we also came across lots of floating mats of fire ants.

Many adult birds also did not make it through all the water. APC are not really perching birds but we did see some try and use trees and the acclimation pens/ buildings as a way to get out of the water.

13) APC Recovery Plan

The APC have a recover plan that is run by the US Fish and Wildlife Service. They are given a spotlight species designation of 6 out of 18.

The recovery plan details how both captive and wild birds should be cared for and managed, what types of habitat management should be conducted from acquired more land to reconvert areas to restored prairie and public outreach efforts.

Overall, they would like to have 100+ APC on every fragment of coastal prairie habitat.

It will still take several years before the APC can be delisted as an endangered bird.

Annual survival of APC is 19%. This quite successful compared to other gallinaceous birds that are 0-8% survival.

14) APC Recovery Sites

There are two current locations APC are managed for. The main areas is the APC NWR and a secondary location on a private ranch in Goliad County. Texas City Prairie Preserve use to have APC released onto its landscape but this was discontinued around 2007.

There are several programs that have helped the refuge acquire land and allow private owners to convert and manage their lands for restored prairie. Over 10,000 acres have been included. The Coastal Prairie Imitative started in 1995 and has helped enlist 80,000 acres. 6,500 acres from this program surround the APC NWR.

Wildlife do not know land boundaries so it is important to help protect land outside of refuges that they may migrate to or use as part of their annual home range.

15) Map of APC NWR

Images of the APC NWR property. There are two water ways that run through it. The Coushatta creek runs west – east and the San Bernard river runs north – south on the east boarder of the refuge.

16) Wild APC Population Management

Population census is conducted in March of every year. Biologists visit known booming grounds and also drive accessible roads listening for the booming calls of males. One good weather condition days these can be heard $\frac{1}{4}$ to $\frac{1}{2}$ mile away. Males and females seen are counted during the surveys along with copulation and predation events. If one can see identification band these are recorded too.

17) Wild APC Population Management: Radio Telemetry

In addition to visually going out and looking for APC, they can also be monitored remotely. Most female birds (and some males pending equipment availability) will receive a simple radio transmitter shown in the top left image. There are lots of different transmitters that can track animal movements via photo periods, gps points, vital conditions and eating behaviors. Ratio transmitters shouldn't exceed more than 3% of the animals body weight and should be situated in a way that they do not obscure normal movements or behaviors. On and adult APC, the radio transmitter weighs 18-21g and is slipped over the animals head and rests under their crop. It is said that these birds are use to having weight on their neck being an animal that stores food in a crop. Most of the weight of these transmitters comes from the battery. Battery life varies with product. The ones we used were good for 12-16 months. Adult and 8 week old chicks who are over 400g in weight can support a radio collar. Chicks are recaptured at night when they get bigger to transition them to and adult radio.

One your animal has a transmitter, this transmitter can be monitored using radio telemetry. At the refuge we searched for animals using trucks that have large antenna for distance tracking (~1/2 mile) and then hand held antenna when looking for birds on foot. Each radio has a unique frequency that allows you to tell individuals apart. During nesting season, we search for female birds using three or more points attempting to box in the location that the animal is present in. This is called triangulation (top right picture). If the female is in that location for 3 days, we assume she is on a nest.

YouTube Link: Short video that demonstrates how radio telemetry works. This simple form of telemetry will tell you if a bird is alive indicated by a beep every 30 seconds. If that beep intensifies at a quicker

pace, this is a mortality mode. Radio transmitters will go into a mortality mode if the birds has not moved for 12-24 hrs (depending on how you set your parameters). Sometimes your radio may have come off the animal and will go into this mode. <https://www.youtube.com/watch?v=WtB9WgtFqyg>

18) Radio Telemetry – Mortality sites

We would go and investigate every mortality signal we heard and also retrieve our radios back to reuse them. At the mortality sites we would take note of what parts of the animal remained and gather up samples and leftover organs that could be analyzed to learn more about the wild birds. If all we found was mostly feathers, this may indicated a mammalian predator like bobcat or coyote. If you found a carcass of neatly cleaned off bones, it could indicated an avian predator. Sometimes all you found was a radio on the ground or it could be in a den or bird nest. At these sites we also looked for tracks and fecal material from the potential predator.

The transmitters can become damaged where you have a less consistent to no signal at all so not every animal can be recovered. However I experience that you can find a radio that is buried under ground by at least 2 inch of mud or under water.

Average adult mortality is 50%

19) Nest Protection

When we believe a female apc is sitting on a nest we will go in by foot using a hand-held antenna and circle the area we hear the strongest signal in – we then walk in a tighter circle till the nest is found/ the female flushes from the location. Refuge staff will the enclose every nest with 100ft of chicken wire to help increase the chances of the eggs hatching. For the first 1-2 days the chicken wire is leaned towards the nest allowing the hen to get comfortable with the structure flying in/ out of it before standing the wire upright. The top edge of the wire is then folded downwards to prevent snakes from climbing up and over the fence. These fences remain in place till the chicks hatch. The area is monitored daily and will be opened up once the hen is ready to leave with her chicks.

Normal nest survival without protection is 32%. With the predator proof fencing, the egg hatchability increased to 72%

20) APC Nests & Chicks

Here are some images of nests that I found on the APC Refuge. Nests are fairly simple and usually under bunch grasses or dewberry bushes the hen can hide under. The hen will incorporate some vegetation and downy feathers into her nest to create a soft & warm environment. She will only use the nest to forage and will defecate away from the area to decrease chances of a scent trail.

APC chicks are precocial in that they are born with feathers, can see and are mobile. Chicks are with the hen for 6-8 weeks before becoming independent. Biologists survey hens for chicks by monitoring their reaction to staff playing a chick in distress call – hens will chicks will coming running to the sound and act defensive while those who no longer have chicks ignore the call. Staff will also do night surveys of hens to see how many chicks they see roosting with her. Chicks will then be netted at night when 6-8 weeks old and radio collard.

Chick survival in the wilds is only 25%.

21) Habitat Management

There are several different habitat management practices the refuge uses and many of them are recommended to private land owners who are participating in restoring native prairie lands.

These include:

- prescribed burning (refuge burns 2,000-3,000 acres every winter on a 4 year cycle) – promotes vegetation grows/ seeding of prairie plants
- grazing by cattle/ traditionally bison (400 animal units across 4 pastures at a time on a 3 pasture rotation) – helps create pathways through punch grasses/ create shorter grass areas for booming grounds
- removal of invasive/ unwanted vegetation via herbicides/ cutting (love grass, youpon, Macartny rose, Chinese tallow, trifoliolate orange)
- collection and planting of prairie seeds, removal of feral hogs

22) Habitat Management cont.

Habitat management continued:

- Application of fire ant bait using crop duster planes
- Vegetation surveys: look at height, density, variety especially looking at burned areas
- Insect surveys: look at quantity and diversity
- Predator deterrence: fence posts and buildings all get spikes to deter raptors from perching in a prairie.
- Food Plots: the refuge plants a 25-100 acre food plot each year consisting of either soy beans, millet, sunflowers

23) More than just APC

There is more than just APC using this habitat. There are over 250 species of birds, 50 mammals and several reptiles, amphibians and insects living on the refuge.

The refuge also conducts other wildlife surveys either through US FWS or universities: Houston toad reintroductions, crawfish frog surveys, mussel surveys as an aquatic indicator, bald eagle counts, bob white quail mark recapture surveys, Christmas bird counts, ect...

24) Captive management of APC

Captive management of APC started in 1992 and was initiated between Fossil Rim Wildlife Center and US FWS.

There are many other facilities that have participated in the captive management and breeding of APC: some assist in analyzing samples to create proper captive diets, are sample holding facilities for feather isotope analysis/ blood banking for genetics.

Houston Zoo is the second largest producer of captive APC: they started in 1994 with an expansion of their efforts in 2005 when they partnered with the NASA facilities to use their green space to create breeding pens for adult birds there. This allowed for the zoo to focus on egg/ chick care in the confinements of an inner city facility.

Fossil Rim and Houston Zoo have been the main captive APC facilities for the last few years with the Patuxent Wildlife Research Center transitioning from greater prairie chickens to APC within the last year or two. These facilities typically have 24-26 breeding pairs with extra hens/ males. In a normal year, FRWC and Houston Zoo may produce 300+ chicks

Managing the captive population starts with an annual meeting held each fall. At these meetings they discuss who has what birds and which birds should be paired for breeding for the best genetics. APC have a species survival plan and stud book that create guidelines for best captive care and breeding recommendations. Birds are paired for breeding using an inbreeding coefficient. Lower the number, the less they are related to each other, the more they should be paired together. Other factors such as the animals age, current genetic representation and chick production traits are taken into consideration when creating pairs. Breeding pairs are put together in January for acclimation to one another, otherwise males live in social groups and females live in social groups outside of breeding.

25) APC Egg Production

Every egg is assigned a number and receives it's own data sheet.

One the data sheet we record:

- the sire/ dam
- What number of egg it was in the clutch
- Was it found in a nest or was it a dumped egg
- size measurements (length, width, weight, egg shell thickness after it hatches)
- Egg shape (too small of eggs will not be incubated as the developing chick will most likely have complications)
- Shell quality (hard shell, thin shell, leather egg)
- Egg shell color
- Eggs are then sterilized using a uv light before being placed into the incubator room. Eggs can be stored on a shelf for a couple of days before going into an incubator so that you have several chicks hatch at the same time.

When eggs are collected, the hens will be given dummy eggs as a replacement. These are either plaster filled infertile apc eggs or domestic chicken eggs. Once a female has laid the approximate max clutch size of 11-13 eggs, she will be allowed to sit on them for a few days before animal care staff take all the eggs away. This mimics a predation event and may encourage the female to double clutch if she has time during the males booming season.

26) APC Egg Management

Some eggs will be placed under domestic hens for their first week of development as this is a crucial time in embryo development. Eggs are then placed into artificial incubators. These machines provide warm air and regulate humidity and will rotate the eggs every few hours.

During incubation, the eggs are candled to determine fertility and developmental stages. Fertile eggs will show the start of blood veins after a few days of incubation. Infertile eggs will have no pattern and are removed from the incubator. You can also monitor the air cell off the egg that can help us determine when the egg should be moved from the incubator to a hatching machine for the chicks to emerge in. Chicks are equipped with an egg tooth that helps them chisel through the egg shell. This behavior is called pipping.

The bottom left photo is an example of what the breeding apc pens look like at Fossil Rim. Each ben ideally will have one male to one female. If females are being picky, she will get two males. Males are allowed to see each other through the fencing.

27) Captive APC Chick Management

Just like the eggs, the chicks have lots of data collected on them.

Chicks are assigned an ID number and are given a plastic leg band that may be colored and have a number on them. These are flexible bands that can grow with the chick. The can also be removed and replaced with bigger bands as needed.

When chicks emerge from the hatcher, they are given a few hours to dry off and are then moved to brooder boxes (top left picture). These are slightly darker, warm areas for the chicks to live in and come accustom to their new surroundings. These brooder boxes will have several chicks in them to mimic a wild clutch (typically 6-8 at a time). They spend 3 days in here before progressing to slightly bigger enclosures. Chicks remain inside till they reach 50g in size and then they can start exploring outside areas. Just like their inside spaces, the outside pens start small and then progress to big grassy yards. Chicks are provided feather dusters to snuggle into and heat lamps to stay warm under.

28) Captive APC Chick Management Cont.

Chicks are weighed every day for the first two weeks to make sure they are gaining appropriate weight and then weighed weekly after that.

Chicks are offered a crumbled pellet that is ground up to appropriate size, a purred salad (collard greens, carrots, peas), mealworms and eventually crickets. We keep "how did I eat" charts for each bird to keep track of how well each bird is eating and if they are being picky eaters. When interacting with the chicks, no costume is required. We offer food on a paper towel or tray when they are young and poke around it to encourage the birds to explore items.

Water is also offered to the birds but marbles are placed in trays to prevent them from drowning. Extra vitamins and supplements can be added to their water as needed.

Chicks have lots of different health concerns outside of not gaining weight. Some may have splayed legs that can be hobbled together for correction, curled toes that can be taped straight if young, you can have bully birds that are feather pickers – those who have been picked at get sharpie applied to their bare backs to reduce being a target – bully birds are separated out of the group or placed with larger birds. You can have things like scoliosis, angle wing occur that can not be fixed, yolk sac infections and grass impactions from Bermuda grass. Some diseases and viruses we have dealt with are strains of crypto cryptosporidium and REV. Birds who test positive for REV cannot be released into the wild even though it exists in song birds and water birds. Cryptosporidium and make it hard for the chicks to maintain weight.

-Fossil Rim has a 70-80% chick survival rate

29) APC Transportation Day:

These days are for birds that are genetically represented in the breeding program and for chicks who have made it to 8 weeks of age and are at 400g weight.

Process:

- Chicks are weighed, if less than 400g they are held back till another transportation day
- Determine gender: looking for development of air sac and eyebrows, start of molting in black tail feathers. Some birds remain unknown.
- Receive permanent metal bands and plastic color refuge band. The metal bands will have a unique id number for each bird and tell what facility they came from. Males are permanently banded on the right and females on the left. Plastic refuge bands will indicate release year and have a larger number on them unique to animal that can be read through binoculars.

- Vet exam: given physical exam, dewormer
- Wing exam: primary flight feathers are examined for molt pattern, if the bird has damaged feathers or is not far enough into the molt they will be held back till another date – we want to make sure they can fly by the time they come out of the acclimation pens. Wing cord is also taken – can make some comparison on size relationships this way (some bird species will also take tail feather measurements)
- Place radio collar on most females and sometimes males.

30) APC Transportation Day Cont.

APC get special transportation boxes. These are padded on all sides as these birds like to jump and injure themselves.

Boxes are placed into the newer transportation trailer that can hold up to birds at one time. It has a camera and is climate controlled for their long rides (sometimes hrs)

Once they are at their facility, birds are placed in soft netted acclimation pens that are dispersed across the refuge. Transport to these areas begins in July and goes through September with the goal being to get the APC out on the refuge and acclimated before migrating raptors come. Acclimation pens (along with the breeding pens) all have hotwire fencing and double netting roofs to deter predators.

In these pens, birds are dusted with seven dust for exoparasite control and radios are tested.

Birds receive supplemental food consisting of water and frozen vegetables (lima beans, peas, corn, green beans) fed 2x day.

APC remain in the acclimation pens for two weeks before being softly released out into their new environment. Soft release consist of just opening the door of the pens and allowing the animals to walk out. The pen doors remain open for the day before being closed off. Supplemental food is provided till November.

31) APC Release video <https://www.facebook.com/911810212209365/videos/217958602823703>

32) APC Public Outreach

- Friend Group: they help with extra fundraising events to help acquire equipment and host an annual festival. The festival takes place at the end of March and allows visitors from across the world to go out into the North refuge area and watch the birds perform on the leks. During the festival they also do birds and plant walks, host speakers on different conservation topics and there are Native American dance performances that center around the prairie chicken.
- The refuge hosts school trips and scouting groups throughout the year
- They do first Saturday of the month van tours – focused on looking for wildlife and habitat management
- Refuge nature center/ auto tour: this is on the south section of the refuge and is open year round from sunrise to sunset. Also have some hiking trails.
- They do lots of connecting with locals especially when you are driving a truck with a giant antenna on top of it. People always want to know what you are up to. This helps us find birds that may be using neighboring properties
- American Conservation Experience program: provides interns (both for apc tracking interns and invasive species/ habitat management interns), serve – month sessions.

33) APC During COVID

So how has the year looked with COVID?

- Captive management restrictions
 - We didn't know if we would have a reduction in staff so we capped the amount of eggs that they would incubate and didn't encourage hens to double clutch
 - FRWC experimented with allowing domestic chickens and APC hens to fully incubate and hatch chicks. 38 eggs were initially allowed to undergo this project. From it they had 10 chicks hatch but only one chick made it to over a week old. They had hard rains and snakes disrupt nests along with hens neglecting chicks. The one surviving chick was then pulled for hand rearing
 - FRWC had 24 breeding pairs this year. They produced 329 eggs with 264 being fertile (~80%). 212 of the eggs hatched (~80%) and had 178 chicks in July (84% success rate). Some chicks are held back for next year's breeding season.
 - Overall FRWC will have 184 birds to be released (24 adults, 160 chicks)
- Reduced Field Research at the Refuge: They were not able to do as much of their vegetation and insect surveys but were able to conduct tracking and nest monitoring
- Reduced funding for both captive and wild management
- Reduced outreach efforts with the festival and other programs being cancelled
- 2020 Updates: the refuge expects to release around 300 chicks this year (compared to 500). They themselves have had a good wild nesting season with over 14 nests hatching and of those over half had several chicks living at the 8 week age. They mentioned that their clutch sizes were also larger this year compared to other years so there is still some hope for the APC.