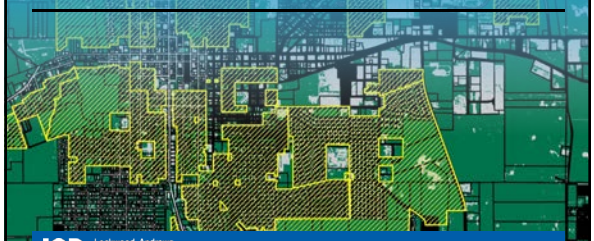
Mineral Wells Stormwater Utility Rate Study



Lockwood, Andrews & Newnam, Inc.

What is a Stormwater Utility Fee?

- Monthly fee
  - Maintenance
  - Improvements
  - Other costs

2

How do you do it?

- Identify contributors
  - Impervious surface = runoff
- Create an impervious surface based billing system

3

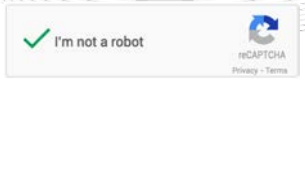
Overview of Methods

- Impervious surface dataset
  - NAIP 2015 aerials
  - Supervised machine learning
- Billing data/Parcel data matching
  - Loose join script
  - Manual matching
- Goal: Combined Billing/Impervious coverage dataset

4

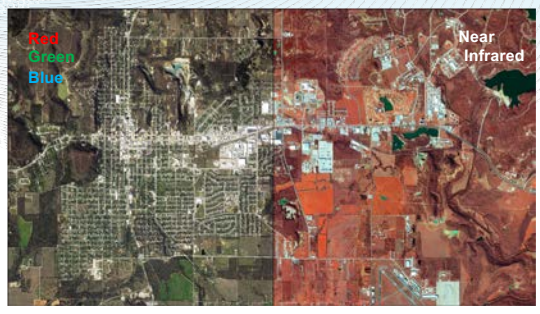
Overview of Methods

- Computers: useful tools
- Speed of computation



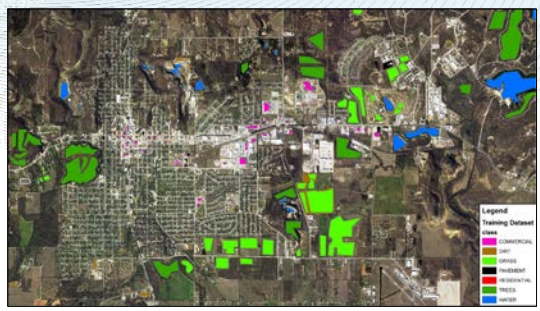
5

NAIP 2015 4-band aerial

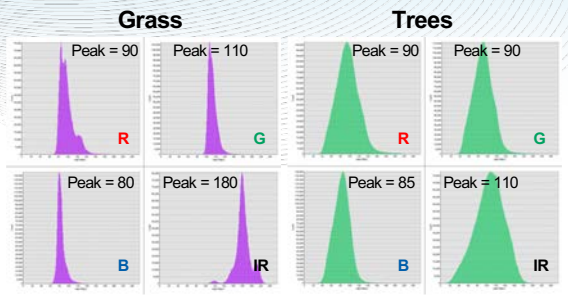


6

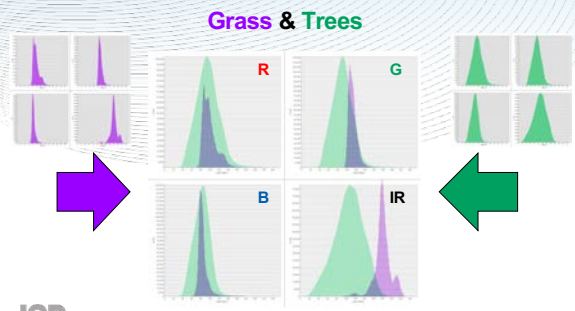
Supervised Machine Learning



Supervised Machine Learning



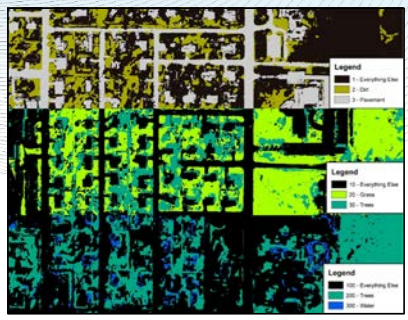
Supervised Machine Learning



Impervious Surface Dataset

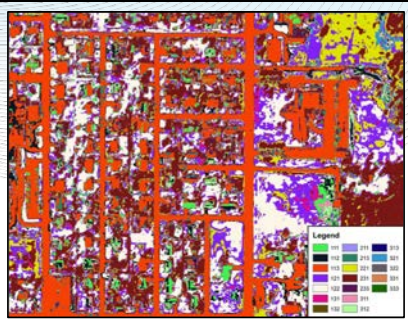
10

Impervious Surface Dataset



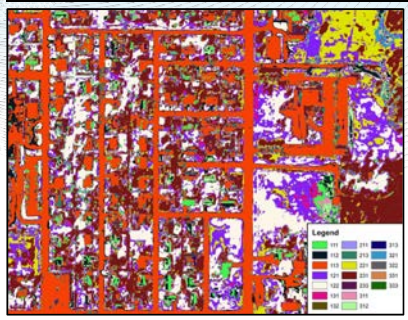
11

Impervious Surface Dataset



12

Impervious Surface Dataset



100 – null
200 – TREES
300 – WATER

10 – null
20 – GRASS
30 – TREES

1 – null
2 – DIRT
3 – PAVEMENT

Ex:
113 – null/null/**PAVE**
211 – **TREES**/null/null
231 – **TREES**/**TREES**/null

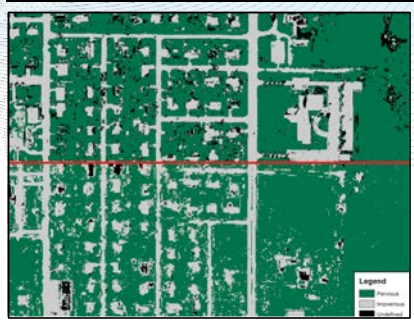
111 – null/null/null
213 – **TREES**/null/**PAVE**

13

Impervious Surface Dataset

14

Impervious Surface Dataset

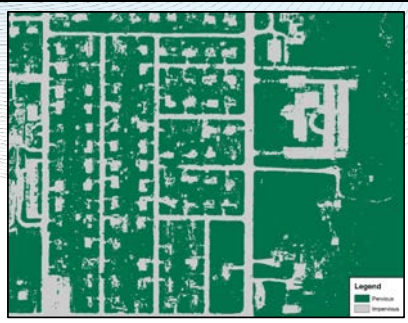


Composite Classification

Original Classification

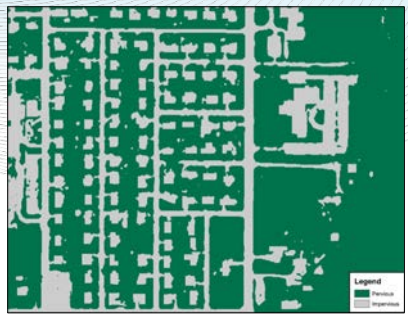
15

Impervious Surface Dataset



16

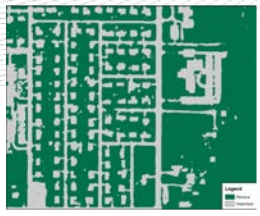
Impervious Surface Dataset



Impervious Surface Dataset

Original Classification

Modified Composite Classification



18

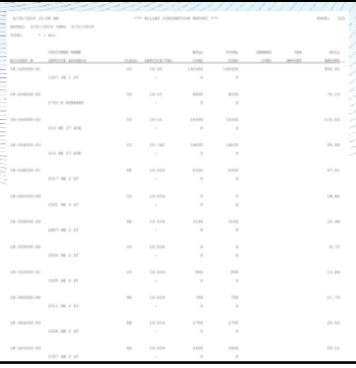
Impervious Surface Dataset

19

Impervious – Parcel Dataset

20

Account – Parcel Matching



21

Account – Parcel Matching

- What we have
  - Parcel-level impervious surface (with address)
  - Billing account addresses
- What we want
  - Billing account addresses with impervious surface
- Common factor: Addresses

22

Account – Parcel Matching

- What we have
  - Parcel-level impervious surface (with address)
  - Billing account addresses
- What we want
  - Billing account addresses with impervious surface
- Common factor: Addresses
- Problem!
  - 101 Oak St
  - 101 Oak Street
  - 101 Oak

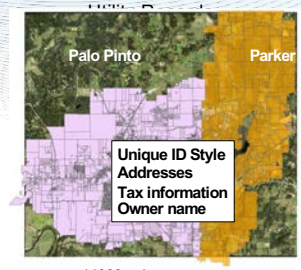
23

Data Sources

24

Data Sources

County Appraisal Data (CAD)



~ 11000 polygons

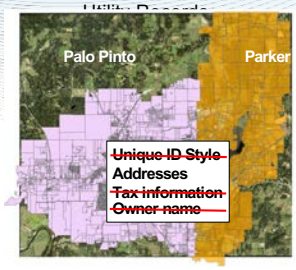
Unique ID style
Addresses
Util. rates
Owner name

~ 6500 rows

25

Data Sources

County Appraisal Data (CAD)



~ 11000 polygons

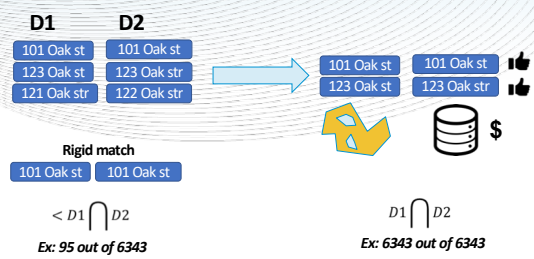
~~Unique ID style~~
Addresses
~~Util. rates~~
~~Owner name~~

~ 6500 rows

26

Loose join

- Objective



Rigid match

101 Oak st | 101 Oak st

$< D1 \cap D2$

Ex: 95 out of 6343

$D1 \cap D2$

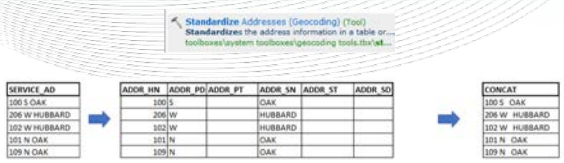
Ex: 6343 out of 6343

27

Loose join

Standardization (Making as similar as possible)

- All Caps
- Comparable address structure ("Number"-"St/av…"-"Zip")



SERVICE_AD
100 S OAK
206 W HUBBARD
102 W HUBBARD
101 N OAK
109 N OAK

ADDR_HN	ADDR_PD	ADDR_PT	ADDR_SN	ADDR_ST	ADDR_SD
100	S		OAK		
206	W		HUBBARD		
102	W		HUBBARD		
101	N		OAK		
109	N		OAK		

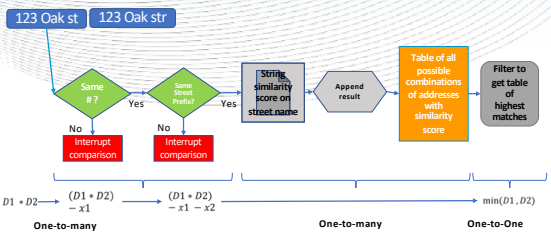
CONCAT
100 S OAK
206 W HUBBARD
102 W HUBBARD
101 N OAK
109 N OAK

28

Loose Join

String matching algorithm

- Partial flexibility: Only on street name



29

Loose Join Script

Billing Acct	Billing Address	Parcel UIN	Parcel Address	Score
02-240000-01	101 CLUSTER DR	UIN6340	101 CLUSTER DR	1.00
16-270050-00	2501 GARRETT MORRIS PKY	UIN7106	2501 GARRETT MORRIS PKWY	0.97
17-281001-02	6501 SHADOW VIEW CT	UIN2310	6501 SHADOWVIEW CT	0.96
28-198000-14	305 TOURNAMENT LANE	UIN3333	305 TOURNAMENT LN	0.93
16-238000-00	1600 SE 24 1/2 AVE	UIN4595	1600 SE 24TH 1/2 AVE	0.91
17-283000-03	802 BELLAIRE CIRCLE	UIN2262	802 BELLAIRE CIR	0.89
17-241000-00	105 KARL KESLLER BLVD	UIN9182	105 CARL KESSLER BLVD	0.88
32-203000-0	376 HIDEAWAY ACRES	UIN4268	376 HIDEWAY ACRES RD	0.87
04-188000-00	205 SE 10 AVE	UIN4429	205 SE 10TH AVE	0.86
18-446000-03	311 SAM HOUSTON	UIN5899	311 SAM HOUSTON AVE	0.85
01-121000-02	317 NW 4 AVE	UIN6712	317 NW 4TH AVE	0.83
35-121000-00	101 FM 2256	UIN7305	101 FM RD 2256	0.82
31-545000-01	504 CEDAR	UIN6627	504 CEDAR ST	0.77
18-144000-01	101 SE 17 AVE B	UIN6892	101 SE 17TH AVE	0.75
25-047000-02	974 MORTON	UIN2318	974 MORTON AVE	0.75
32-890000-00	214 SW 26 AVE B	UIN7315	214 SW 26TH AVE	0.75

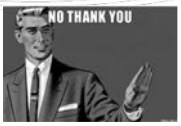
Acceptable threshold >= 0.75

30

Quality Control

2 concerns:
- Data quality
- Integrity of loose join

2 approaches:
- Inspect 6400 records and identify false positives.



- Graphical result of "incorrect-ness"

31

Quality Control

Incorrectness =

1) Wrong address given by CAD to polygon

Test: Does Parcel centroid line up with geocoded address ?

32

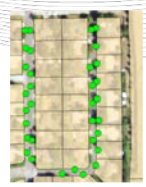
Quality Control

Incorrectness =

2) Wrong address "JOINED" automatically despite high similarity score

- Test: Can a third party detect a significant difference between Add.1 & Add.2 that "Loose join" could not detect?

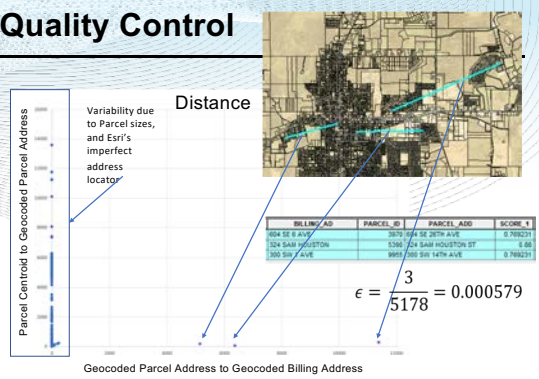
Parcel Address 1



Billing Address 2

33

Quality Control



34

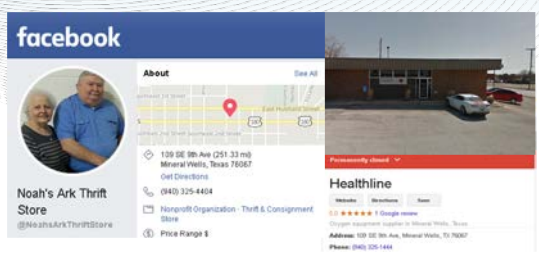
Account – Parcel Matching

- 6,434 Billing Records
- 5,200 matched by "loose join" script
- 62 undefined
- 1,172 matched manually

35

Manual Matching

Google Street View, Yelp, Facebook, etc…



36

Manual Matching

Google Street View, Yelp, Facebook, etc…

37

Manual Matching

Google Street View, Yelp, Facebook, etc…

38

Impervious – Parcel Dataset

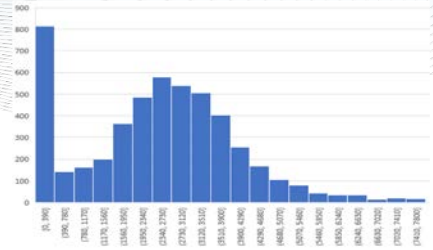
39

Impervious – Parcel Dataset

40

Equivalent Residential Unit

- 2,600 square feet = 1 ERU



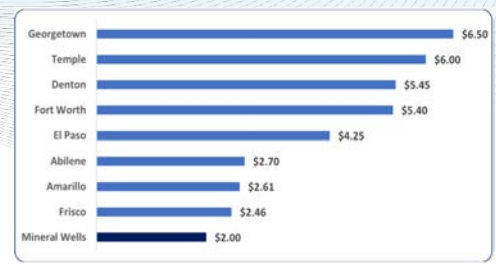
41

ERU-Based Billing Example

	Single Family Home	Wal-Mart
Address	501 Brazos Drive	601 N FM RD 1821
Account	20-072000-00	20-285000-01
Total Square Feet	10,075	988,567
Impervious Square Feet	3,757	796,507
ERU	1.4	306.3

42

Comparison - Rate per 1 ERU



43

Comparison - Rate per 13 ERU

Mean non-SFR Property (13 ERU)

44

Fully Funded Utility

- $4.00 per ERU = 100% funded

	SFR	Mean non-SFR
ERU	1 ERU	13 ERU
Current Monthly Fee	$2.00	$2.00
Current Annual Fee	$24.00	$24.00
Proposed Monthly Fee	$4.00	$52.00
Proposed Annual Fee	$48.00	$624.00
Annual Difference in Fee	$24.00	$600.00

45

Fully Funded Utility

SFR Rate Comparison (1 ERU)

46

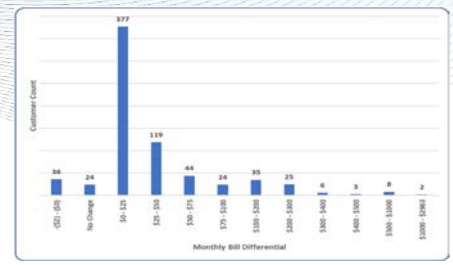
Fully Funded Utility

Mean non-SFR Rate Comparison (13 ERU)

47

Fully Funded Utility

Non-SFR Monthly Bill Differential ($4/ERU)



48

Phased Implementation?

- $2.00 per ERU = 50% funded
- $3.00 per ERU = 75% funded
- $4.00 per ERU = 100% funded

49

Questions?

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50

Thank You

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