The Pigeon and the Pea: what you don't know can hurt you

A Botany Study of Wildlife Attractants at DFW Airport

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Once Upon a Time…

Once Upon a Time…
(about DFW Airport)

DFW Airport-- 17,000+ acres

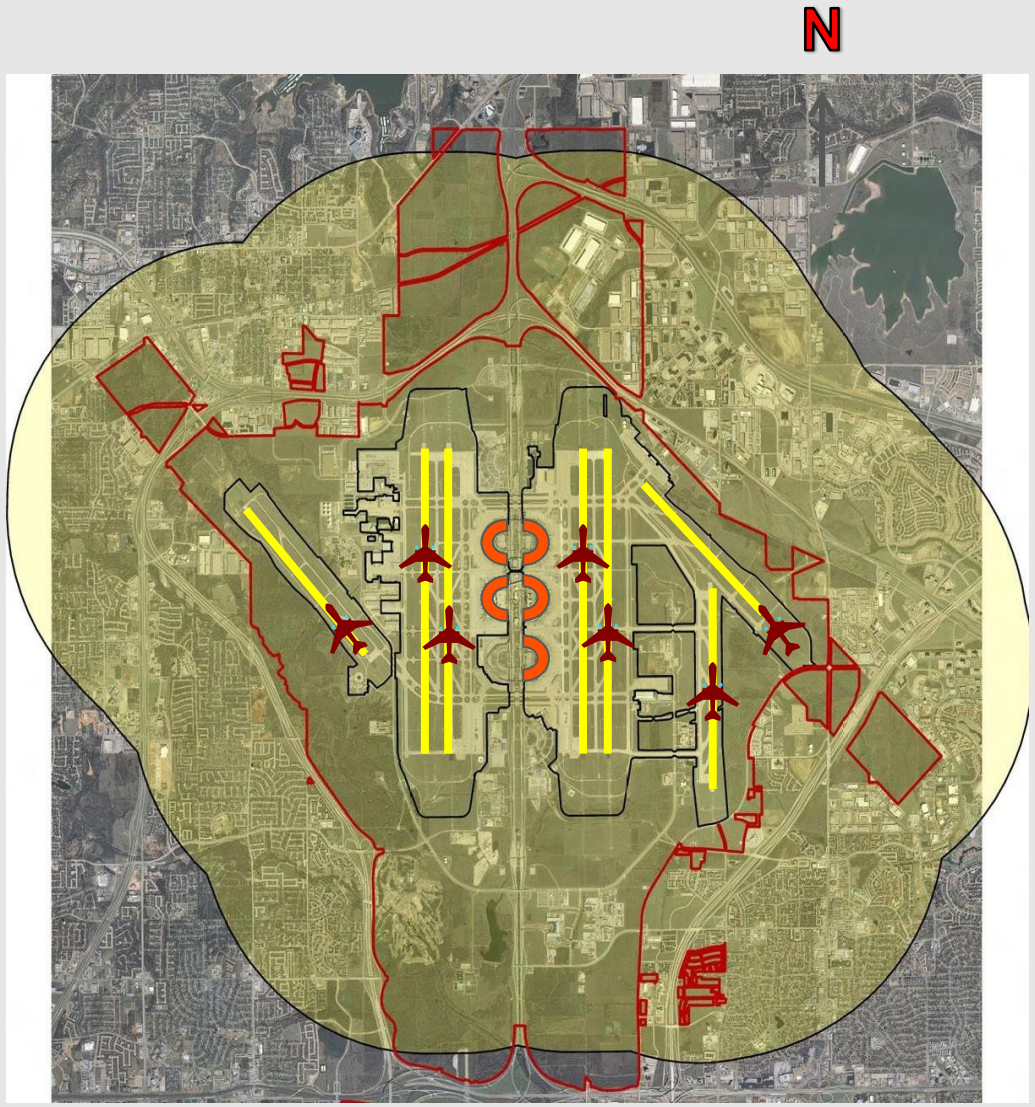
+50% developed

Airport Operations Area (AOA) = 6900 Acres with 7 active runways

Landside= 5 passenger terminals; a Corporate Aviation Facility; Airport Board buildings; and numerous leased facilities including office, freight, and non-aviation tenants such as Chesapeake Energy

@ 680,000 operations annually

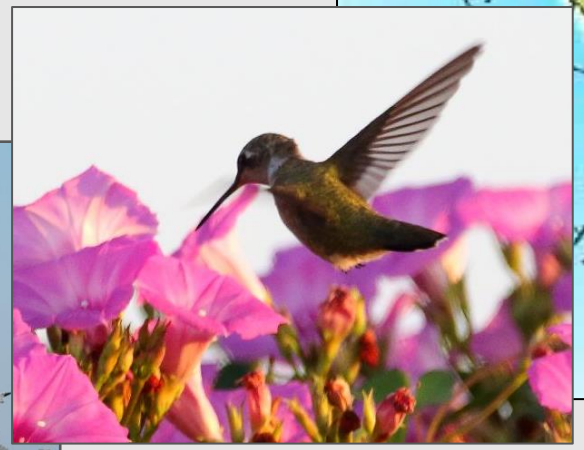
+40% undeveloped lands including a variety of habitats: grasslands, woodlands, transitional shrubland, open water features, wetlands



Once Upon a Time…
(wildlife diversity at DFW Airport)

DFW Airport is located along a major path of the Central Flyway- one of four North American migratory bird routes.

The birds using these corridors include both resident and migratory birds, from tiny solitary hummingbirds to big flocks of very large pelicans.



Once Upon a Time…
(wildlife diversity at DFW Airport)

Over 100 bird species, plus coyotes, bobcats, raccoons, opossums, armadillos, reptiles, and numerous invertebrates have been documented by Airfield Operations staff at DFW Airport.



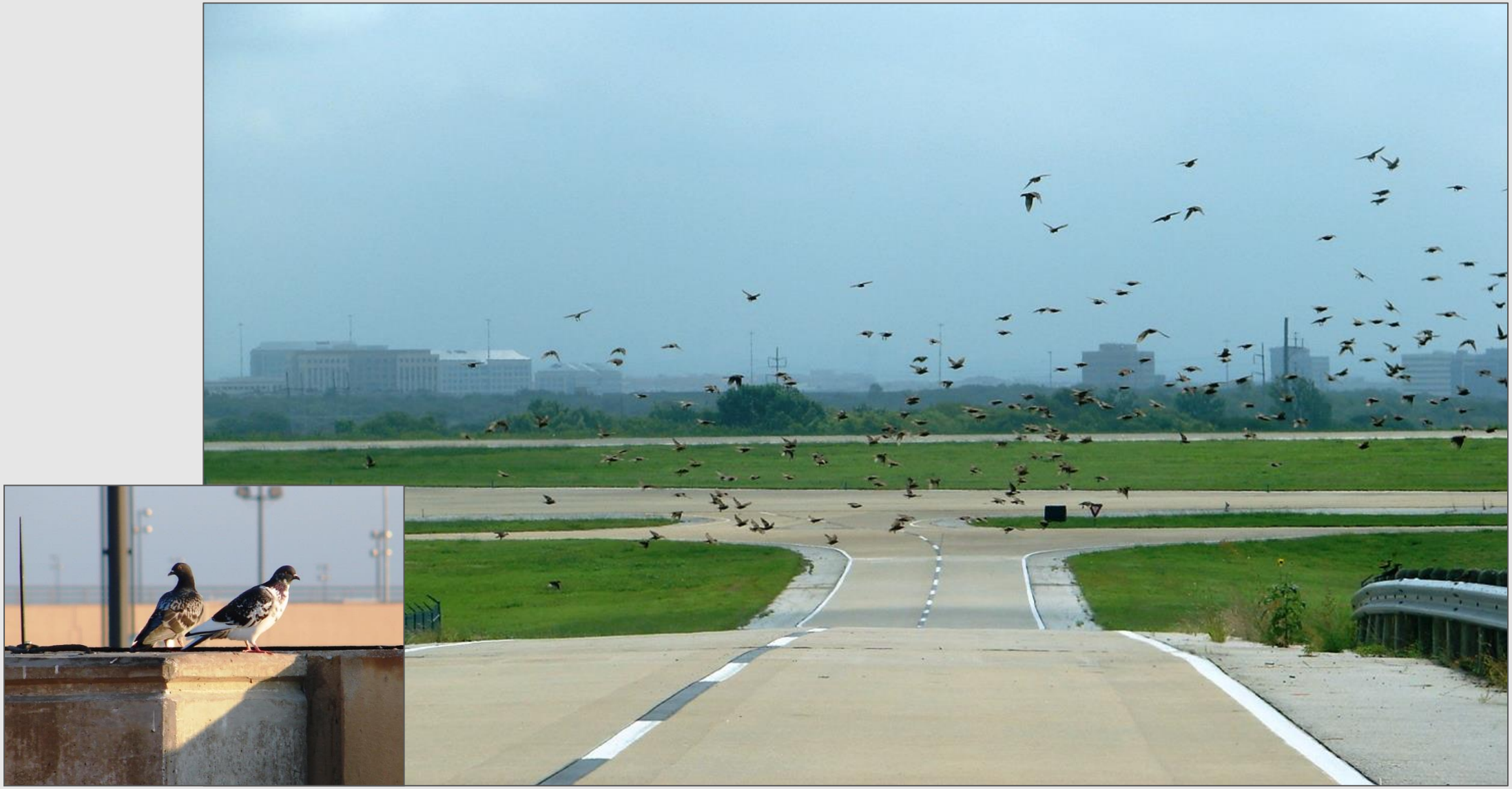





Once Upon a Time…
(wildlife diversity at DFW Airport)

While species types and activity levels vary year by year in most cases, some are a stubborn presence.

Relevant Bird Activity and History



Relevant Bird Activity and History

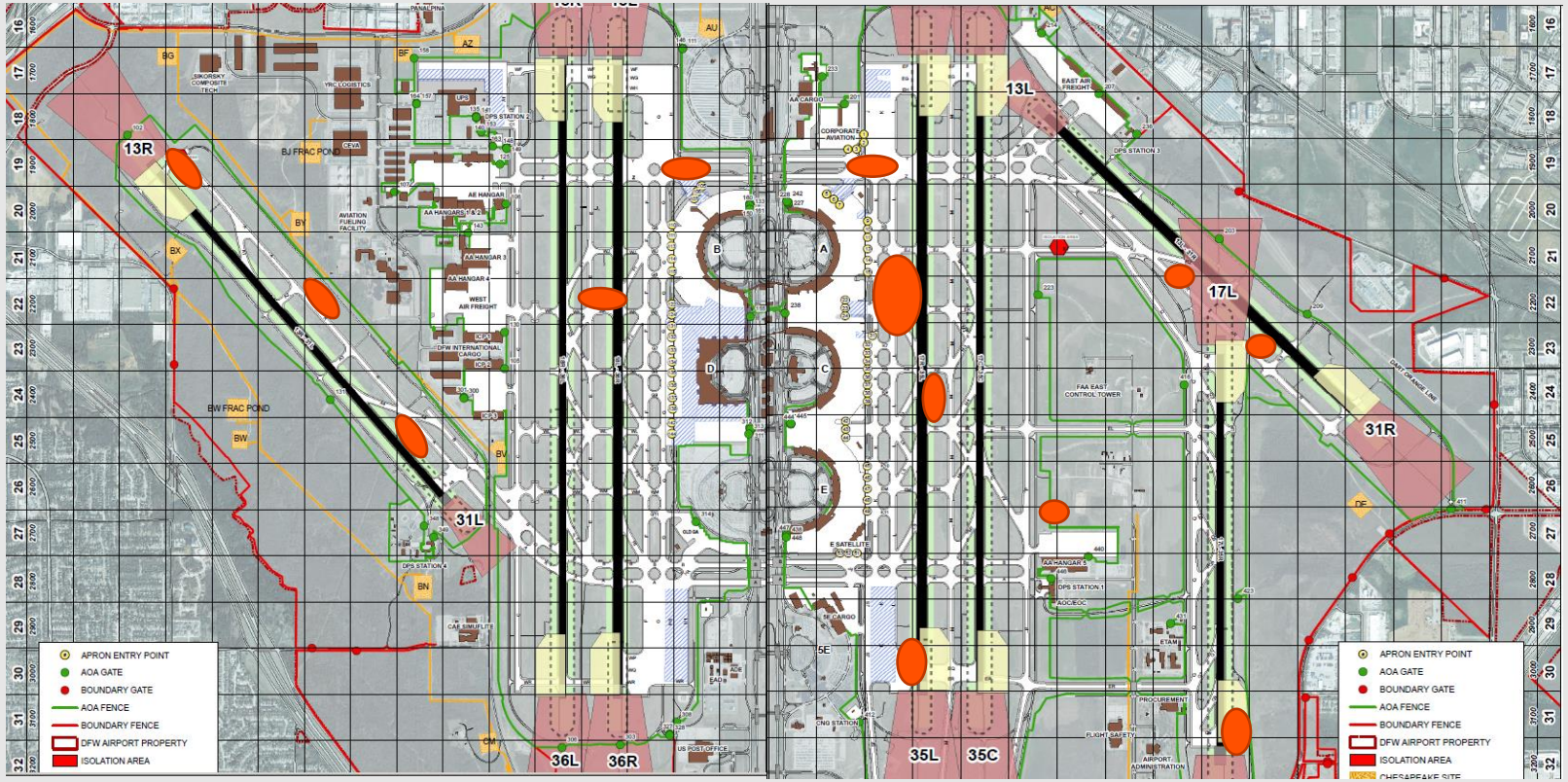
In recent years, seasonal rock pigeon (pigeon) activity had been notably persistent in specific areas of DFW's AOA.

- Flocking activity on the AOA typically escalated in early June and continued into October.
- Pigeon flocks number ~ 30-300 individuals.
- Flock sizes and frequency of visits to the AOA diminished or entirely disappeared during the cool fall and winter months.
- Mitigation efforts were applied with a "Zero Tolerance" policy for pigeons.
  - A professional pigeon trapping program to "lure" pigeons away from the AOA began in 2012 and continued into 2014 with disappointing results.
  - Additional trapping on the AOA was more successful but results were overall disappointing.
  - Intensified airfield resources… Pigeons learned to estimate the distance a 12-gauge shotgun can "reach."

DFW

Relevant Bird Activity and History

Despite continued harassment and depredation, pigeons remained strongly attracted to certain areas of the AOA. Pigeons continually risked survival to remain or return to certain areas of the AOA over the summer months.



Areas of persistent pigeon activity documented during the 2014 calendar year

Relevant Bird Activity and History

Wildlife has three basic needs for survival: food, water, and shelter.

No water or shelter was observed in these areas. There was no discernable food in these areas.

However, pigeons had a strong, persistent attraction for areas on the AOA, and exhibited feeding behavior there.

Relevant Strike History

On June 11, 2014 the first of a series of strikes occurred, with a multiple damaging strike and precautionary return. During the following months, seven pigeon strikes negatively affected flight or caused damage, in addition to a number of multiple strikes, one involving ~ 50 pigeons.

Relevant Strike History
2014 Pigeon Strikes
-Triggering Events-

Multiple strikes, damaging strikes, engine ingestions, and those that negatively affect flight are considered to be triggering events by the FAA.

CFR Part 139.337 requires that Certificated Airports “must take immediate action to alleviate wildlife hazards whenever they are detected.”

Triggering events require the certificate holder to review their Wildlife Hazard Management Plan.

Relevant Bird Activity and History

No attractants were visible in areas of persistent pigeon activity or in the vicinity of these strikes. Yet, pigeons continued to be persistent, even while risking depredation.

A study of the contents in the crops of pigeons ensued, to determine what the pigeons were feeding on that attracted them to the AOA.

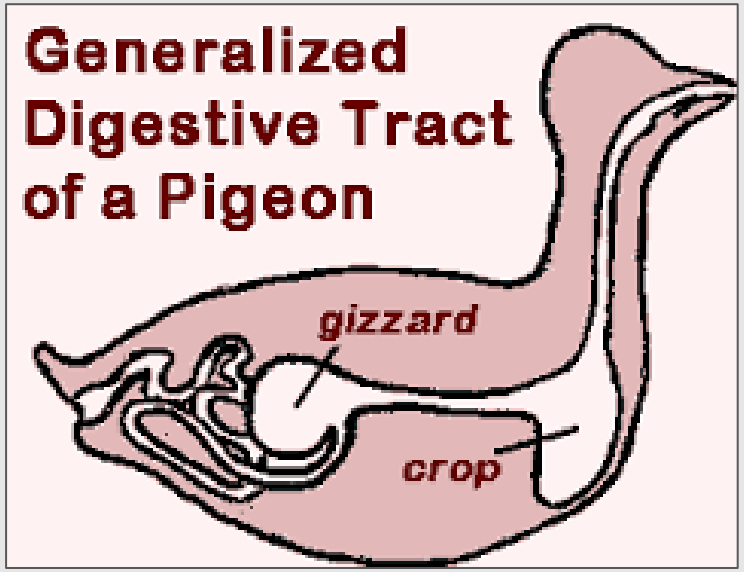
Sidebar

Nearly all birds have a crop-- a pouch that allows birds to quickly consume and store food for later digestion.

The crop is an expandable organ that stores both food and grit, which travels to the gizzard to be ground down and digested.

Pigeons are opportunistic feeders, but their diets consist primarily of seeds, grains, and berries.

Crop contents can be extracted intact before proceeding down the digestive tract. Once the contents travel to the gizzard, they become ground down and are digested.



www.backyardnature.net/birdguts.htm

Sidebar

Crop content analysis is not a novel idea. Researchers have been utilizing digestive tract content analysis for decades...

The Culprit

Contents of crops were extracted from pigeons in July 2014 for identification of the seeds.

- From all pigeons involved in strikes
- From pigeons observed actively feeding on the AOA
- All samples were labeled with date, time, and location

Crop contents were sent to **Amanda K. Neill, Director of the Herbarium at the Botanical Research Institute of Texas (BRIT) for identification.**

In August 2014 the following analysis was received:

The Culprit

"99% of the seeds in all the samples you sent me were one species, Lathyrus hirsutus, *Caley Pea or Singletary Pea. This is a weedy herbaceous annual vine in the legume family that is native to Europe & the Mediterranean. It was brought into the US long ago, probably by accident, and has also been sold for plantings for erosion control. The seeds are known to be eaten by birds."*

The Culprit

"… this plant species blooms from March-May in this part of TX and produces mature fruits & seeds in May-June… Usually as soon as hot weather arrives they get powdery mildew and decline rapidly, and basically disappear.

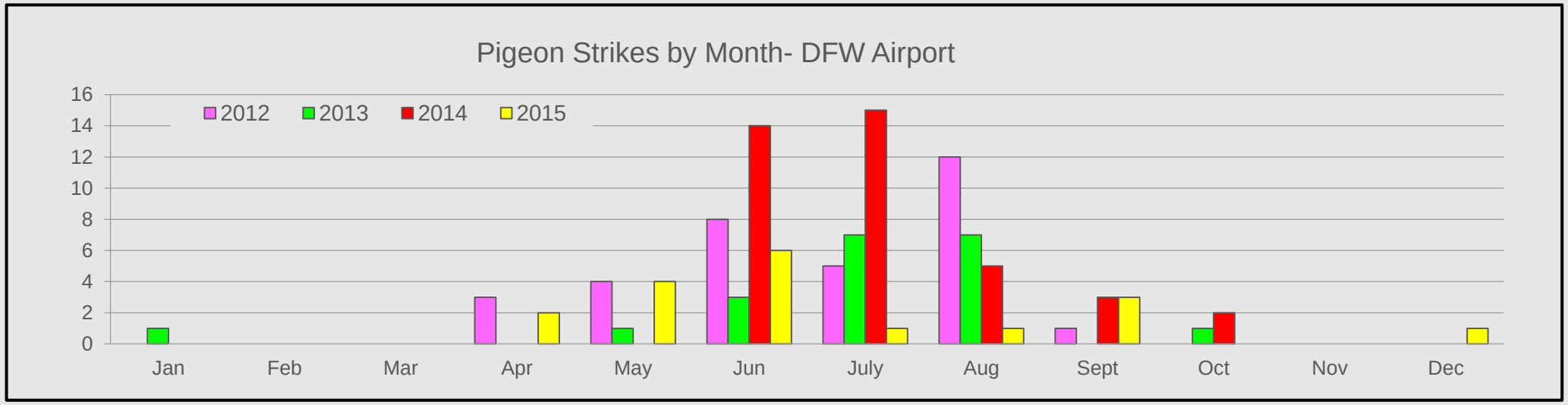
"Though it is technically a "vine" it really is more of a sprawling herb and grows in full sun in grassy areas, climbing only a little up grasses and other herbs, so it probably is occurring in places where you mow sometimes… this plant is an annual, and the flowers are showy enough that you could probably easily identify populations of it."

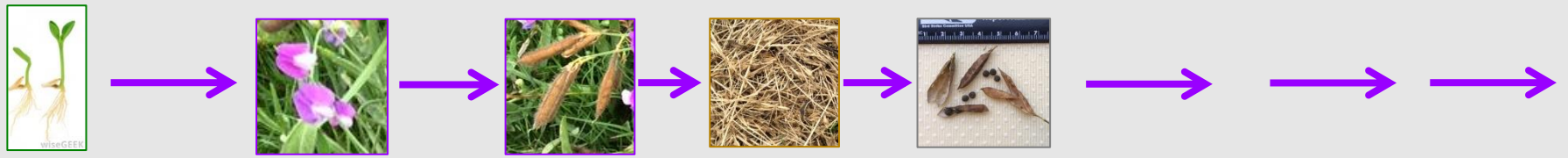
http://www.missouriplants.com/Bluealt/Lathyrus_hirsutus_page.html

http://www.noble.org/apps/plantimagegallery/Plant.aspx?PlantID=91&IndexType=Family&PlantMainName=Lathyrus%20hirsutus&PlantTypeID=1

The Culprit
A HA!!!

The timeframe of Caley Pea fruit maturation coincided with the timeframe seasonal pigeon activity began to increase on the AOA. It stood to reason why there were no visible attractants in areas where pigeons were showing feeding behavior. The plant had already died back, but the seeds were still present on dried plants and the ground around them.





Caley germinates and grows → Caley blooms → Fruits mature → Plants die back → Seeds not eaten remain as seed bank for future years

The Culprit

Since the identity of the plant that produces seeds was not confirmed until August 2014, after the season's annual springtime plants had already died back, Ms. Neill advised monitoring the AOA for sign of the plants in early spring. She agreed to a site visit to DFW Airport to assist in searching for the plant in Mar/Apr 2015.

On April 2015, a suspicious plant was observed growing on the AOA.

April 3, 2015, Caley Pea in foreground at 36R@A

Caley Pea

The Culprit

On subsequent visits shortly after, Amanda Neill identified Caley Pea growing in numerous areas throughout the AOA.

April 3, 2015, Caley Pea at 13R north end

April 3, 2015, Caley Pea at SW hold pad

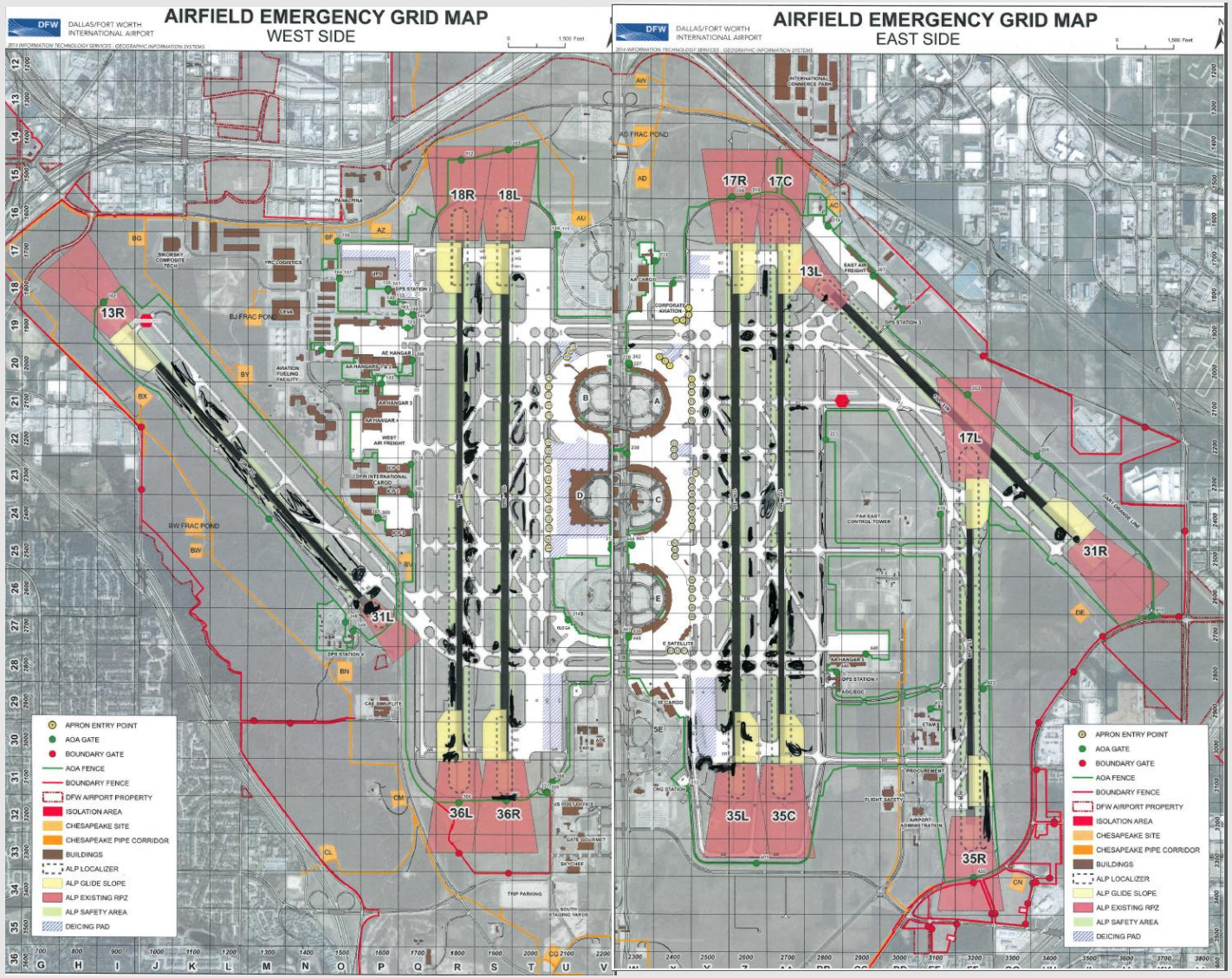
April 7, 2015, Caley Pea at 17L, south end

The Culprit

A more widespread investigation followed.

Black-marked areas indicate where Caley Pea was observed during an AOA survey on April 15, 2015.

Observations were conducted on one day, and only included areas visible from paved surfaces.



Flora Survey

Caley Pea's existence on the AOA and its newly-discovered attractiveness to pigeons was until this time unknown. This raised questions regarding other potential attractions on and near the AOA.

In order to determine if other plant species were contributing to bird activity and strike history at DFW Airport, DFW Airport contracted with Amanda Neill as a consultant in spring 2015 to conduct a flora study of DFW Airport.

The Scope of Work initially included:

1) Research plants that might be present at DFW Airport that could attract wildlife,

2) Conduct botanical surveys to determine if those genera/species are present on or near the AOA, and

3) Create a field guide for DFW Board Departments and others (neighboring airports) to use to identify and control plant species.

Flora Survey

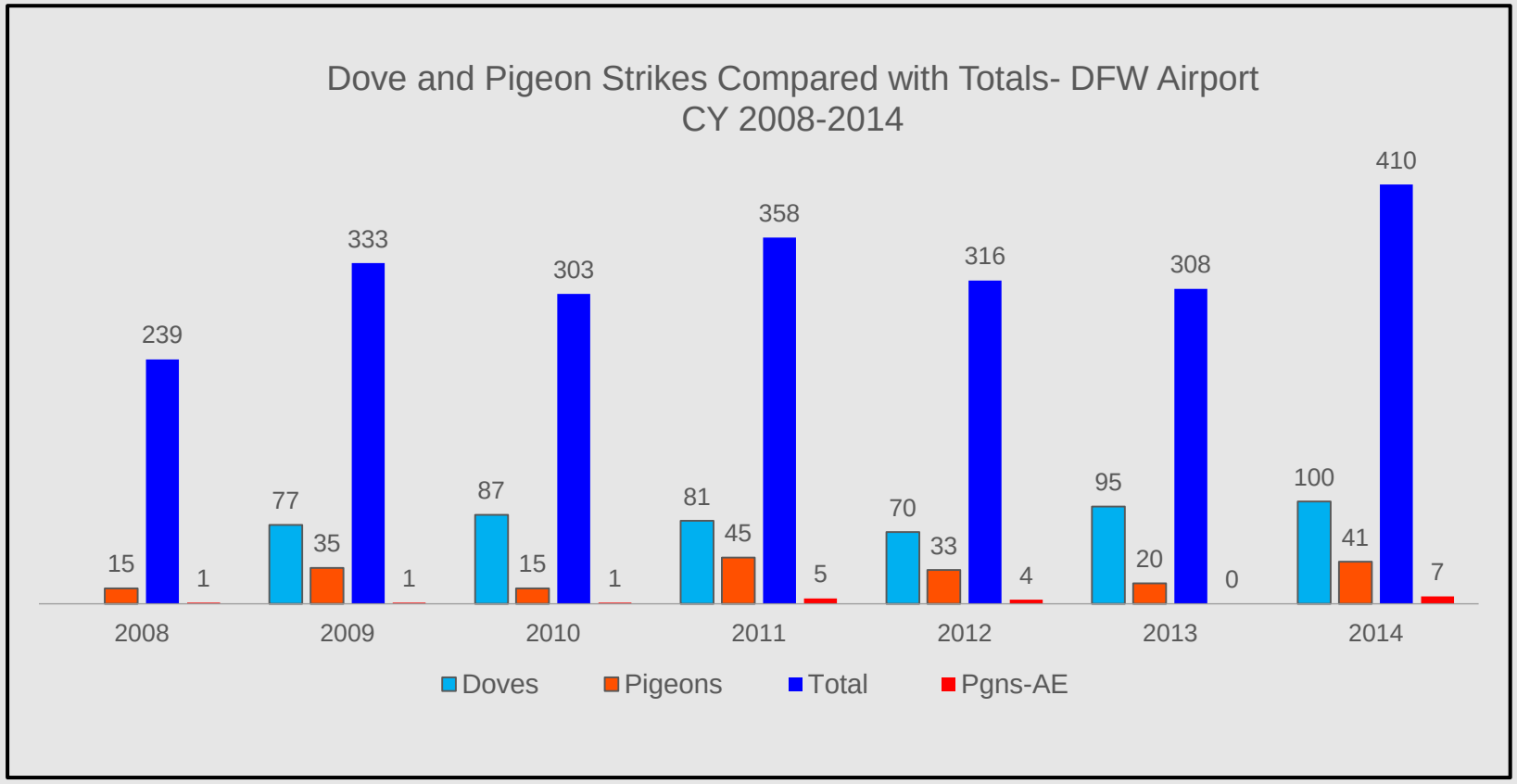
During the remainder of the 2015 growing season, regular surveys were conducted at select areas on and near the AOA.

Areas were selected based on 1) history of bird activity, 2) habitat (potential for attractants), and 3) proximity to the AOA.

The purpose of the study was to survey the airport's plants, document the existence of those that are attractive to wildlife, and note their general frequency.

Concurrent Crop Content Analysis

The Scope expanded to include continued extraction for analysis of crop contents from all pigeons depredated or struck by aircraft, and mourning dove were also included, as they are a seed-eating bird and a major contributor to DFW Airport's bird strike numbers.



The Study

(or, *Gut Content Analysis: what your airport's birds are dying to tell you, and how to get it out of them*)

Concurrent Crop Content Analysis

Seeds from each individual bird were extracted for identification, and placed into bags labeled with date, map grid location, and bird type.

Concurrent Crop Content Analysis

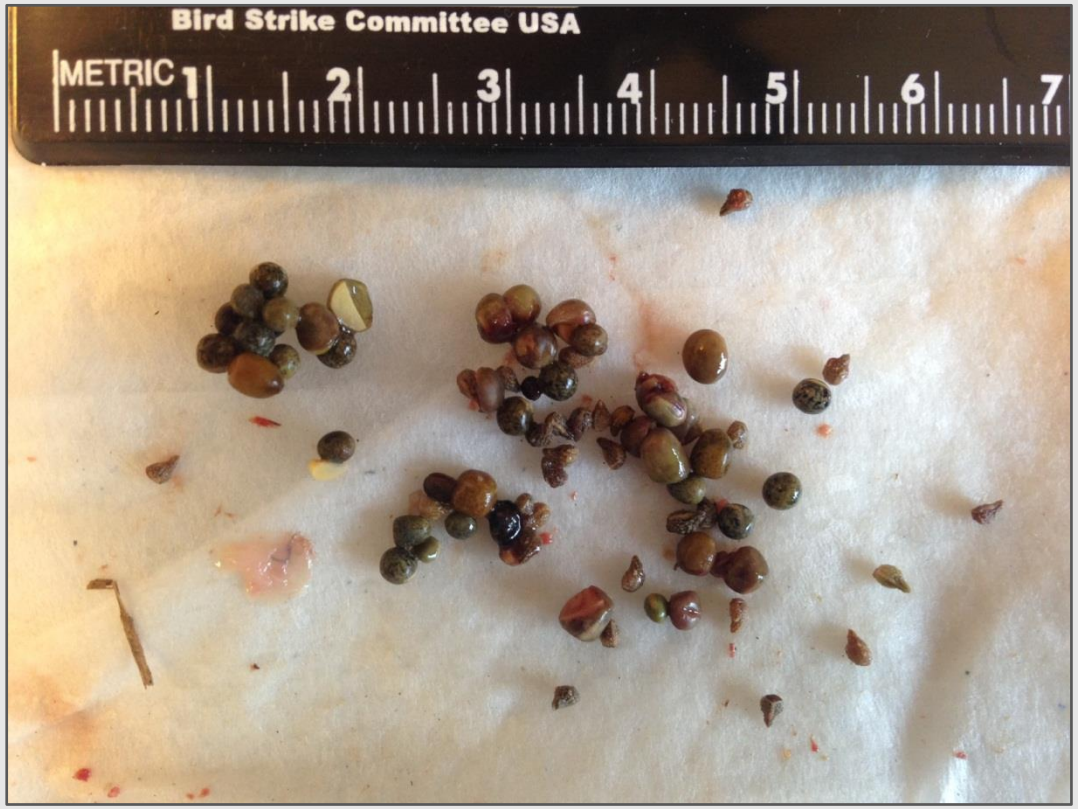
Seeds were identified and documented for each individual.

Information documented included:

- Date
- Time of day
- Location depredated or struck
- Bird Species
- Numbers of birds collected (struck or depredated) from the location
- Seed species and approximate amount per sample

Concurrent Crop Content Analysis

Through the remaining 2015 growing season, crop contents from 122 pigeons and dove were analyzed and the seeds identified.



Concurrent Crop Content Analysis

Crop contents analysis was a critical part of the study, to determine the attractiveness (to seed-eating birds) of plants identified during the field studies.

Concurrent field studies were a critical part of crop content analysis, to confirm identity of seeds found in crops, and verify presence of the plants as growing on or near the AOA.

Survey Results

Botanists… every airport should have one

Survey Results

Survey results were published in 3 field guide volumes, with each guide portraying observed species by season: the spring guide includes plants that were observed in flower and fruit until approximately the end of May, the summer guide includes plants that flower and fruit from June until August, and the fall/winter guide includes those that reproduce until the end of the growing season.

Survey Results

The field guide volumes are available in printable PDF format and as interactive e-books:

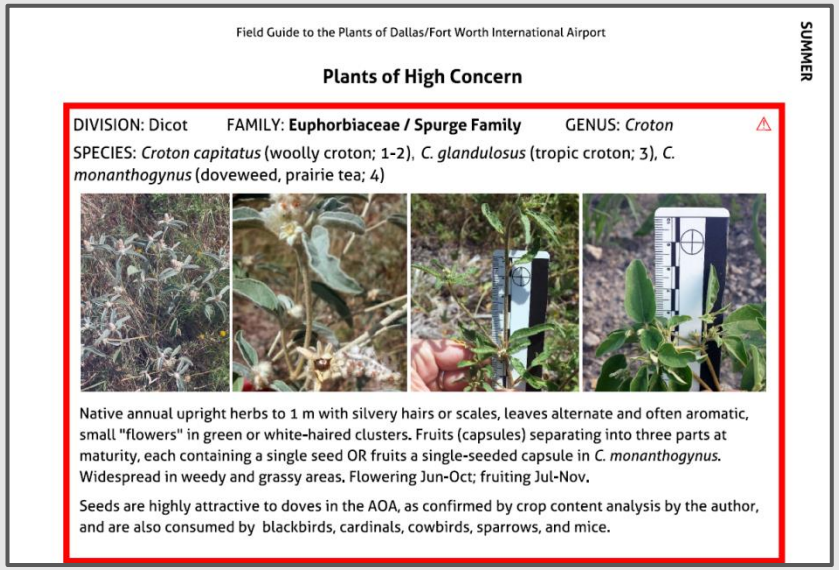
http://pub.lucidpress.com/DFWAirportPlantsSpringFieldGuide/

http://pub.lucidpress.com/DFWAirportPlantsSummerFieldGuide/

http://pub.lucidpress.com/DFWAirportPlantsFallFieldGuide/

Survey Results

In each seasonal guide, plant species were categorized by section, based on significance of their attraction to animals, mainly birds, and their frequency of occurrence.



Field Guide to the Plants of Dallas/Fort Worth International Airport

SUMMER

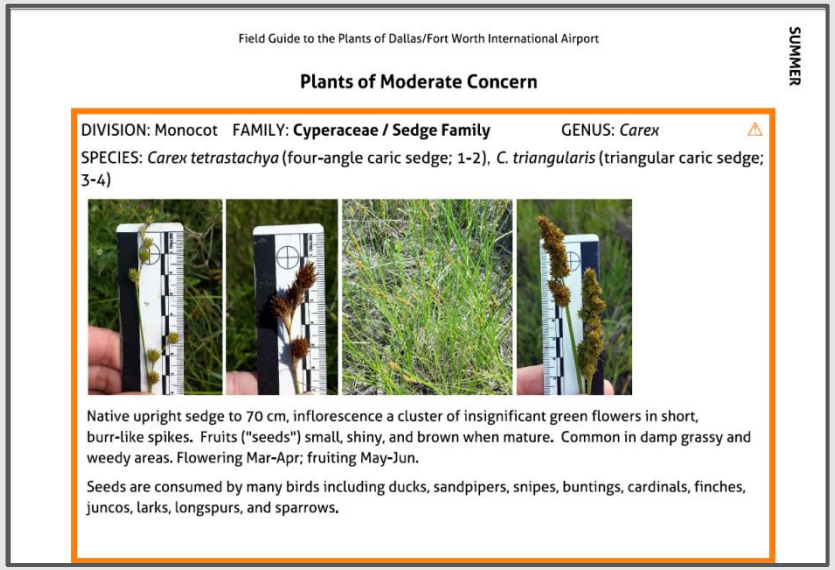
Plants of High Concern

DIVISION: Dicot FAMILY: **Euphorbiaceae / Spurge Family** GENUS: *Croton*

SPECIES: *Croton capitatus* (woolly croton; 1-2), *C. glandulosus* (tropic croton; 3), *C. monanthogynus* (doveweed, prairie tea; 4)

Native annual upright herbs to 1 m with silvery hairs or scales, leaves alternate and often aromatic, small "flowers" in green or white-haired clusters. Fruits (capsules) separating into three parts at maturity, each containing a single seed OR fruits a single-seeded capsule in *C. monanthogynus*. Widespread in weedy and grassy areas. Flowering Jun-Oct; fruiting Jul-Nov.

Seeds are highly attractive to doves in the AOA, as confirmed by crop content analysis by the author, and are also consumed by blackbirds, cardinals, cowbirds, sparrows, and mice.



Field Guide to the Plants of Dallas/Fort Worth International Airport

SUMMER

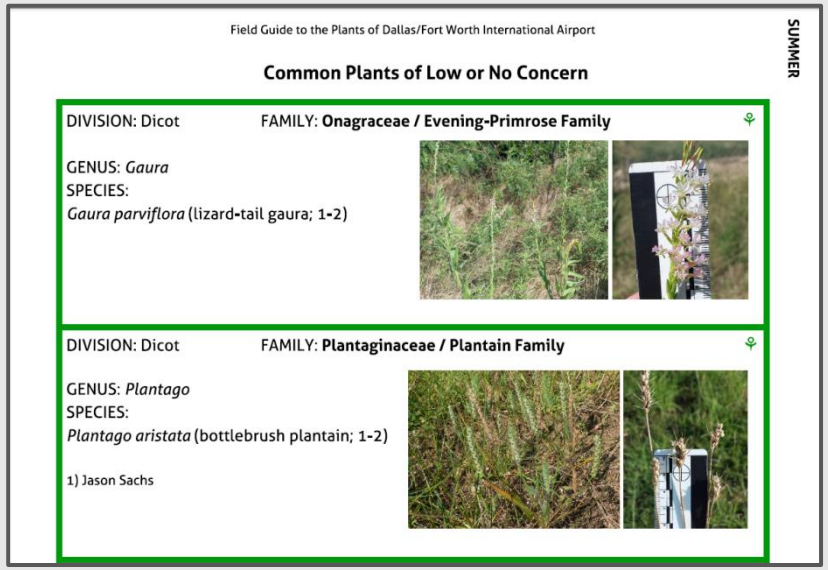
Plants of Moderate Concern

DIVISION: Monocot FAMILY: **Cyperaceae / Sedge Family** GENUS: *Carex*

SPECIES: *Carex tetrastachya* (four-angle caric sedge; 1-2), *C. triangularis* (triangular caric sedge; 3-4)

Native upright sedge to 70 cm, inflorescence a cluster of insignificant green flowers in short, burr-like spikes. Fruits ("seeds") small, shiny, and brown when mature. Common in damp grassy and weedy areas. Flowering Mar-Apr; fruiting May-Jun.

Seeds are consumed by many birds including ducks, sandpipers, snipes, buntings, cardinals, finches, juncos, larks, longspurs, and sparrows.



Field Guide to the Plants of Dallas/Fort Worth International Airport

SUMMER

Common Plants of Low or No Concern

DIVISION: Dicot FAMILY: **Onagraceae / Evening-Primrose Family**

GENUS: *Gaura*
SPECIES:
Gaura parviflora (lizard-tail gaura; 1-2)

DIVISION: Dicot FAMILY: **Plantaginaceae / Plantain Family**

GENUS: *Plantago*
SPECIES:
Plantago aristata (bottlebrush plantain; 1-2)

1) Jason Sachs

Survey Results

Plants of High Concern include those that are commonly found on airport property, and include:

- Plants that are documented in published research as being wildlife attractants.
- Plants whose parts (fruit, seeds) were identified in analyzed crop contents in sufficient quantity or frequency to presume were selected.

Plants of Moderate Concern include those that are found on airport property in less frequency or far removed from the AOA, and include:

- Plants that are documented in published research as being wildlife attractants, providing food or cover/nesting areas.

Plants of Little or No Concern include plants found commonly on and near that AOA in sufficient numbers that they are likely to be noticed and their attraction to wildlife is not supported by crop content analysis or published research.

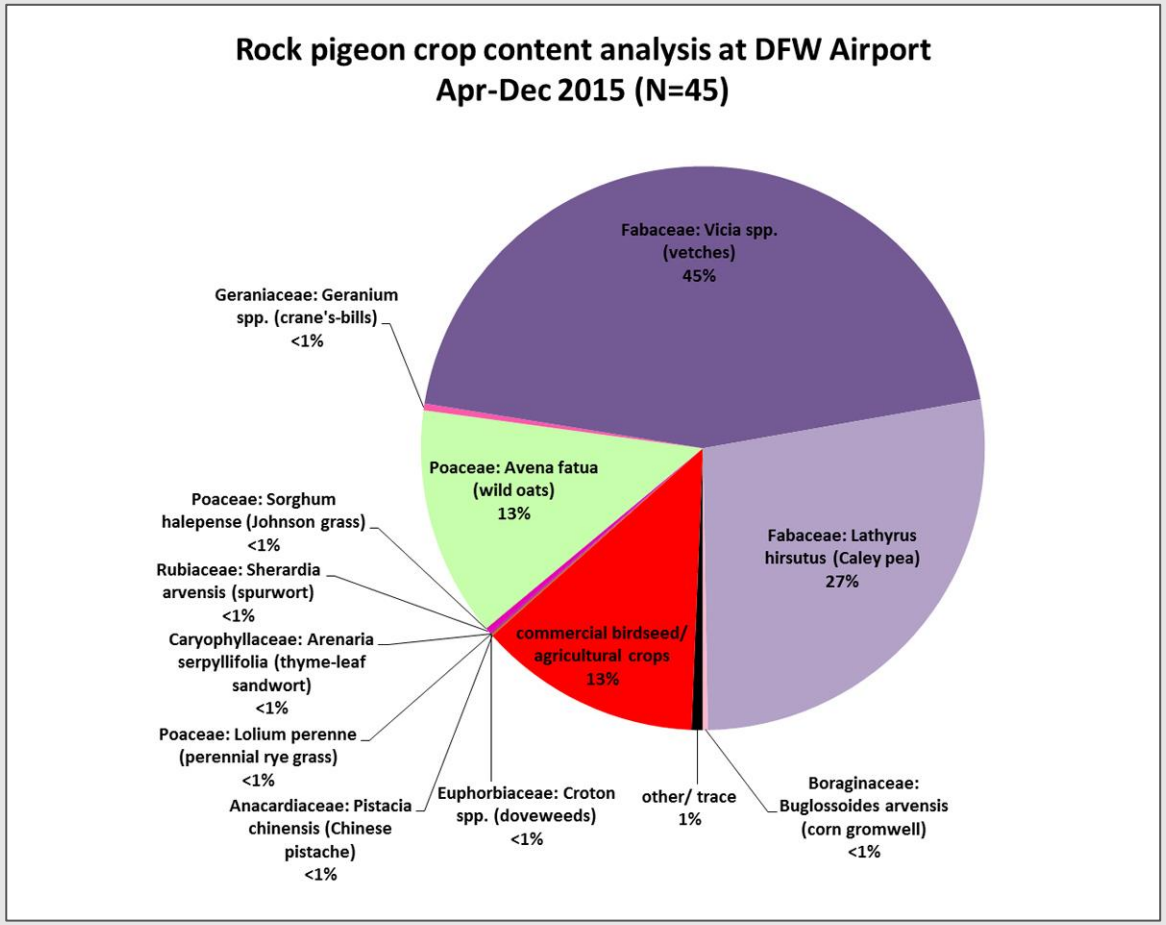
Survey Results

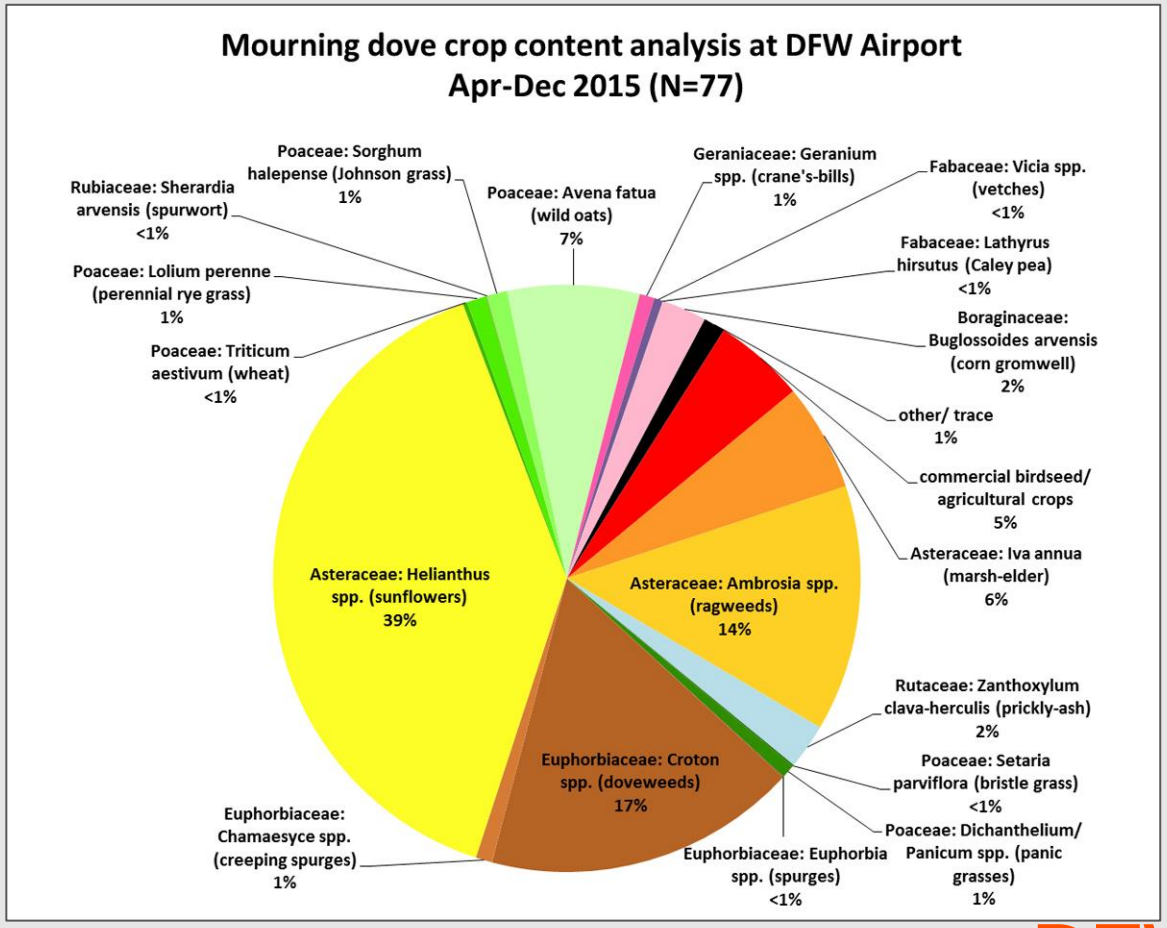
Nearly 200 common plant genera/species were documented for DFW Airport

- 33 species of high concern
- 48 of moderate concern
- 97 of low or no concern

Crop Seed Analysis

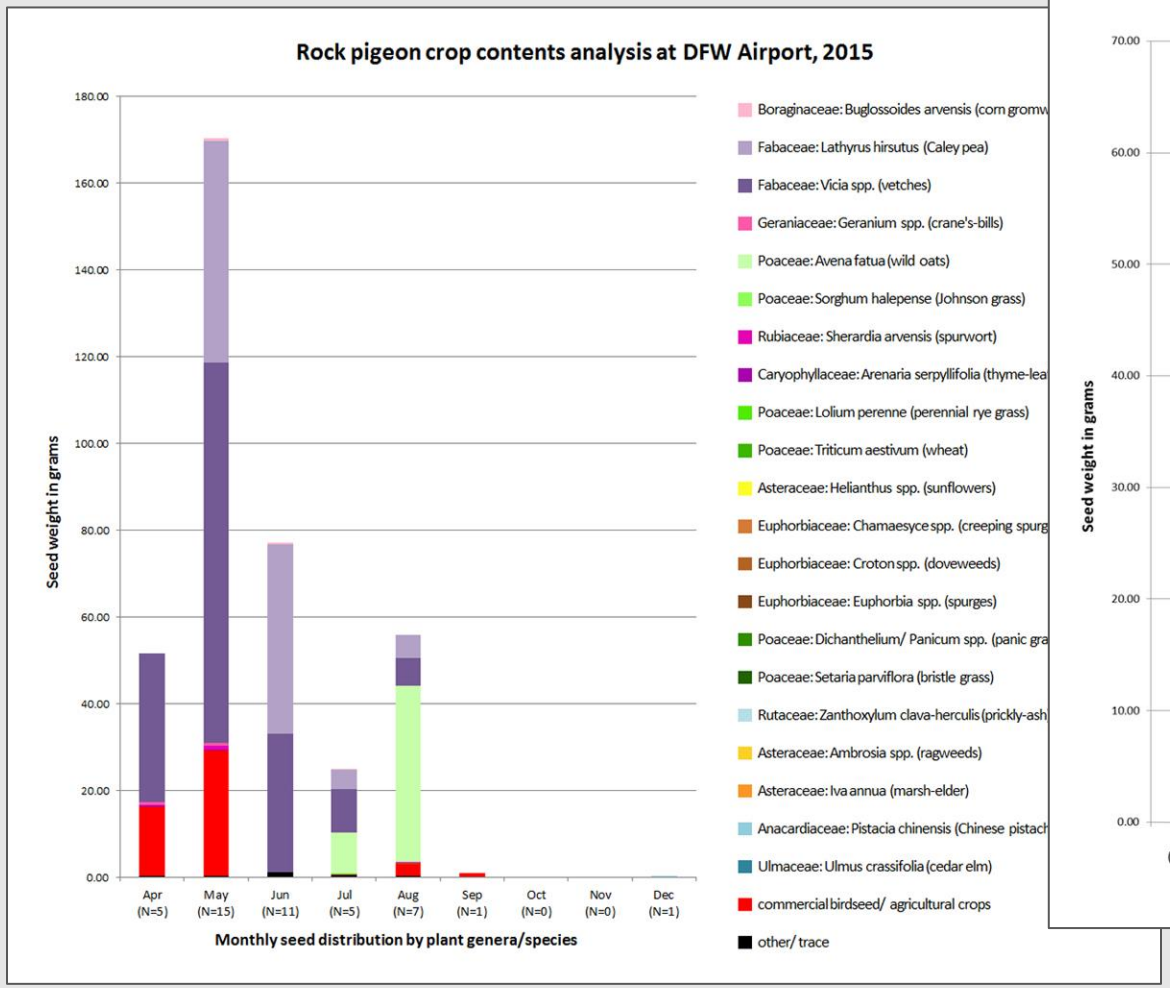
Seeds from 122 bird crops were separated by plant species (when a single, distinctive species was present) or genus (when several species in a genus were present) and weighed, in order to determine overall proportional importance to diet.

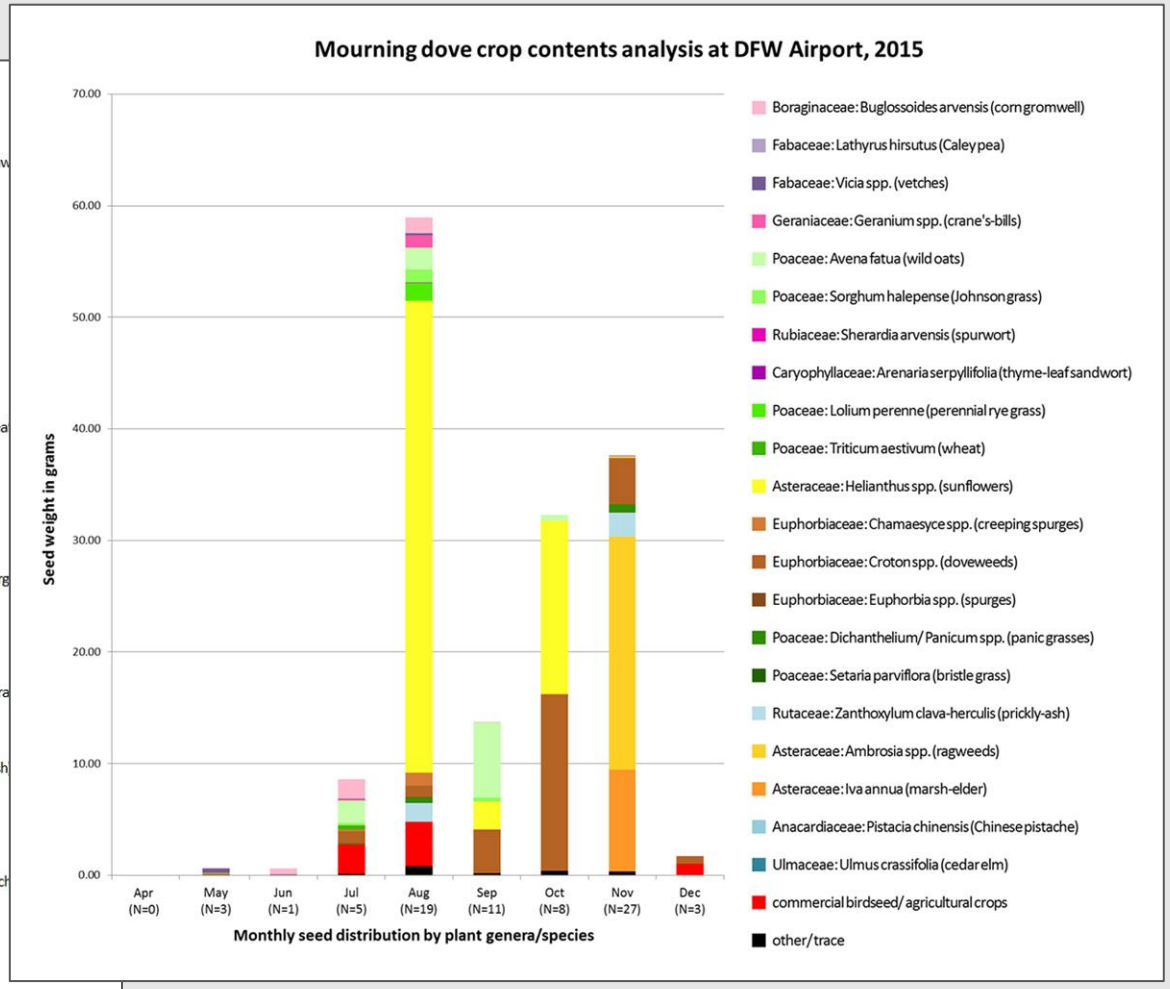




Crop Seed Analysis

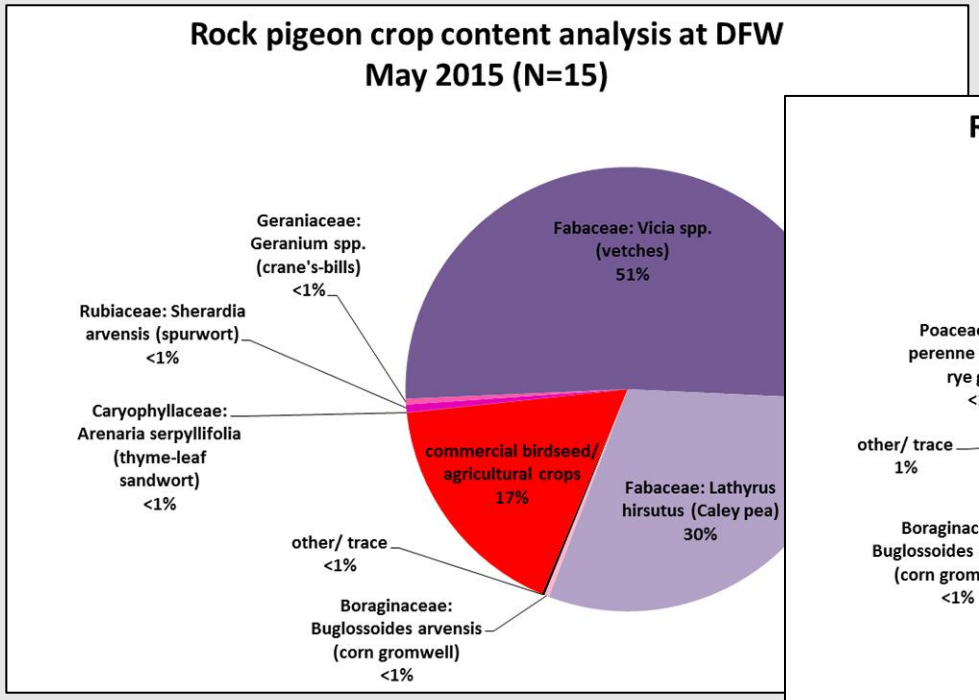
Pigeon activity peaked in the spring, and pigeons primarily ate seeds produced by just three genera of plants, mostly weeds native to the Old World (as are pigeons). Dove activity peaked in late summer and fall, and dove ate a diverse diet of many species' seeds, mostly from plants native to Texas.

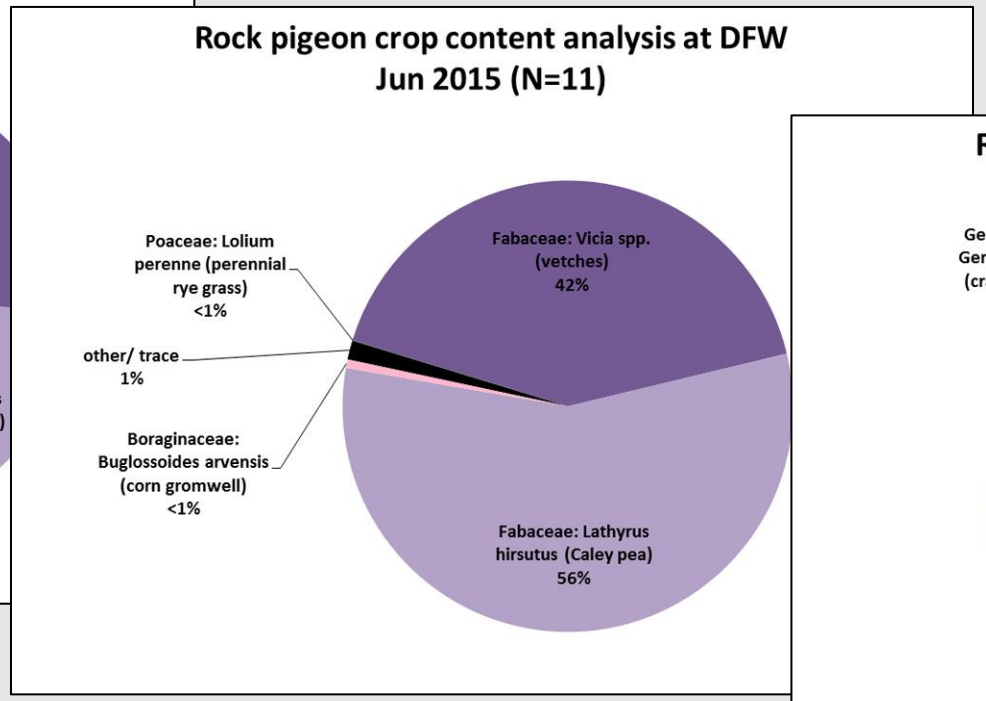


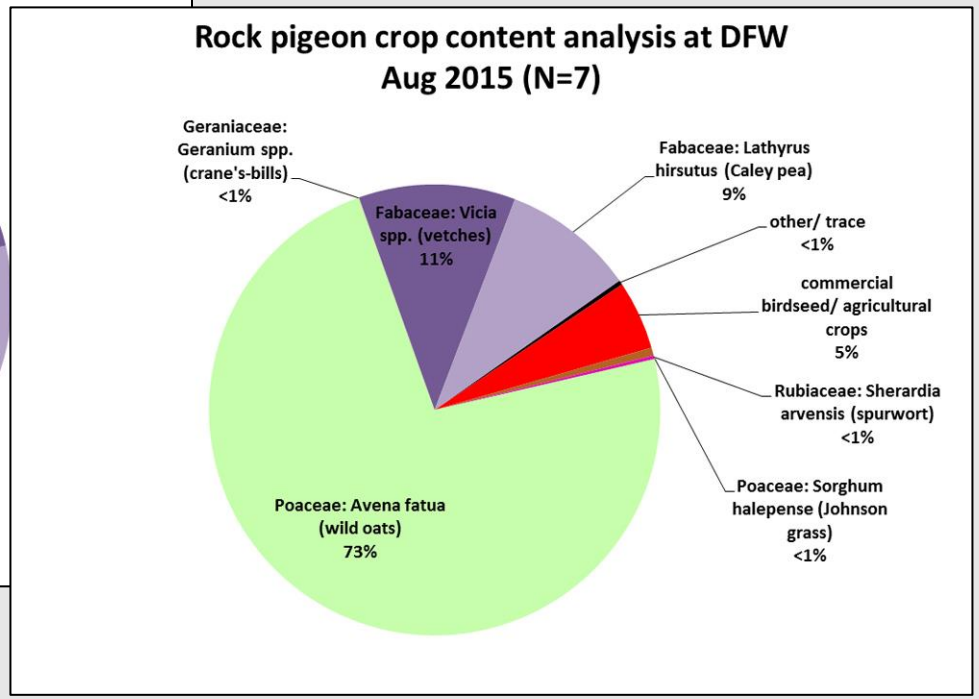


Crop Seed Analysis

Monthly totals provide seasonal patterns of availability.



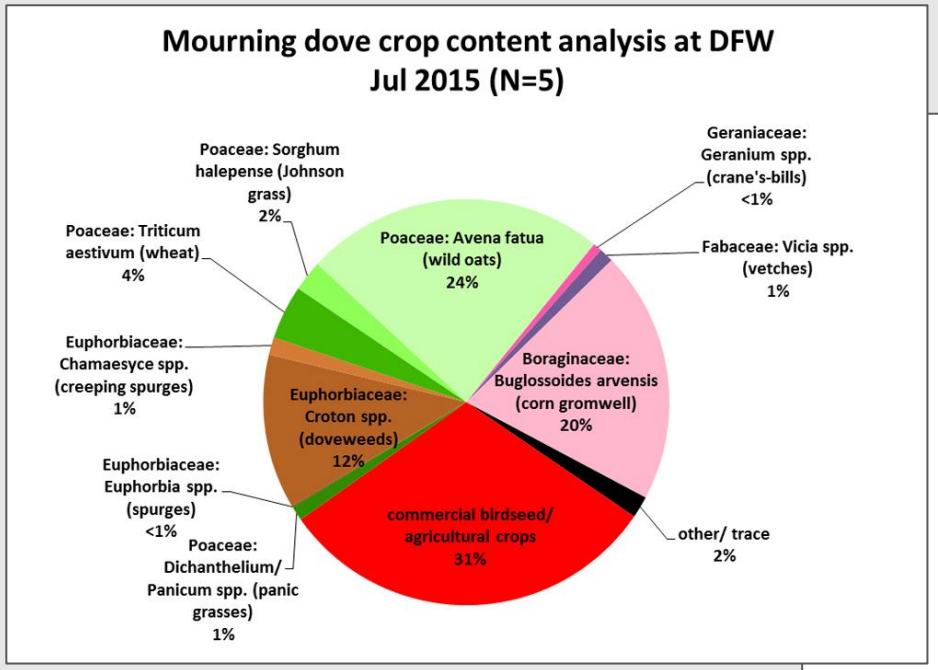


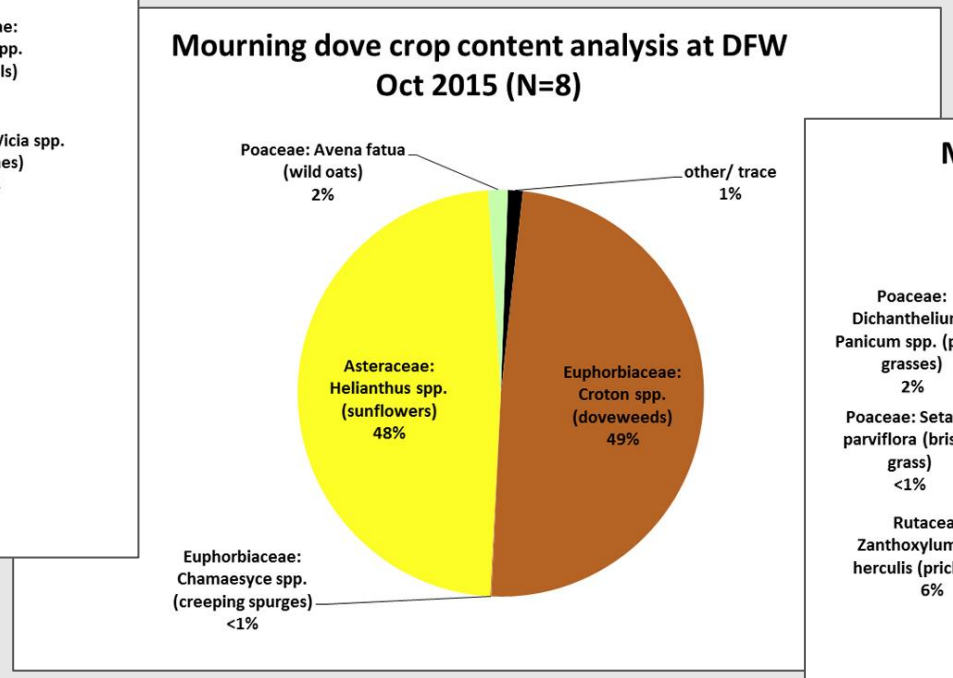


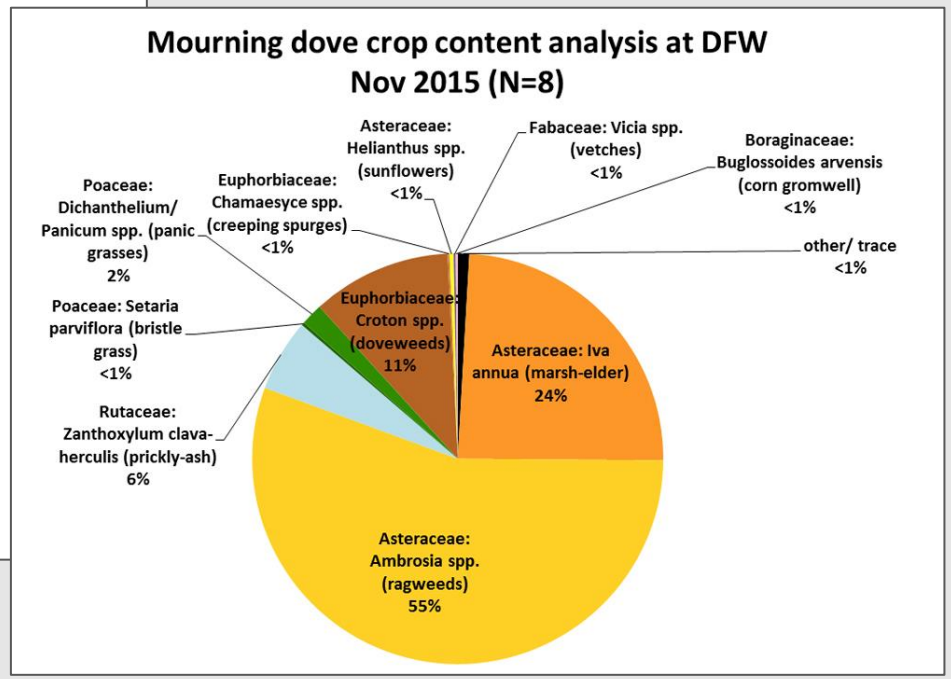
DFW pigeons: three most active months in 2015

Crop Seed Analysis

Monthly totals provide seasonal patterns of availability.







DFW mourning dove: three most active months in 2015

Crop Seed Analysis

In 2015, pigeons and dove that were struck or depredated at DFW demonstrated strong differences in diet and seasonality, as well as in the diversity of plant species they consumed.

Plants most attractive to pigeons are early spring annual weeds that sprout in early winter in the DFW area.

Plants most attractive to dove are warm-season annuals or perennials that sprout in late spring in the DFW area.

This pattern has implications for effective control methods.





Project Results

Project Results

With an understanding of these seasonal patterns, we now appropriately plan and schedule our resources to target these plant attractants.

Project Results

Hands-on field training is conducted with both in-house crews and the members of the North Central Texas Airport Consortium.

Project Results

Study deliverables included wildlife attractant seed ID kits. A reference collection!

Take Home Lesson #1

It's amazing what you can see just by looking

On November 19, 2015, two back-to-back bird strikes including a multiple strike (a Triggering Event) on approach to 36L resulted in the runway's closure for bird dispersal due to heavy and persistent bird activity. An area of focused bird activity at the approach end of the runway was inspected for potential attractants. Now-dormant giant ragweed plants (typically 4-6' tall plants) were discovered. Stunted by the season's mowing activity, they had adapted by sprawling low instead of upright, and produced flowers/seeds below the mowers' blades…

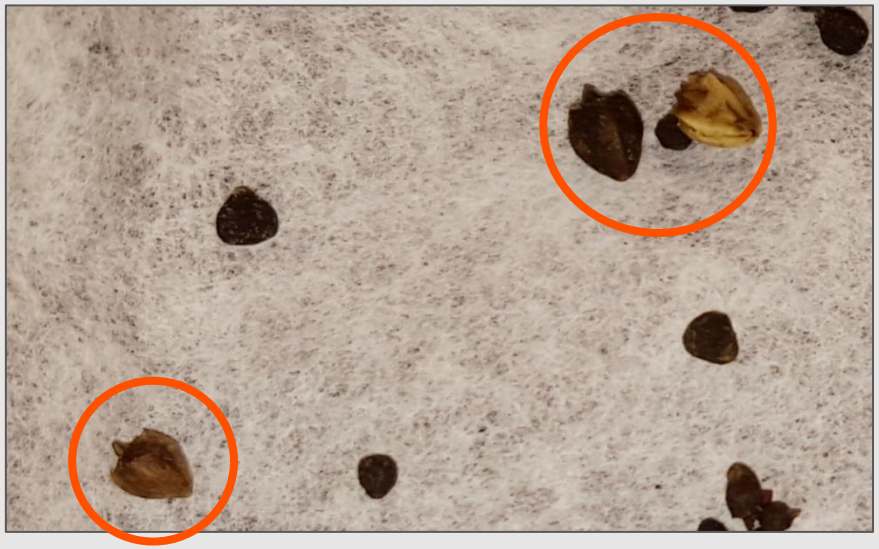
Take Home Lesson #1

It's amazing what you can see just by looking

Giant ragweed in its natural form (right), and in its adapted growth form (left).

Take Home Lesson #1

It's amazing what you can see just by looking



…Seeds from mourning doves struck and depredated were ID'd as coming from giant ragweed. Possibly, the mowing response exhibited by the plants resulted in the seeds being more accessible to the ground-feeding doves.

Take Home Lesson #2

Know your enemy

On November 3, 2015 seedlings of the Caley Pea, an early springtime emergent, were discovered sprouting in numerous areas of the AOA. Intact seeds of plants extracted from the soil further confirmed these small seedlings' identity. A watch plot was established to monitor the plants' growth through the 2016 season. It was found that Caley pea's life cycle begins as early as early winter and seedling germination extends into late spring.

Take Home Lesson #2

Know your enemy

Young plant, giant ragweed

Young plant, one-seeded croton

Subsequently, a number of other attractant plants have been identified in their early growth stages on the AOA, and training is ongoing to educate the staff at DFW Airport in early identification and mitigation strategies.

Take Home Lesson #3

Keep your head down

Keep your head down (and look). Unfortunately, keeping its head down is an annual plant's key survival strategy.

Take Home Lesson #4

Practice good housekeeping

It’s possible that seeds can be brought onto the AOA via landside equipment.
It’s also possible that moving equipment from one part of the airfield to another spreads seeds.

The moral of the story is…

Survey Results
(*The moral of the story is…)*

1. Based on analysis of crop contents, diets among species vary. For the most part, mourning dove and pigeons are not attracted to the same seeds.

2. Pigeons and dove take seasonal advantage of fruit/seed availability on the AOA over the course of the entire growing season.

3. Plants previously not thought to be attractants are.

4. Plants don’t have to be present to be an attractant.

5. Most of the plants of high concern are primarily annuals, and can be mitigated with a stringent mowing regime and/or herbicide/pre-emergents. Based on recent discoveries, neither strategy is foolproof.

6. Some plants may not be as confined to seasonal life histories as once thought.

7. We’ll have to be smarter than the plants in order to mitigate them.

How to find a botanist?

- Find a herbarium (plant specimen museum):
  Google “Index Herbariorum” (hosted by the New York Botanical Garden) and search by location
- Contact likely departments at your nearest college or university:
  (Botany, Biology, Range Science, Horticulture, Agriculture, Ecology)
- Contact your local County Extension Agent
- Talk to your local USDA and USFWS biologists (including NRCS, ARS, APHIS...)
- Post an inquiry/photo to the HERBARIA listserv (hosted by the Society of Herbarium Curators)
- There are also several popular social sites dedicated to plant identification

Courtesy of BRIT

There’s a strong chance you can find someone to ID plants and seeds for you at low or no cost!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Thank you!