

MATH MODELING CAN

MAKE YOU FILTHY RICH

ROBERT KAPLINSKY

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robertkaplinsky.com

[@robertkaplinsky](https://www.instagram.com/robertkaplinsky)





Real-World Link



Common Core
State Standards

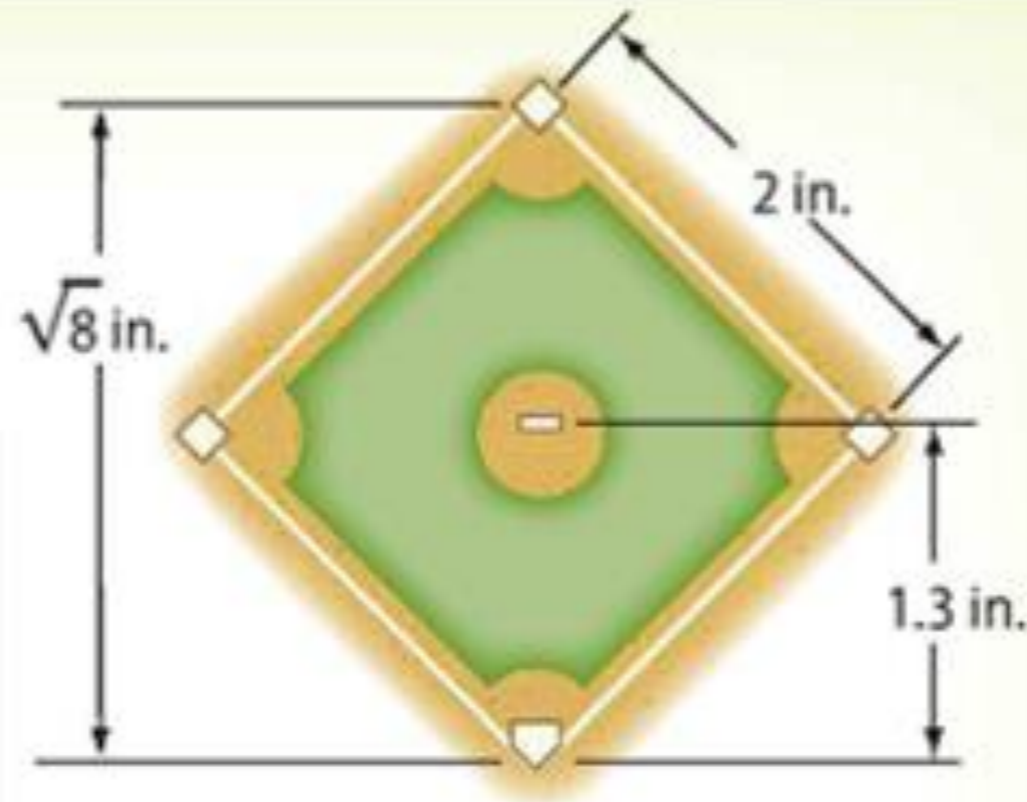
Content Standards

8.NS.1, 8.NS.2, 8.EE.2

Mathematical Practices

1, 3, 4, 6

Sports Major League baseball has rules for the dimensions of the baseball diamond. A model of the diamond is shown.



1. On the model, the distance from the pitching mound to home plate is 1.3 inches. Is 1.3 a rational number? Explain.

2. On the model, the distance from first base to second base is 2 inches. Is 2 a rational number? Explain.

3. The distance from home plate to second base is $\sqrt{8}$ inches. Using a calculator, find $\sqrt{8}$. Does it appear to terminate or repeat?





Real-World Link



Common Core State Standards

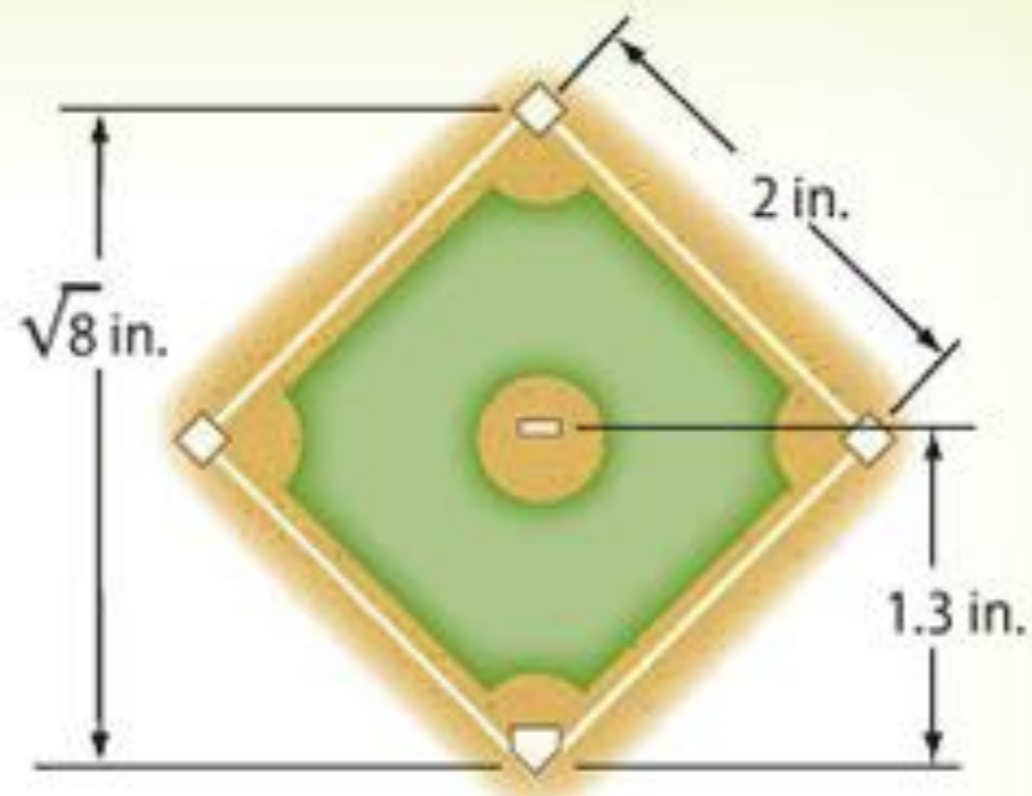
Content Standards

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Doritos® & Cheetos® Mix **20** Singles

DORITOS® Nacho Cheese Flavored Tortilla Chips 1 OZ. EA. DORITOS® COOL RANCH® Flavored Tortilla Chips 1 OZ. EA. CHEETOS® Puffs Cheese Flavored Snacks 7/8 OZ. EA. CHEETOS® Crunchy Cheese Flavored Snacks 1 OZ. EA.

20 INDIVIDUAL BAGS: 7/8 OZ. EACH, 1 OZ. EACH, TOTAL NET WT. 19 5/8 OZ. (1 LB. 3 5/8 OZ.) 556.3 g

⚠ WARNING: PREVENT ENTANGLEMENT AND STRANGULATION. KEEP THIS BAG AWAY FROM YOUNG CHILDREN. IT IS NOT A TOY.

THINKING TIME

- Why did many of you expect there to be five of each?
- Why was it not five of each?
- How might they decide on this combination?



Classic Mix

20
Singles

LAY'S® Classic Potato Chips. DORITOS® Nacho Cheese Flavored Tortilla Chips. DORITOS® COOL RANCH® Flavored Tortilla Chips. CHEETOS® Crunchy Cheese Flavored Snacks. SUNCHIPS® Original Multigrain Snacks. FRITOS® Original Corn Chips (All 1 OZ. Each)

20 INDIVIDUAL BAGS: 1 OZ. EACH, TOTAL NET WT. 20 OZ. (1 LB. 4 OZ.) 567 g

⚠ WARNING: PREVENT ENTANGLEMENT AND STRANGULATION. KEEP THIS BAG AWAY FROM YOUNG CHILDREN. IT IS NOT A TOY.

GOALS

HOW DO WE MAKE SENSE OF MATH MODELING?

IS IT JUST ANSWERING QUESTIONS?

HOW DO YOU PROFIT FROM MATH MODELING?

HOW DO WE HELP OUR STUDENTS IMPROVE?

WHERE CAN WE FIND MORE RESOURCES?









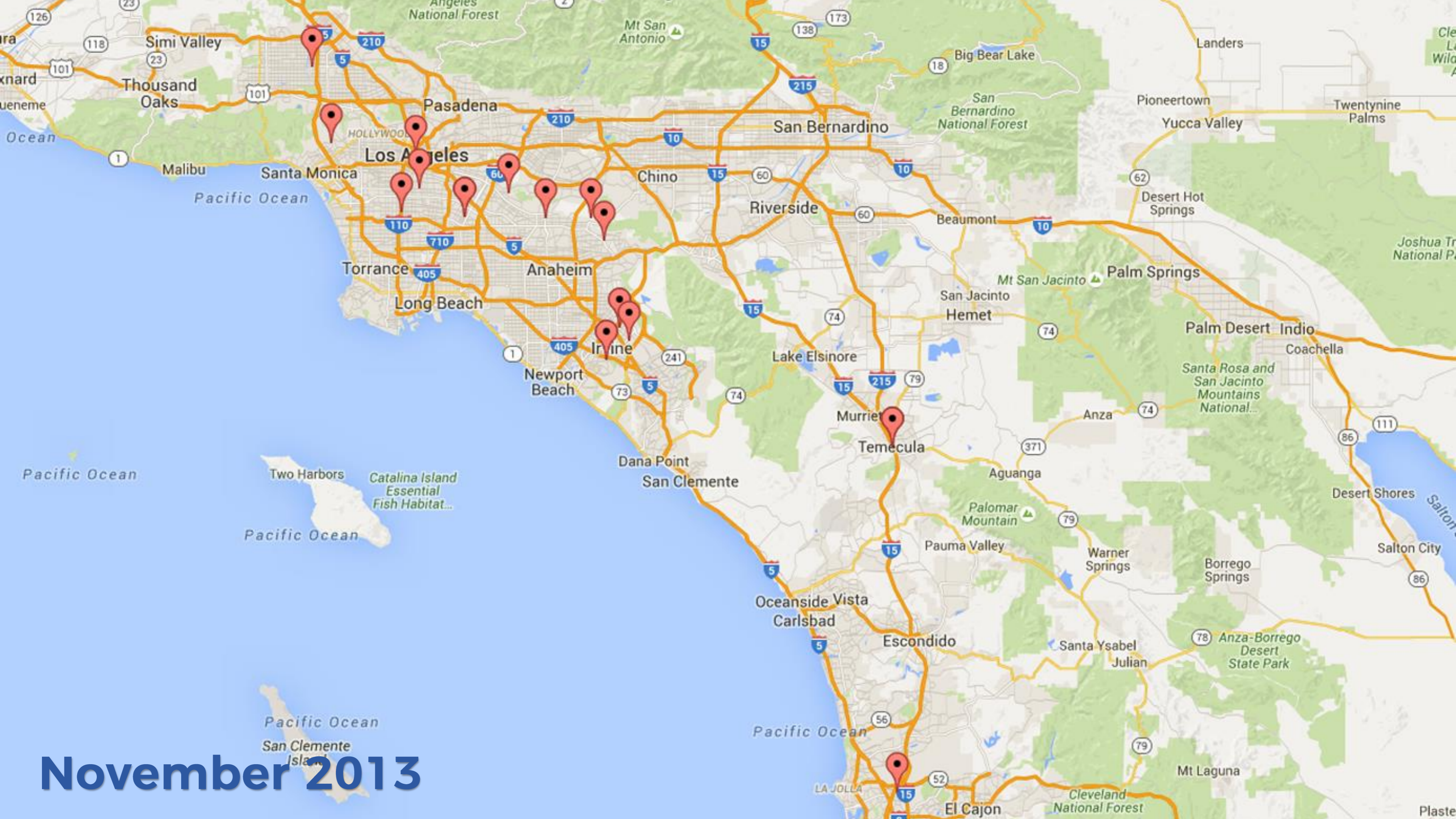


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graph TD; Spies --> Analysts; Analysts --> Model; Model --> Spies; Analysts --> Model;
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Spies

Analysts

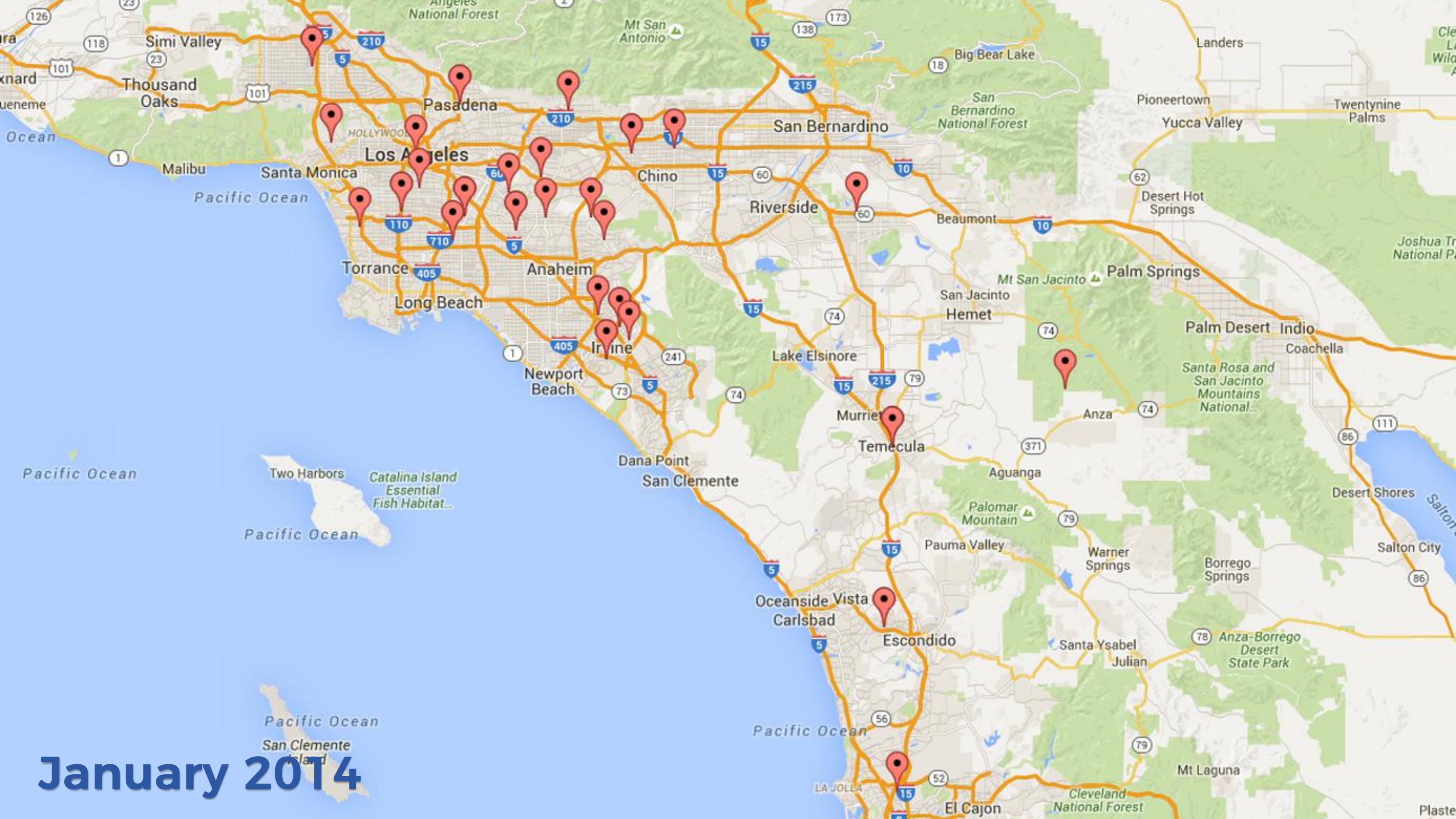
Model



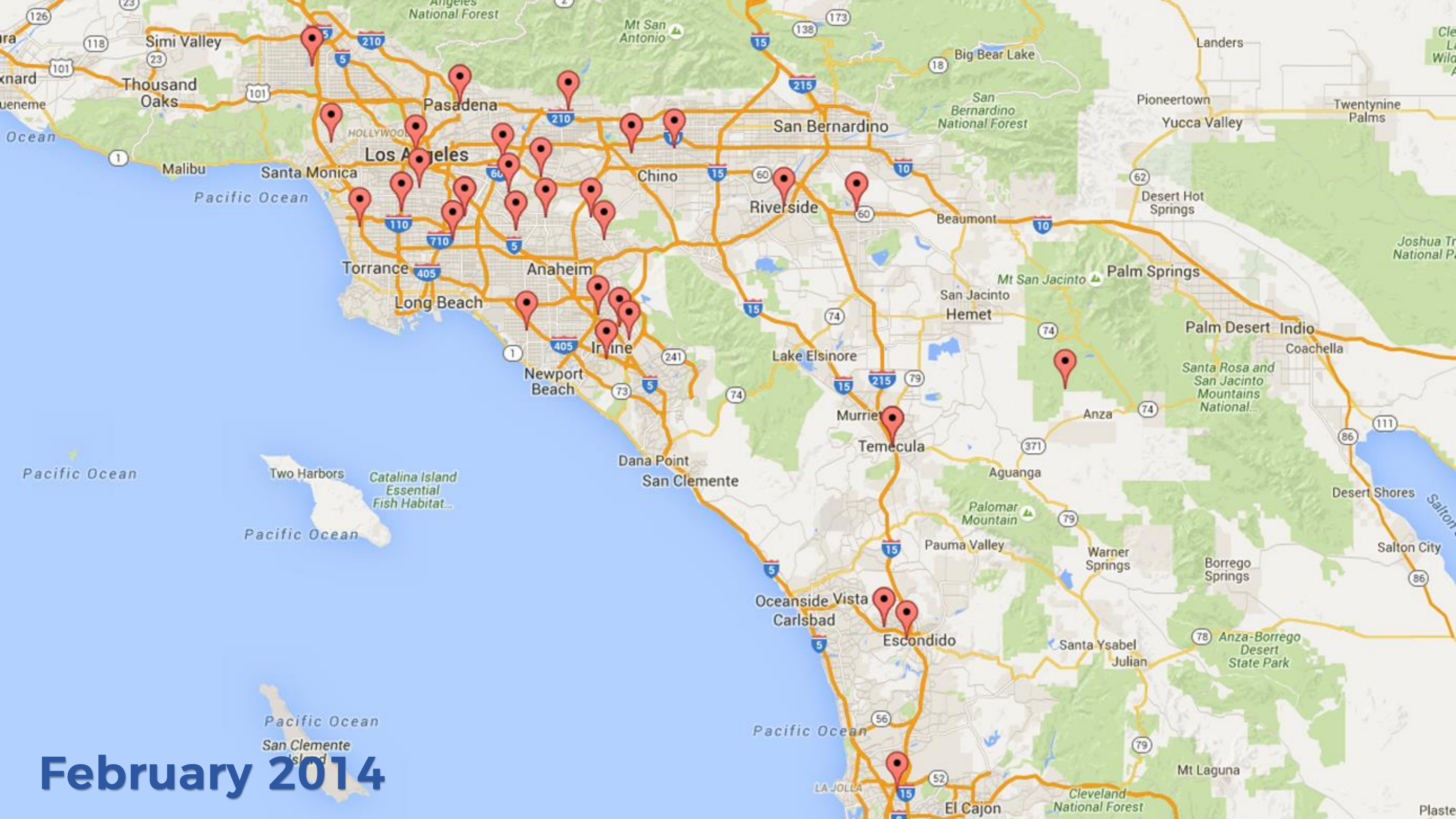
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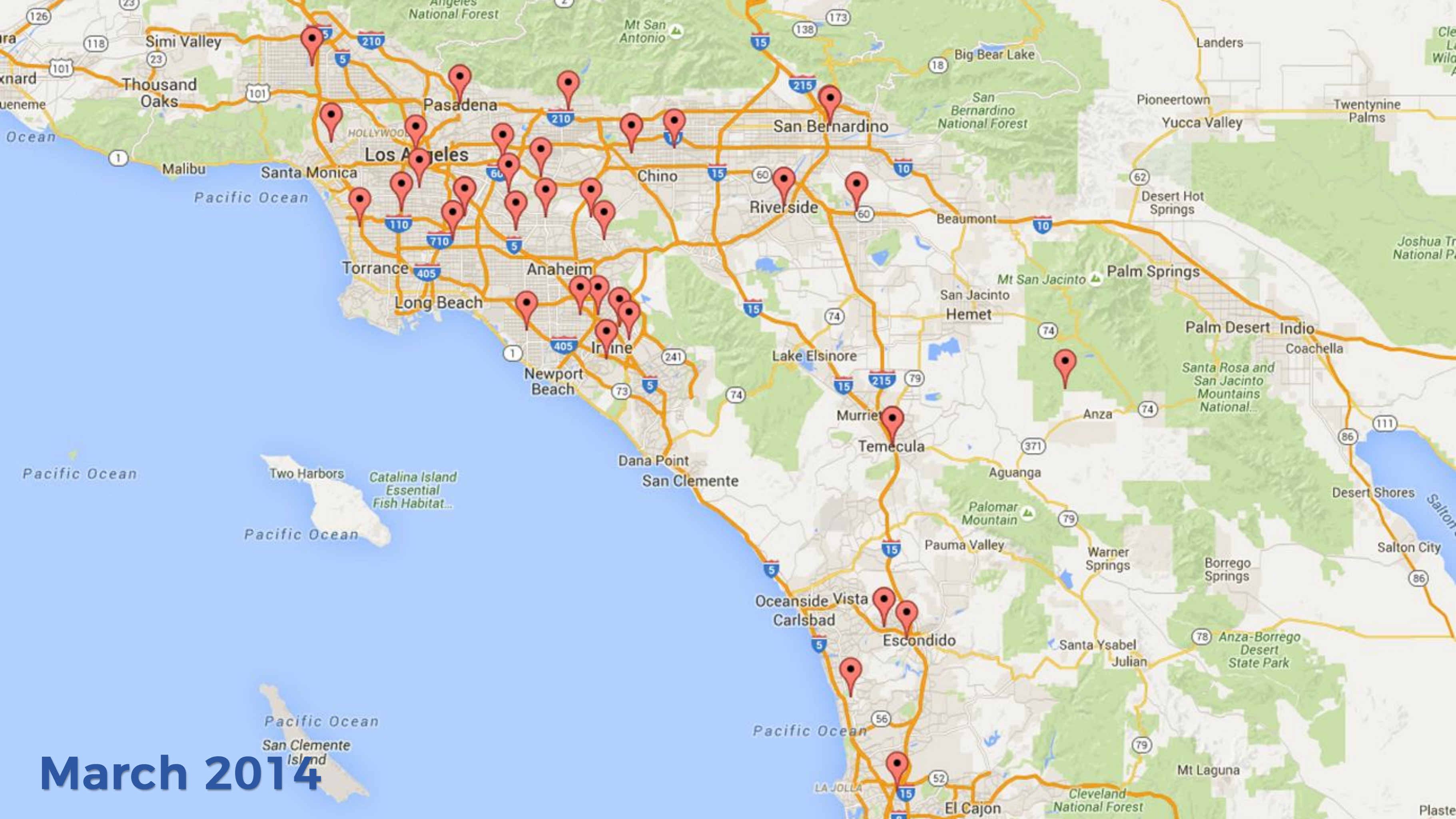
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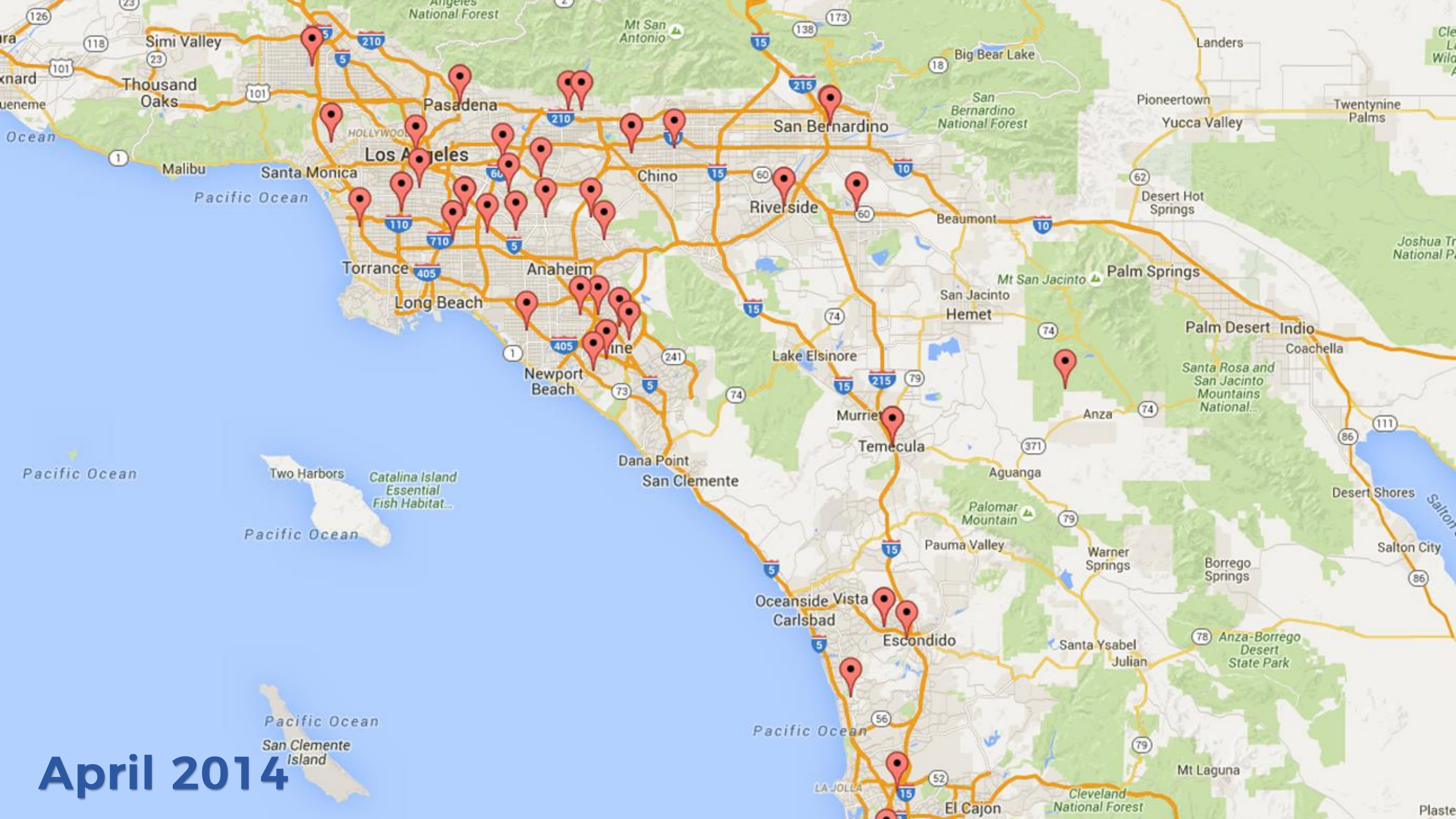
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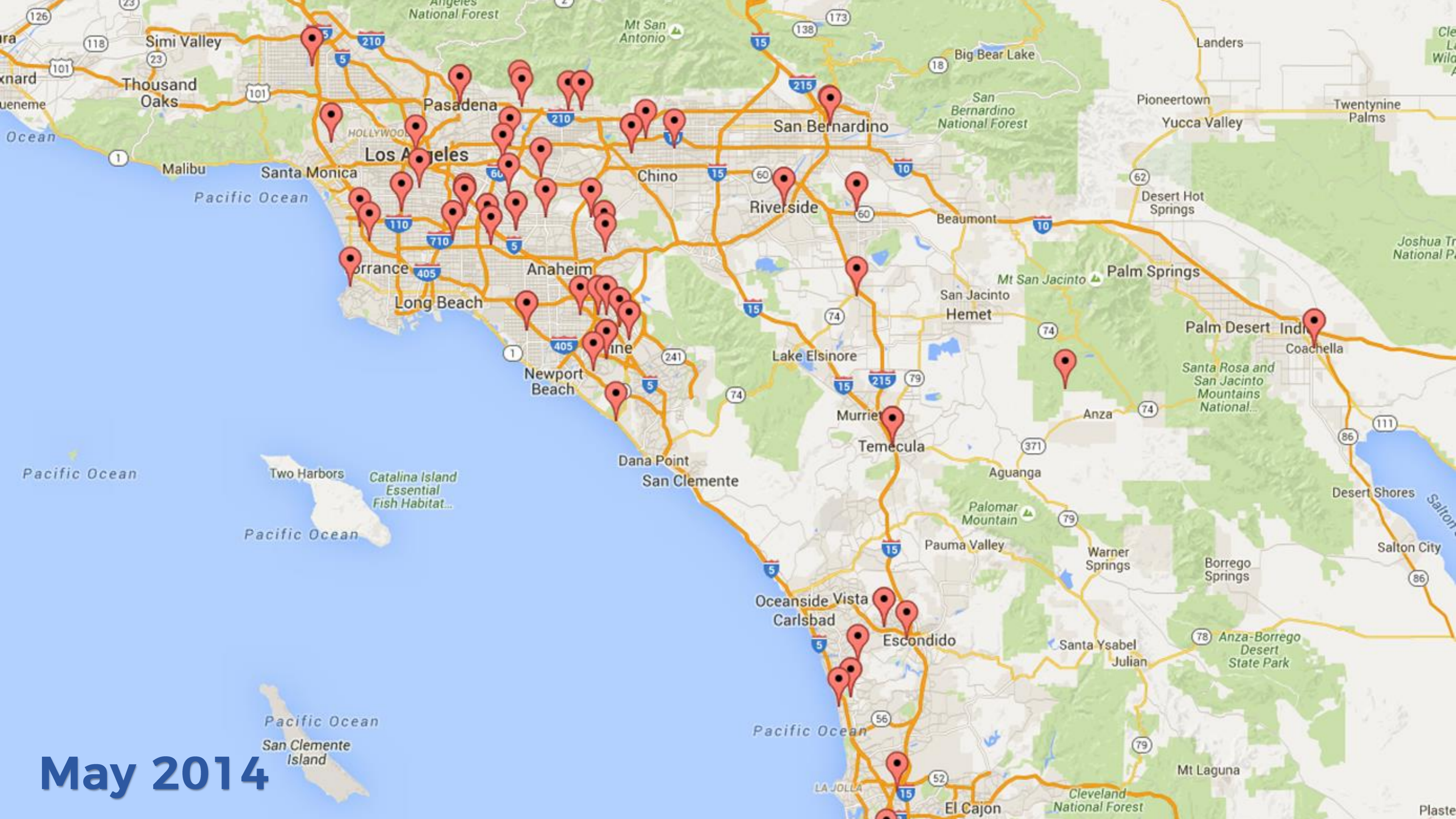
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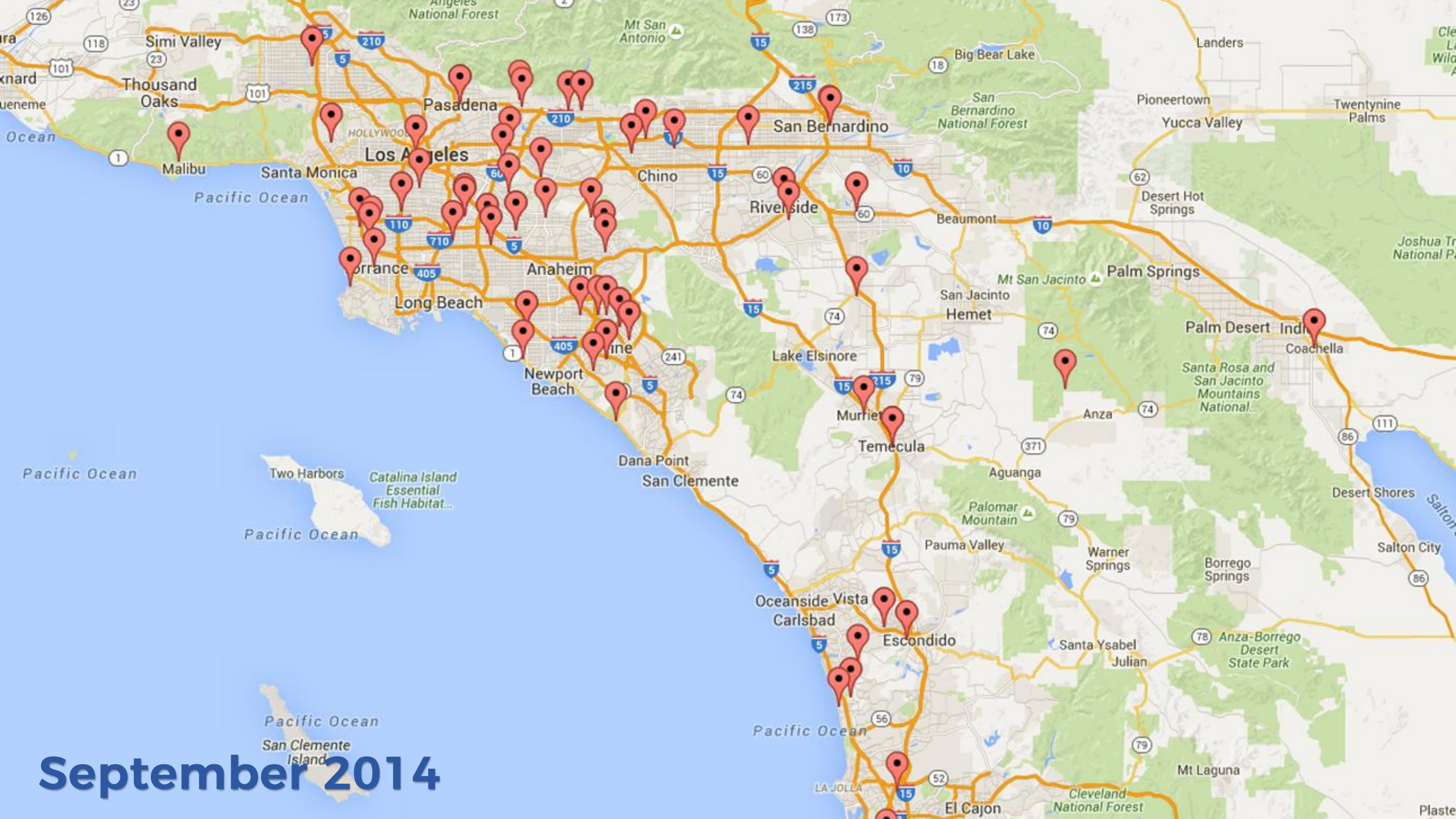
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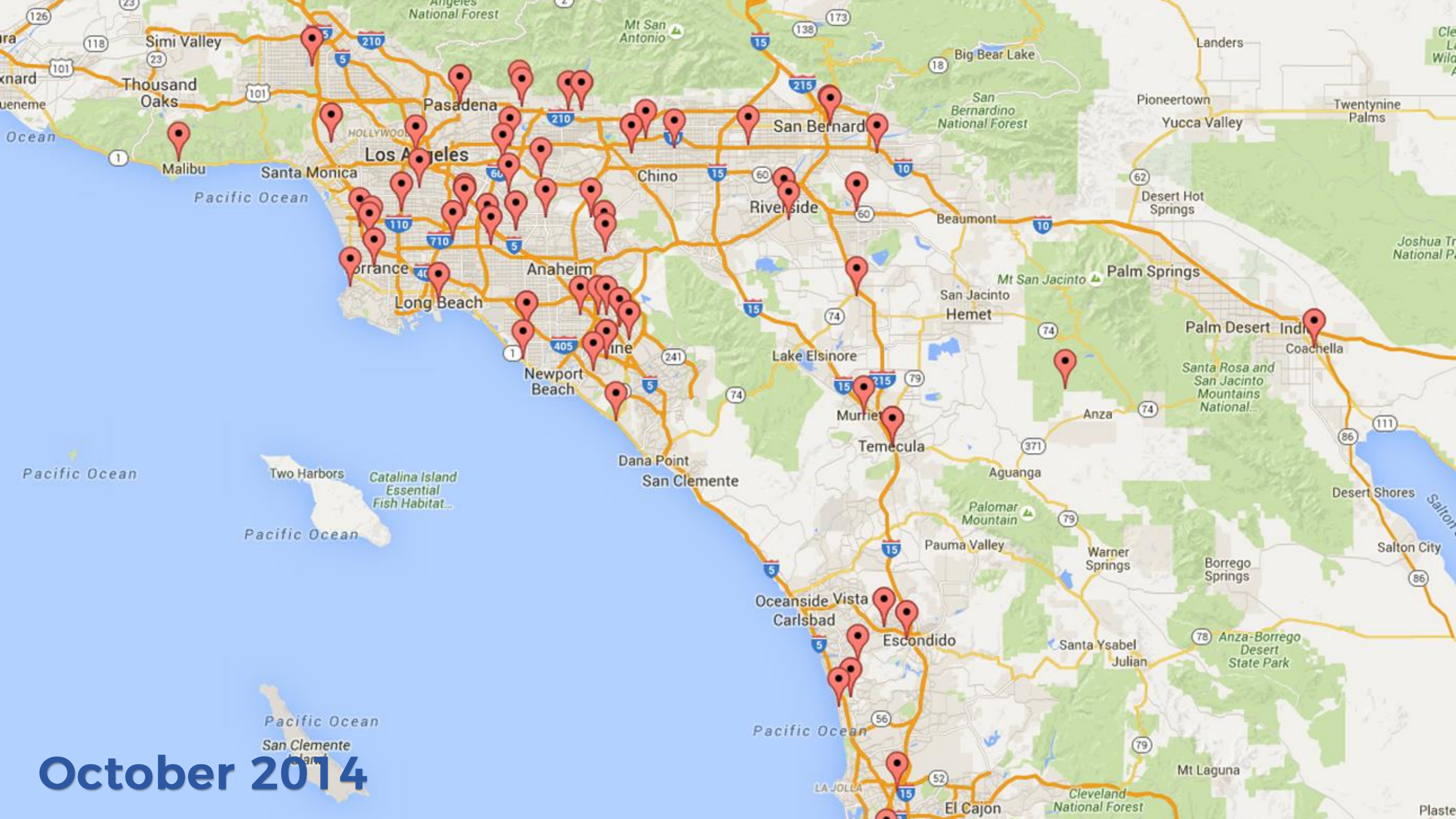
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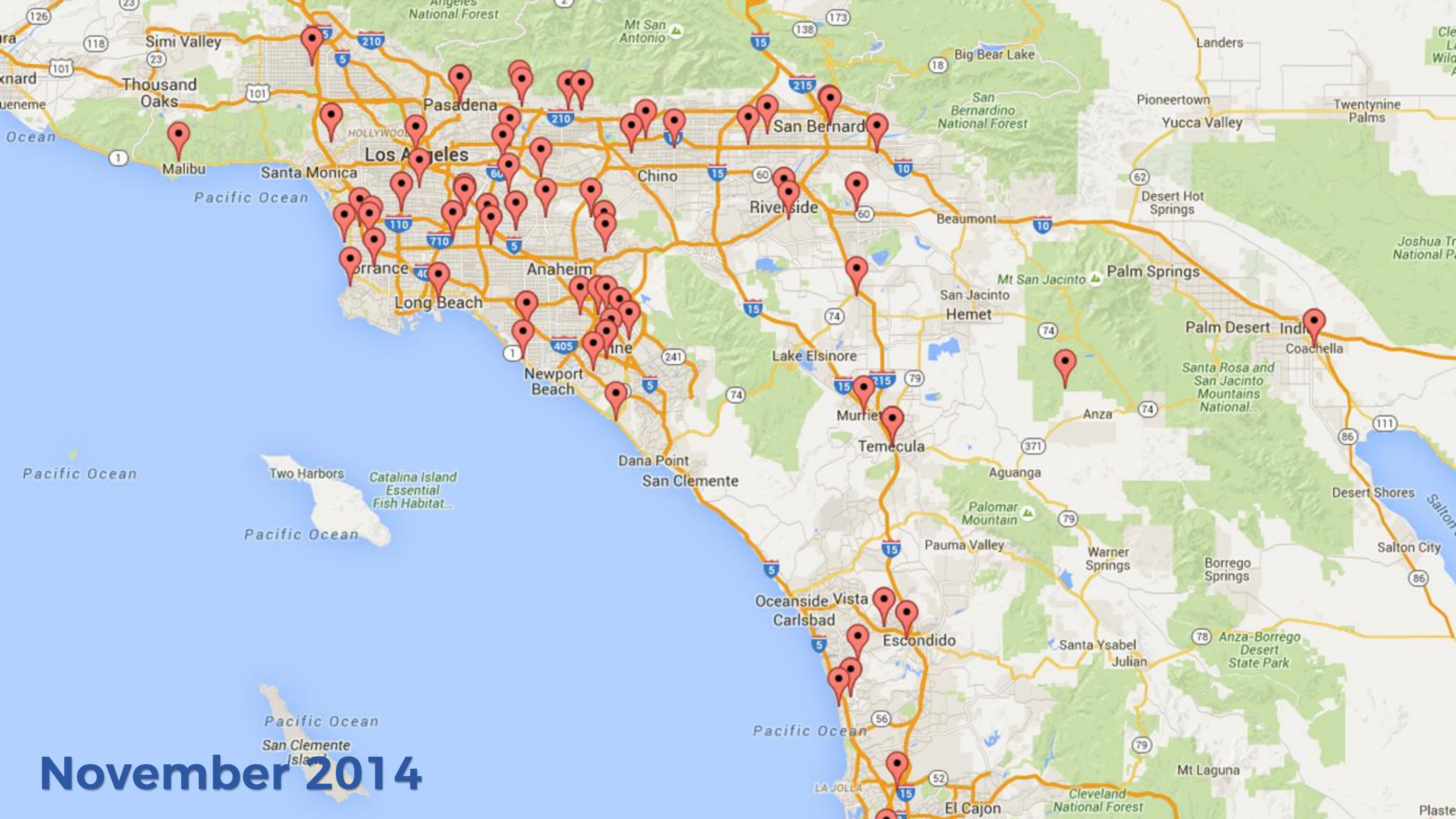
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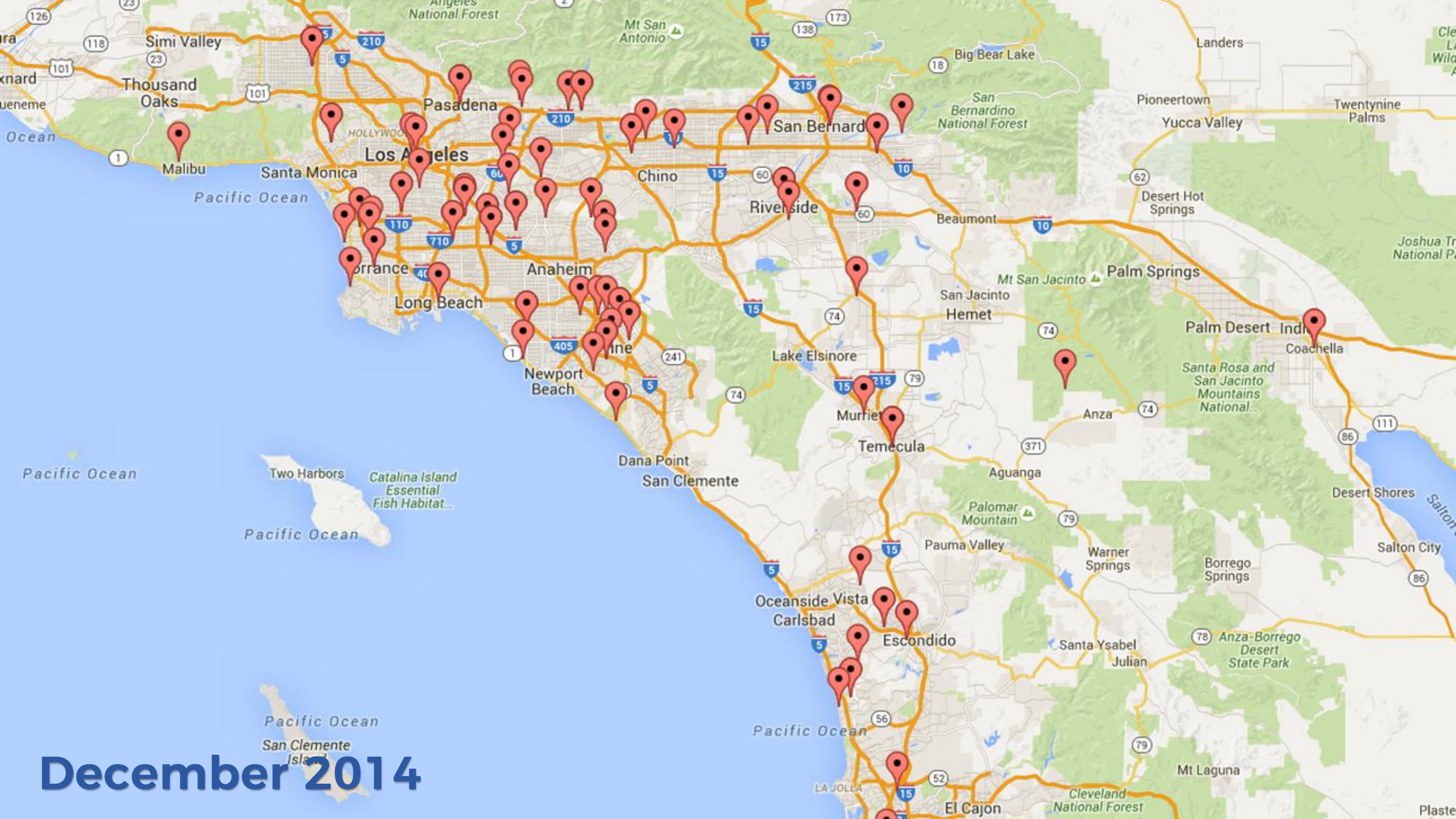
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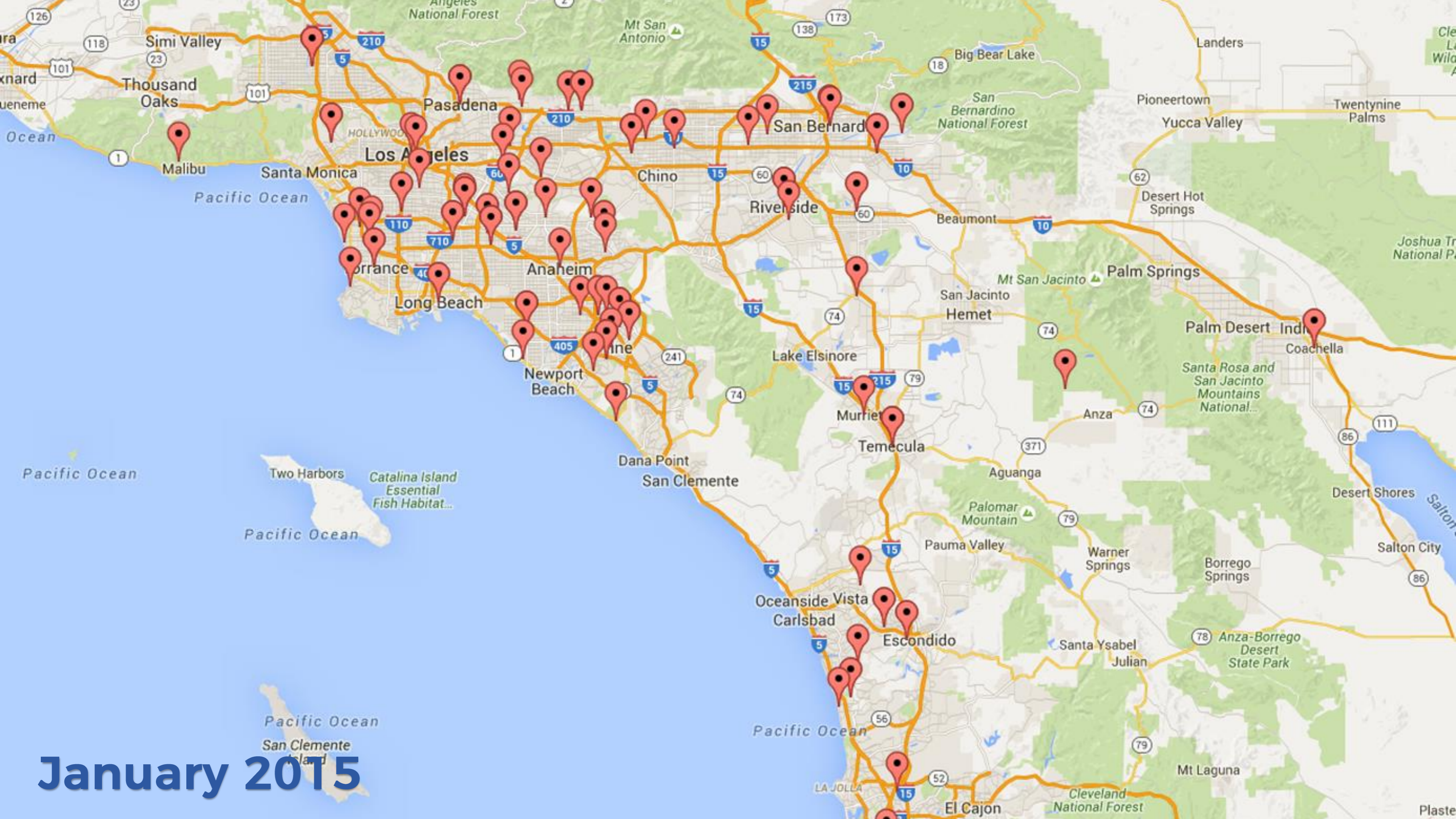
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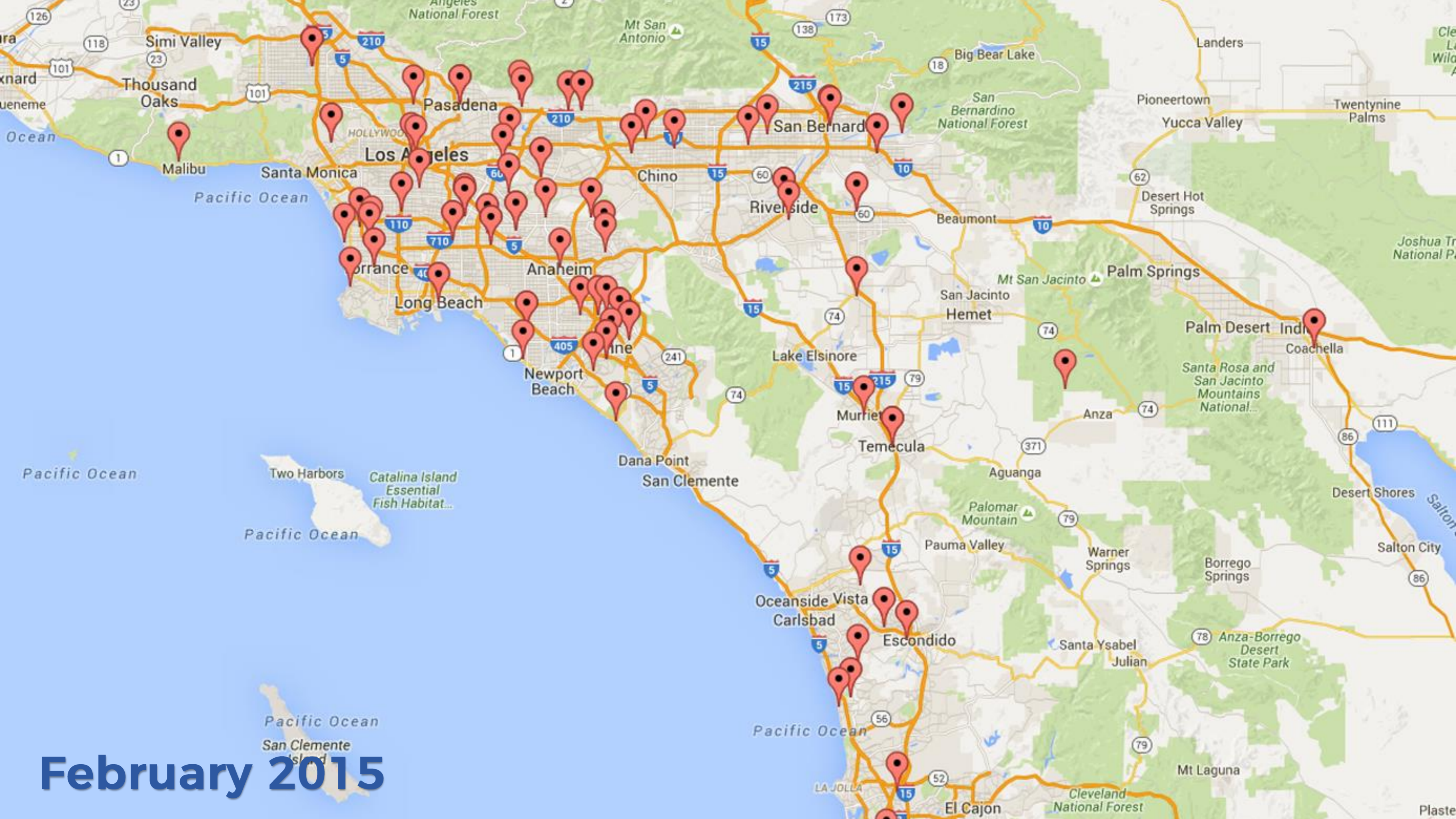
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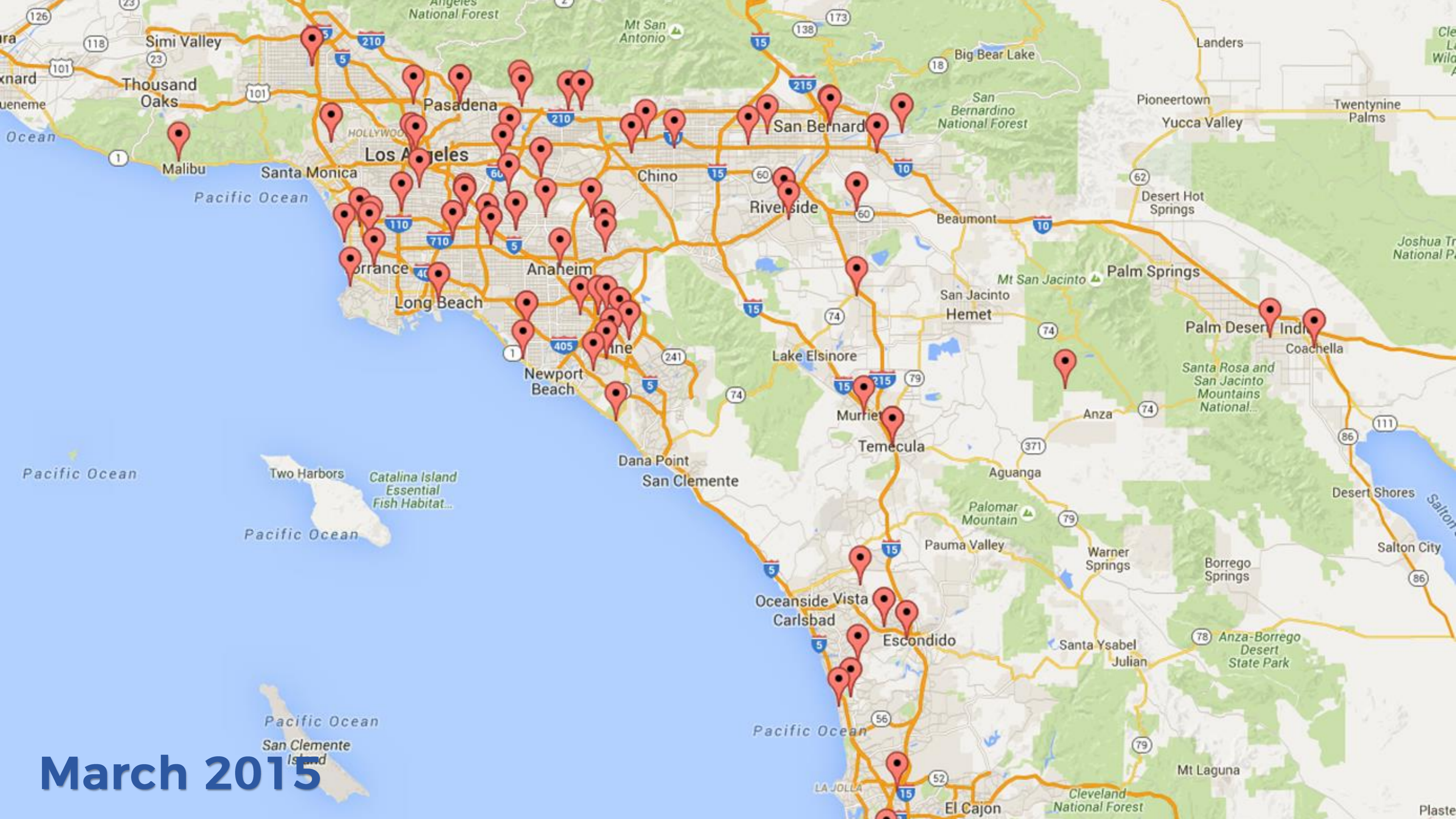
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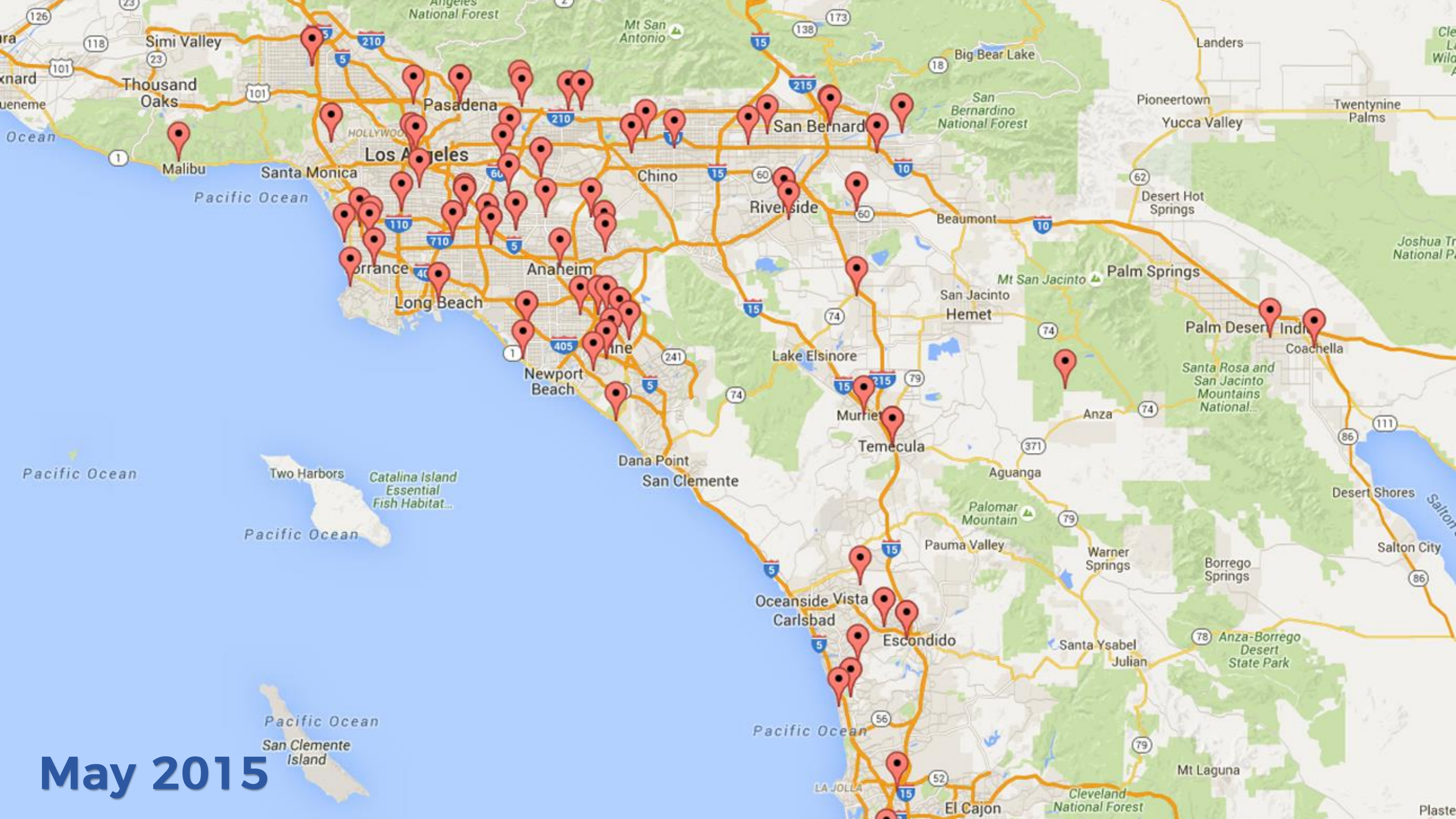
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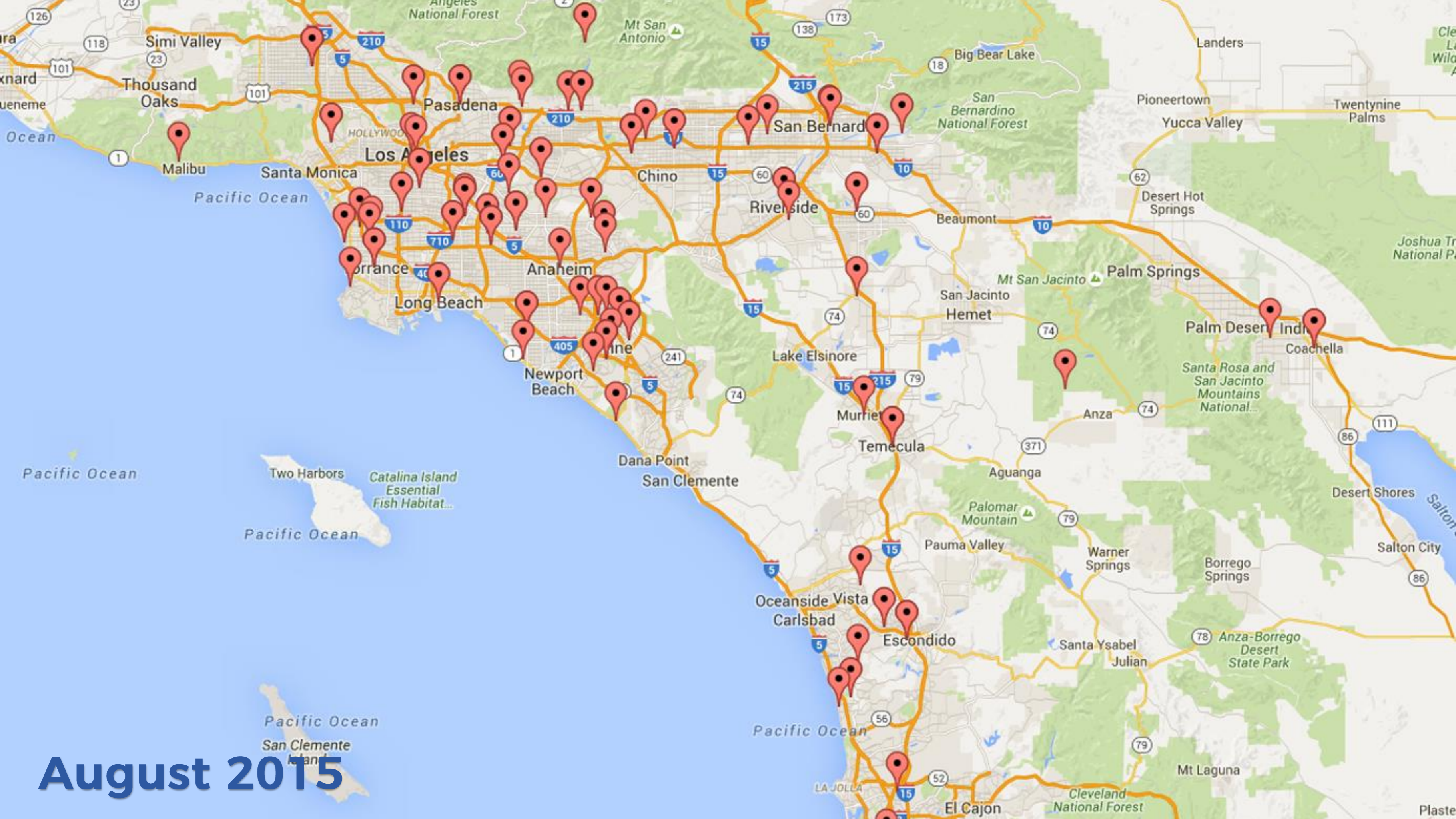
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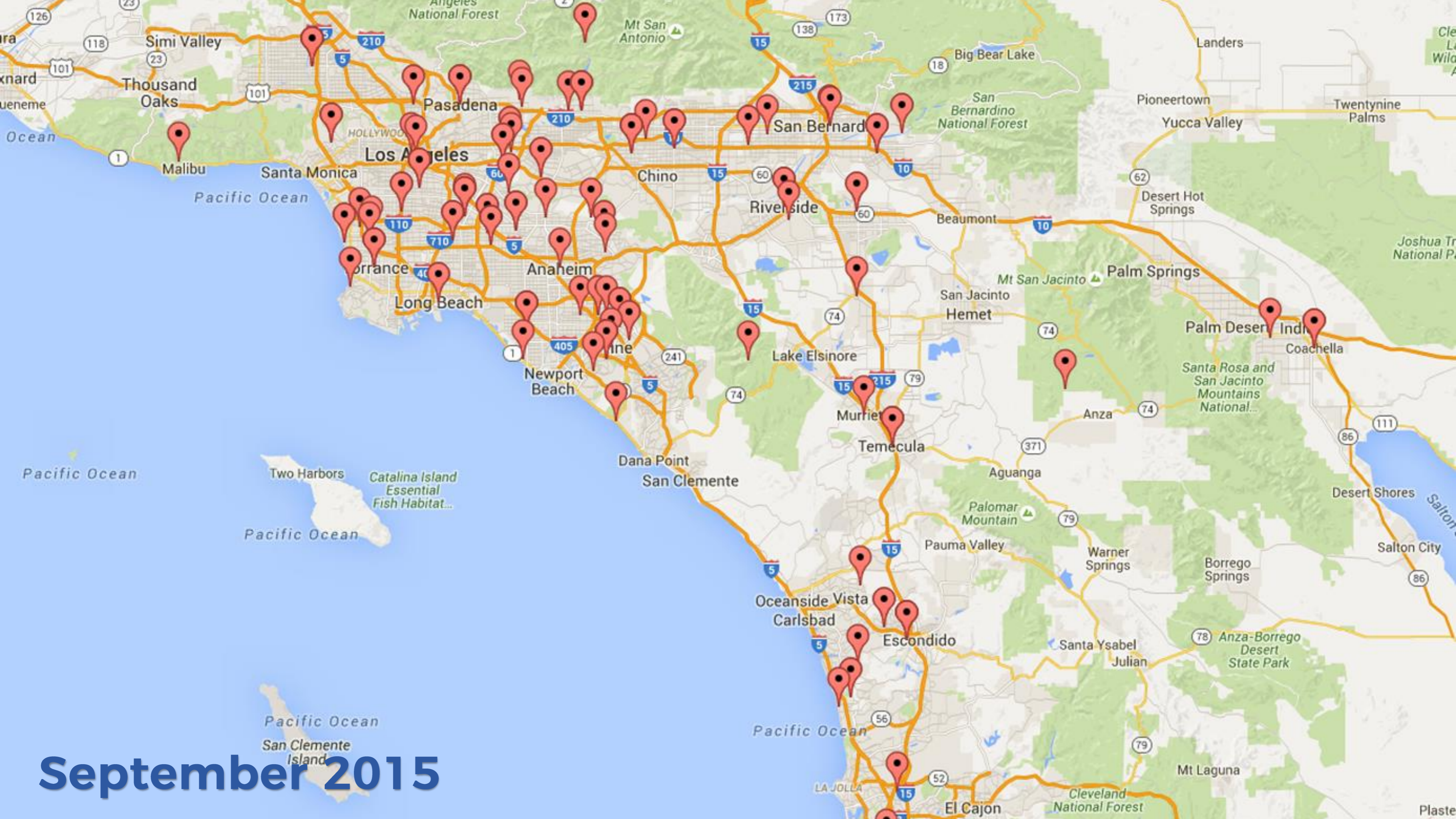
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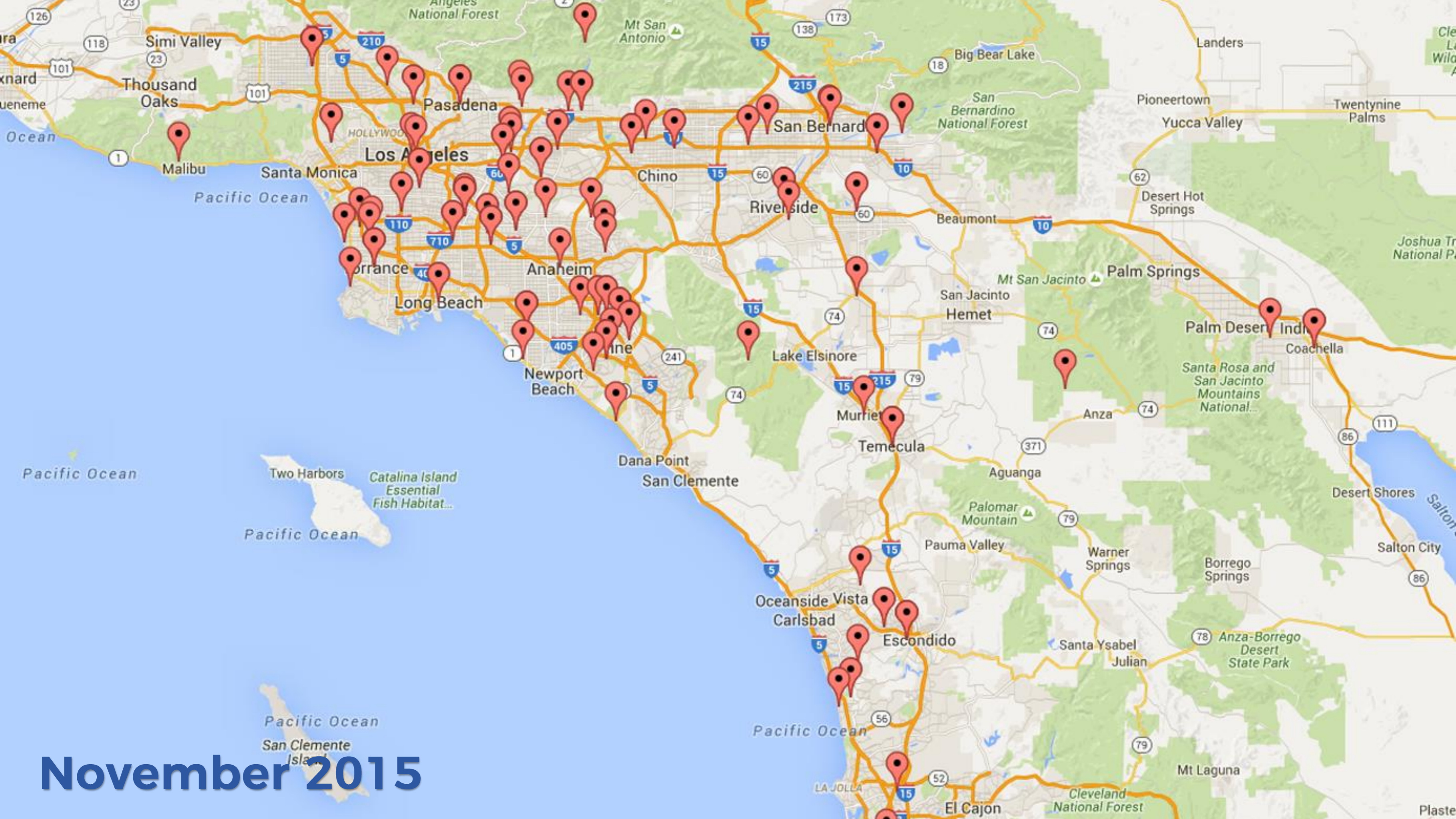
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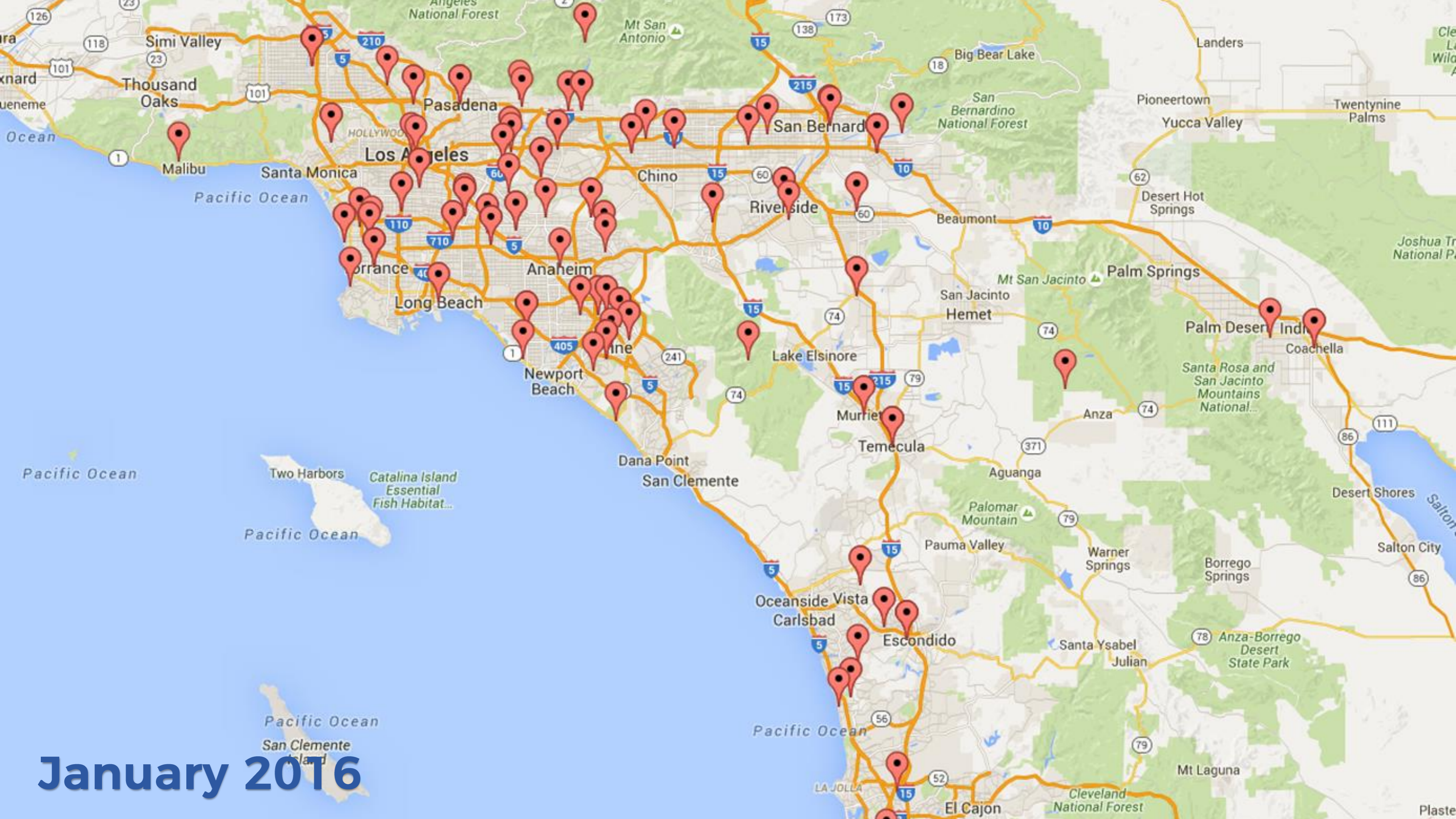
August 2015



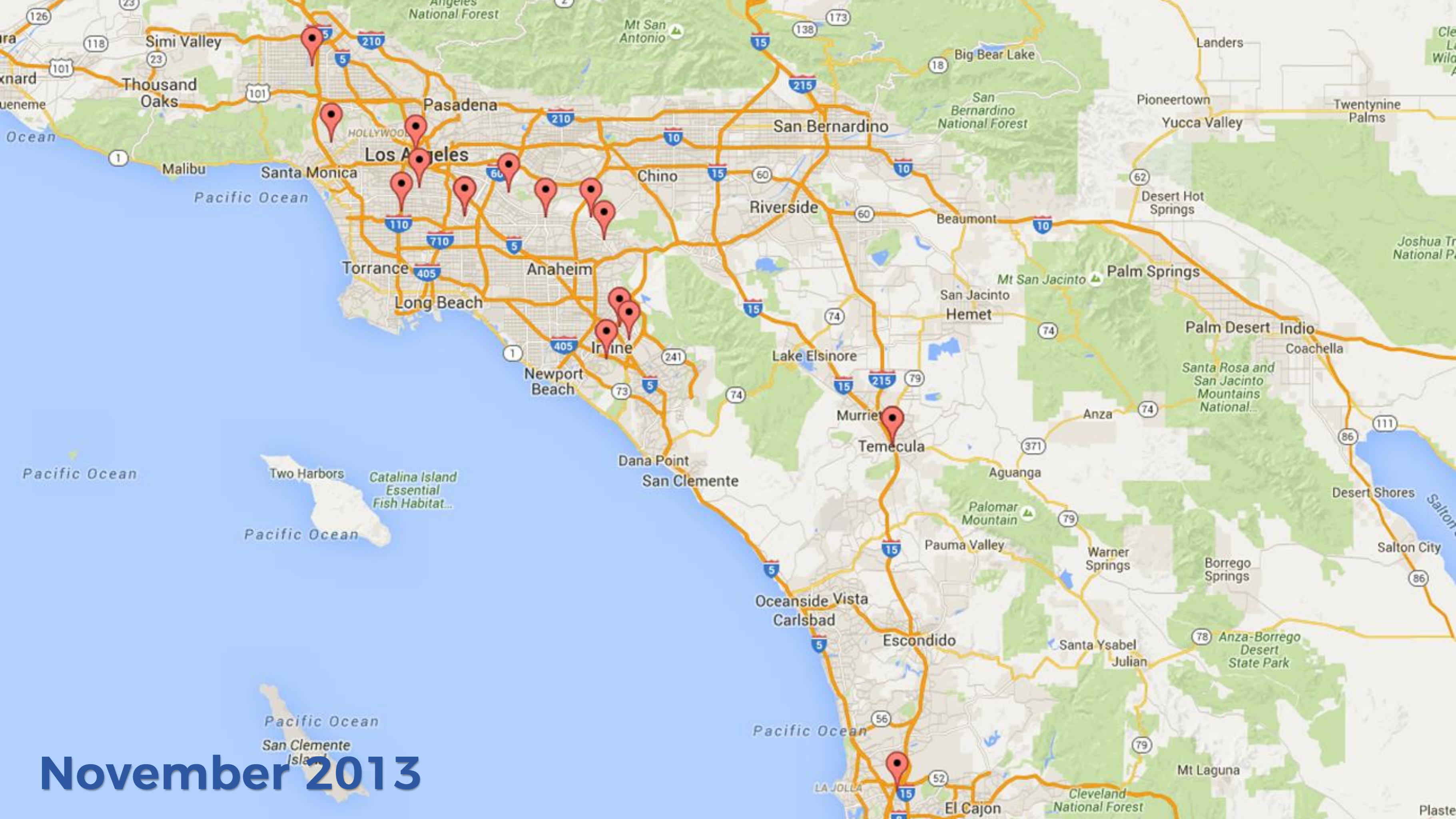
September 2015



November 2015



January 2016




November 2013

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graph TD; Spies --> Analysts; Analysts --> Model; Model --> Spies; Analysts --> Model;
```

Spies

Analysts

Model



All models are
wrong, but some
are useful.

GEORGE E. P. BOX



Classic Mix

20
Singles

LAY'S® Classic Potato Chips, DORITOS® Nacho Cheese Flavored Tortilla Chips, DORITOS® COOL RANCH® Flavored Tortilla Chips, CHEETOS® Crunchy Cheese Flavored Snacks, SUNCHIPS® Original Multigrain Snacks, FRITOS® Original Corn Chips (All 1 OZ. Each)

20 INDIVIDUAL BAGS: 1 OZ. EACH, TOTAL NET WT. 20 OZ. (1 LB. 4 OZ.) 567 g

⚠ WARNING: PREVENT ENTANGLEMENT AND STRANGULATION. KEEP THIS BAG AWAY FROM YOUNG CHILDREN. IT IS NOT A TOY.

```
graph TD; Spies --> Analysts; Analysts --> Model; Model --> Spies;
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Spies

Analysts

Model

THINKING TIME

EASY TO STORE.



Classic Mix **20**
Singles

4 LAY'S® Classic Potato Chips, 4 DORITOS® Nacho Cheese Flavored Tortilla Chips, 2 DORITOS® COOL RANCH® Flavored Tortilla Chips, 4 CHEETOS® Crunchy Cheese Flavored Snacks, 2 SUNCHIPS® Original Multigrain Snacks, 4 FRITOS® Original Corn Chips (All 1 OZ. Each)
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Robert Kaplinsky

@robertkaplinsky



Hey #MTBoS, can you do me a favor and complete this 3 question anonymous survey about your favorite chips? I need data for a presentation. Please RT.

goo.gl/forms/etPtujll... #iteachmath



Favorite Chips

Please complete this anonymous survey. I'll be using this data in a presentation.

docs.google.com

8:05 PM - 4 Feb 2018

63 Retweets **45** Likes



18

63

45





Favorite Chips (Responses)



File Edit View Insert Format Data Tools Form Add-ons Help

Comments

Share

100%
 \$ % .0 .00 123
Arial
10
B *I* ~~U~~ A

...

fx

Timestamp

	A	B	C	D	E	F	G	H
1	Timestamp	Lays (Classic)	Doritos (Nacho Cheese)	Doritos (Cool Ranch)	Cheetos (Crunchy)	Sun Chips (Original)	Fritos (Original)	Time Zone
2	2/4/2018 20:06:53	6	5	4	2	3	1	Central Time Zone
3	2/4/2018 20:06:55	1	5	6	3	2	4	Eastern Time Zone
4	2/4/2018 20:06:56	5	2	1	3	6	4	Central Time Zone
5	2/4/2018 20:06:57	2	1	6	3	5	4	Pacific Time Zone
6	2/4/2018 20:07:36	4	1	2	3	5	6	Pacific Time Zone
7	2/4/2018 20:08:02	5	1	6	4	2	3	Pacific Time Zone
8	2/4/2018 20:08:05	6	2	4	3	5	1	Pacific Time Zone
9	2/4/2018 20:08:07	4	2	1	5	3	6	Pacific Time Zone
10	2/4/2018 20:08:29	5	3	4	1	6	2	Central Time Zone
11	2/4/2018 20:08:56	4	5	6	1	2	3	Central Time Zone
12	2/4/2018 20:09:54	5	6	5	6	5	4	Pacific Time Zone
13	2/4/2018 20:10:01	4	2	3	1	5	6	Pacific Time Zone
14	2/4/2018 20:10:04	6	2	3	1	5	4	Central Time Zone
15	2/4/2018 20:10:04	3	5	6	1	4	2	Central Time Zone
16	2/4/2018 20:10:05	4	2	6	1	3	5	Eastern Time Zone
17	2/4/2018 20:10:06	3	2	6	5	1	2	Pacific Time Zone
18	2/4/2018 20:10:10	4	2	6	3	5	1	Mountain Time Zone
19	2/4/2018 20:10:12	3	1	5	6	2	4	Eastern Time Zone
20	2/4/2018 20:10:26	5	3	6	2	4	1	Pacific Time Zone

+ Sheet3

Explore

THINKING TIME

- The available data includes:
 - Lays, Nacho Cheese Doritos, Cool Ranch Doritos, Cheetos, Sun Chips, and Fritos ranked from 1 to 6
 - Geographic region: West, Central, or Eastern

ANALYSTS' JOB FOR THE TOP 1

1. **Count** all the first place votes for each chip type.
2. **Divide** the total first place votes for each chip type by the total number of votes.
3. **Multiply that fraction** by 20 to find how many bags there would be in a twenty pack, **rounding** as necessary.

ANALYSTS' EXAMPLE

ANALYSTS' JOB FOR THE TOP 4

1. **Count** all the first, second, third, and fourth place votes for each chip type.
2. **Multiply** the first place votes by four, the second place votes by three, the third place votes by two, and the fourth place votes by one.
3. **Add** the weighted votes for each chip type and **divide** by the total number of weighted votes.
4. **Divide** the weighted votes for each chip type by the total number of votes.
5. **Multiply that fraction** by 20 to find how many bags there would be in a twenty pack, **rounding** as necessary.

ANALYSTS' EXAMPLE

CHIP BAG RESULTS

GOALS

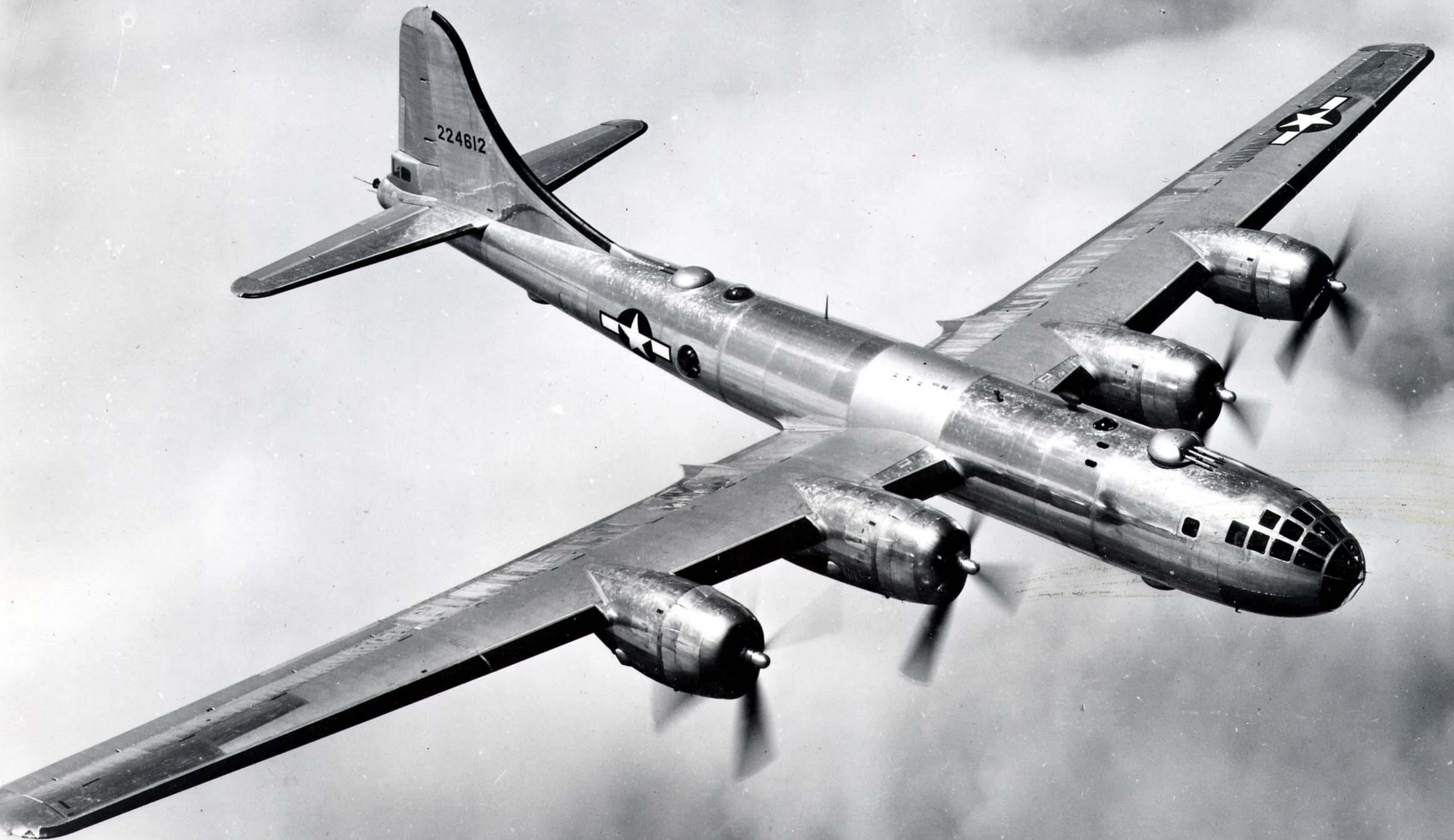
HOW DO WE MAKE SENSE OF MATH MODELING?

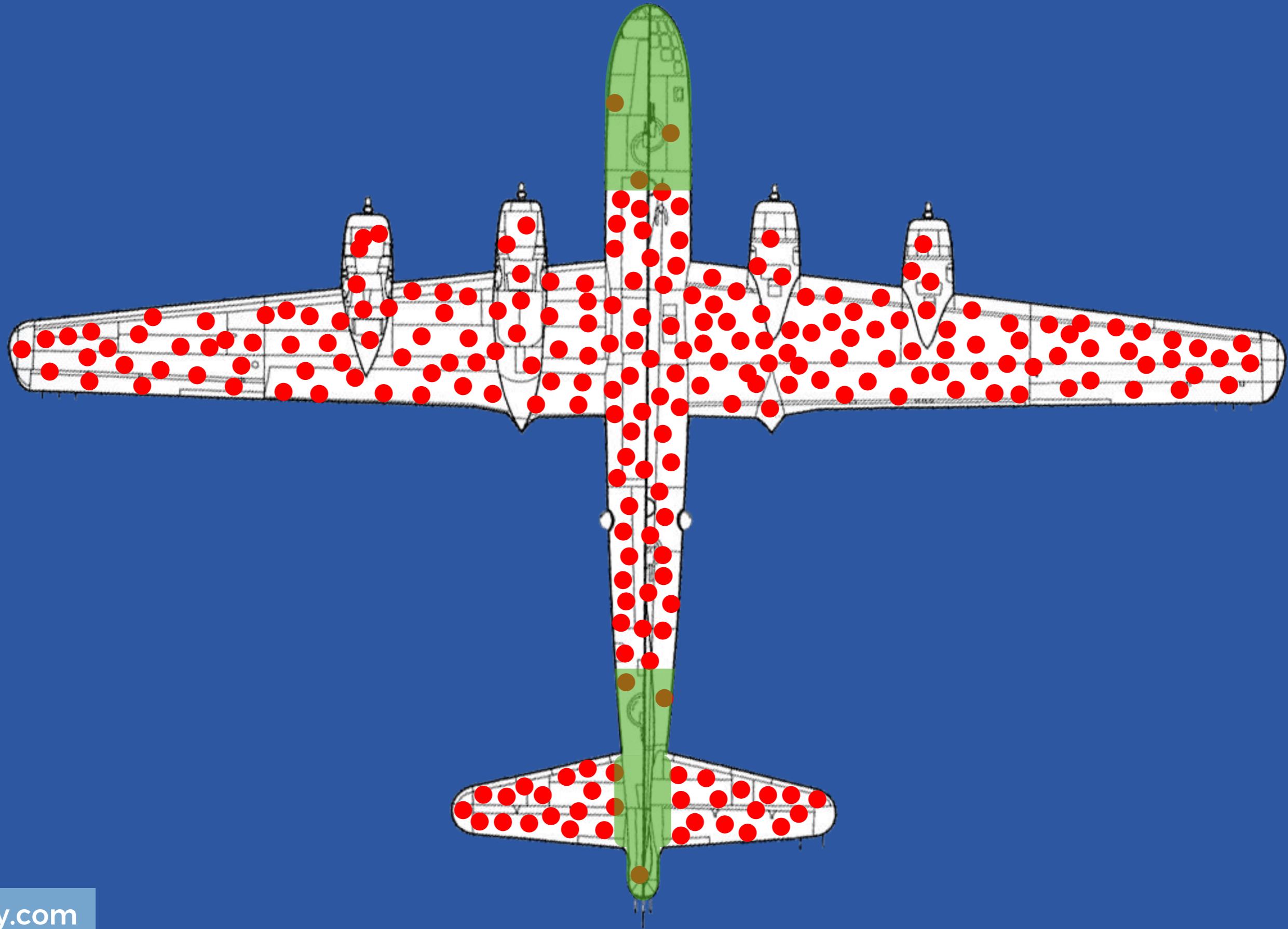
IS IT JUST ANSWERING QUESTIONS?

HOW DO YOU PROFIT FROM MATH MODELING?

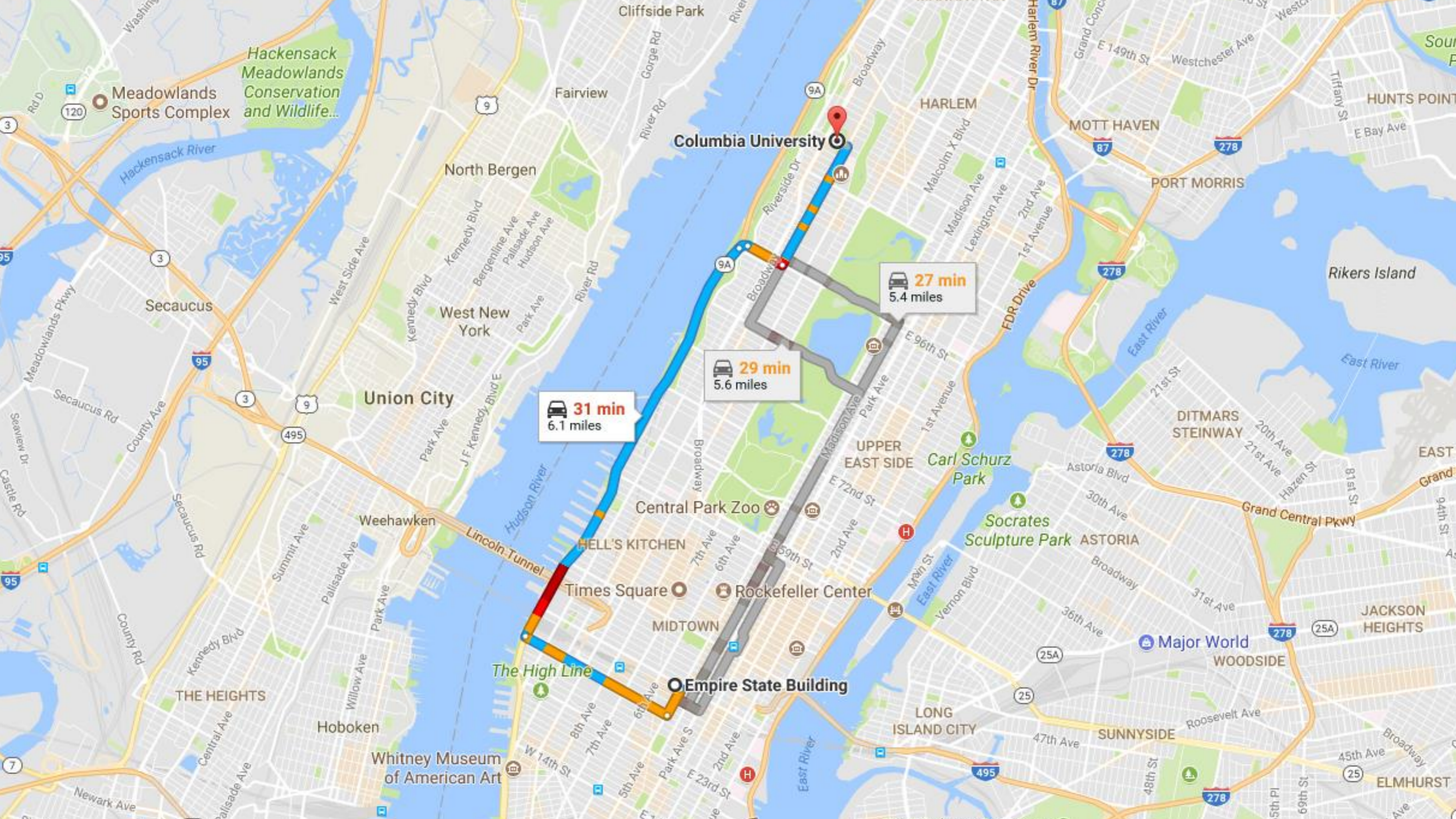
HOW DO WE HELP OUR STUDENTS IMPROVE?

WHERE CAN WE FIND MORE RESOURCES?





- ~~How do we protect our planes?~~
- ~~Which parts of the plane are being hit by the most bullets?~~
- Which parts of the plane are the most critical to protect?



Columbia University

Empire State Building

31 min
6.1 miles

29 min
5.6 miles

27 min
5.4 miles

- ~~How do we find the fastest route for each customer?~~
- How do we find the fastest route for each customer without impacting our other customers?



Classic Mix

20
Singles

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- ~~How many of each flavor should we put in a package?~~
- ~~How many of each flavor should we put in a package for each region?~~
- How can we determine if the extra cost of creating different packages will make us more money?

Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later.

CCSS MATH PRACTICE 4

They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

CCSS MATH PRACTICE 4

GOALS

HOW DO WE MAKE SENSE OF MATH MODELING?

IS IT JUST ANSWERING QUESTIONS?

HOW DO YOU PROFIT FROM MATH MODELING?

HOW DO WE HELP OUR STUDENTS IMPROVE?

WHERE CAN WE FIND MORE RESOURCES?



TARGET PARKING




```
graph TD; Spies --> Analysts; Analysts --> Model; Model --> Spies;
```

Spies

Analysts

Model



They used 25 products for a pregnancy prediction' score including:

- **unscented lotion**
- **mineral supplements**
- **cotton balls**

Source: New York Times

ANALYSTS' EXAMPLE

1. Add the number of bottles of unscented lotion, jars of mineral supplements, and bags of cotton balls.
2. Multiply that times the day of the week.
3. Click your heels twice.
4. Repeat the phrase "There's no place like home!"



UNITED



N4047

B G →

B →

← G A

A319
4047

```
graph TD; Spies --> Analysts; Analysts --> Model; Model --> Spies;
```

Spies

Analysts

Model

Priority is determined by:

- passenger's fare class
- itinerary
- frequent flyer program membership
- check-in time

Source: United Airlines



Search



Robert

Home



Robert Kaplinsky

News Feed

Messenger

Watch

Marketplace

Explore

Pages

Events

Groups

Friend Lists

On This Day 3

Insights

Games 7

Fundraisers

Live Video

Pokes

See More...

Create

Ad · Page · Group · Event · Fundraiser

Make Post | Photo/Video Album | Live Video

What's on your mind, Robert?

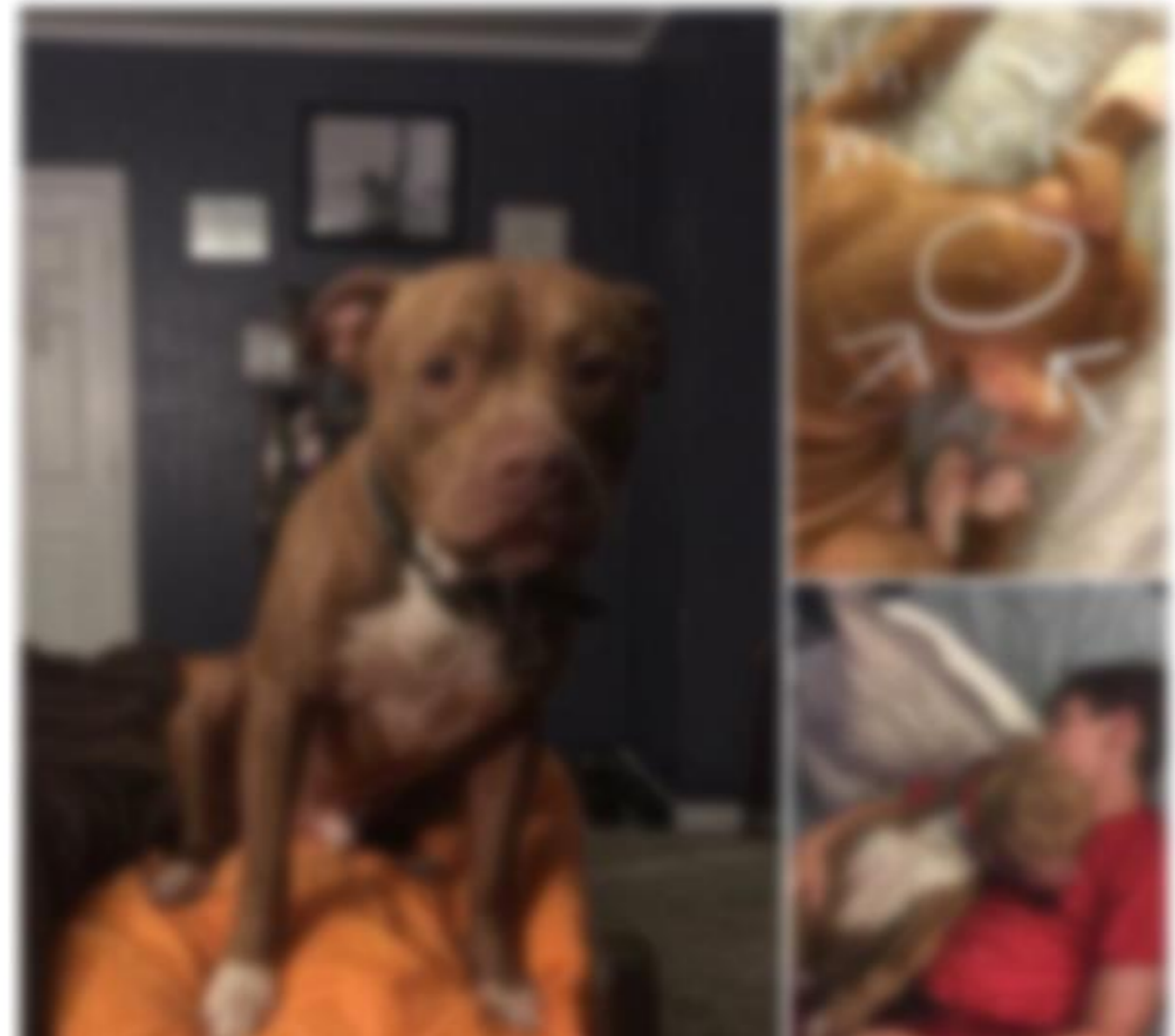
Photo/Video

Feeling/Activity

More options

Ad Schedule: Another Time...
7 views · 2h

Missing this boy gets back to his family



See better content

Trending

- James Madison: The Dissolution of James and Isabella's Personal Email Server
- Fredericksburg, Virginia: Mother recovering from copperhead snake bite at Virginia Tech
- Anthony Weiner: Anthony Weiner Sentenced to 21 Months in Prison

Watchlist: Latest Episodes

- Episode: The Making of a Legend
- Episode: The Making of a Legend
- Episode: The Making of a Legend

See All

Sponsored

Create Ad



```
graph TD; Spies --> Analysts; Analysts --> Model; Model --> Spies;
```

Spies

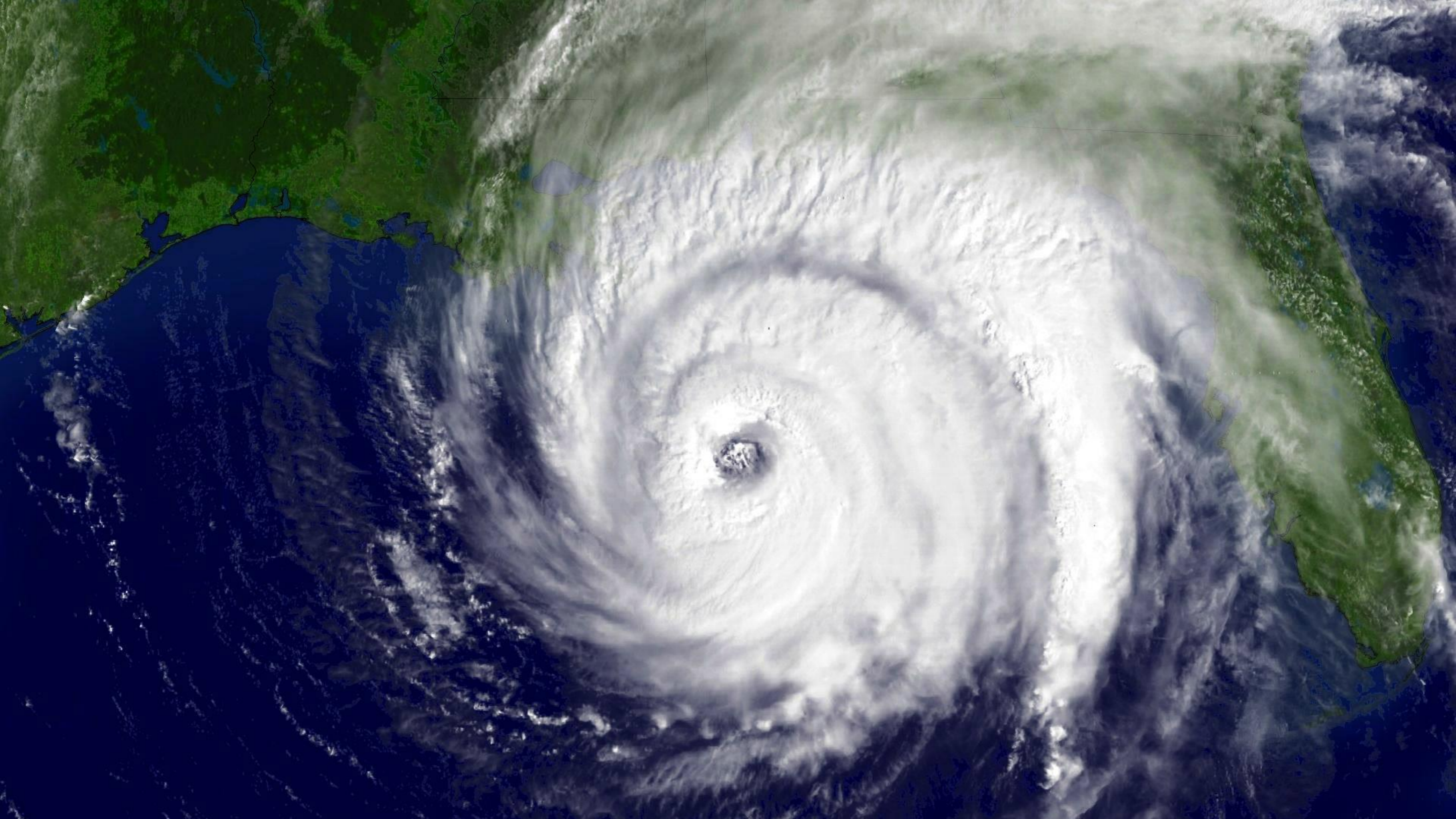
Analysts

Model

The stories that show in your News Feed are influenced by:

- friends you interact with the most
- the number of comments and likes a post receives
- what kind of story it is (ex: photo, video, status update)

Source: Facebook



Spies

Analysts

Model



WAFFLE HOUSE

WAFFLE HOUSE

The index has three levels:

- **Green:** full menu - restaurant has power and damage is limited.
- **Yellow:** limited menu - no power or only power from a generator, or food supplies may be low.
- **Red:** the restaurant is closed - indicating severe damage.

Source: Wikipedia

MORE EXAMPLES

- How does US News and World Reports rank colleges?
- How does Google know which results to show?
- How do sports teams know who to draft?
- How does SpaceX make boosters land standing up?
- How does Zillow estimate home prices?
- How does Pandora know what music to play?
- How did the BCS rank college football teams?
- How do they figure out who should speak at a conference?

GOALS

HOW DO WE MAKE SENSE OF MATH MODELING?

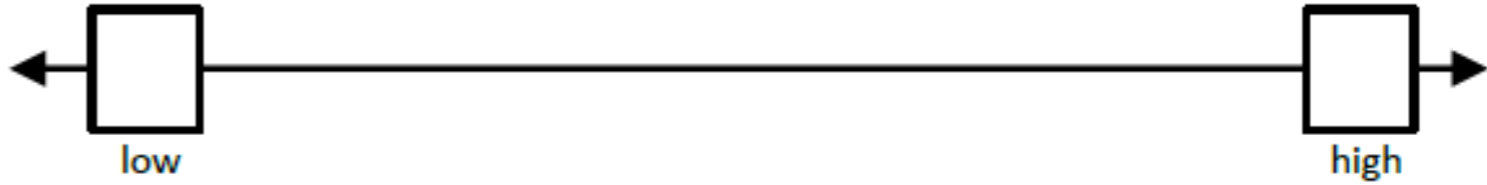
IS IT JUST ANSWERING QUESTIONS?

HOW DO YOU PROFIT FROM MATH MODELING?

HOW DO WE HELP OUR STUDENTS IMPROVE?

WHERE CAN WE FIND MORE RESOURCES?

Name: _____ Period: _____ Date: _____

What problem are you trying to figure out?	What estimates do you have?
	 <p>Place your estimate on the number line.</p>
What info do you already know about the problem?	What info do you need about the problem?
<p>TOP SECRET!</p>	<p>SPIES ONLY</p>
What is your conclusion? How did you reach that conclusion?	

Your work

DANGER

**ANALYSTS
AT WORK**

MODELING EXAMPLES

ELEMENTARY SCHOOL

MIDDLE SCHOOL

HIGH SCHOOL

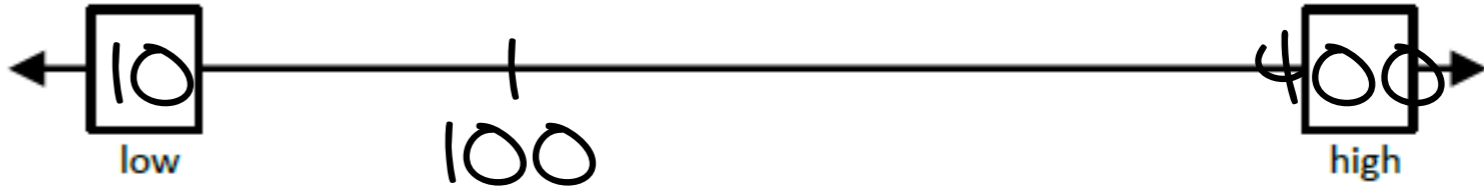


Spies

Analysts

Model

THINKING TIME

What problem are you trying to figure out?	What estimates do you have?
<p>How many beverage choices are there?</p>	 <p style="text-align: center;">Place your estimate on the number line.</p>
What info do you already know about the problem?	What info do you need about the problem?
<ul style="list-style-type: none"> • There are main flavors and added flavors. • Lemonade is yummy. 	<ul style="list-style-type: none"> • How many main flavors are there? • How many added flavors are there? • Can we mix them all together?
What is your conclusion? How did you reach that conclusion?	

COUNT ALL



1		8		16		24		27		32		40		46															
			no caffeine		no caffeine						no caffeine		no caffeine																
2		5		9		13		17		21		28		30		37		44		47		51							
3		6		10		14		18		22		25		29		31		33		38		42		45		48		52	
4		7		11		15		19		23			no caffeine			34		39		43		49		53					
				12				20		26		35		36						50									

low/no calories

54		62		69		76		84		92		95		103		111		117		125																	
					no caffeine		no caffeine		no caffeine		no caffeine		no caffeine		no caffeine		no caffeine																				
55		59		63		66		70		73		77		81		85		89		93		96		100		104		108		112		115		118		122	
56		60		64		67		71		74		78		82		86		90		94		97		101		105		109		113		116		119		123	
57		61		65		68		72		75		79		83		87		91				98		102		106		110		114		120		124			
58						80		88								99		107						121													

COUNT GROUPS



no caffeine



no caffeine



no caffeine



no caffeine



no caffeine



no caffeine



low/no calories



8



7



no caffeine



7



no caffeine



8



no caffeine



8



no caffeine



2



no caffeine



8



no caffeine



8



no caffeine



6



no caffeine



8



no caffeine

1

INVENTED STRATEGY



8

8

no caffeine

8

no caffeine

7

7

no caffeine

7

no caffeine

8

no caffeine

low/no calories

8

8

no caffeine

8

no caffeine

8

no caffeine

8

8

no caffeine

8

no caffeine

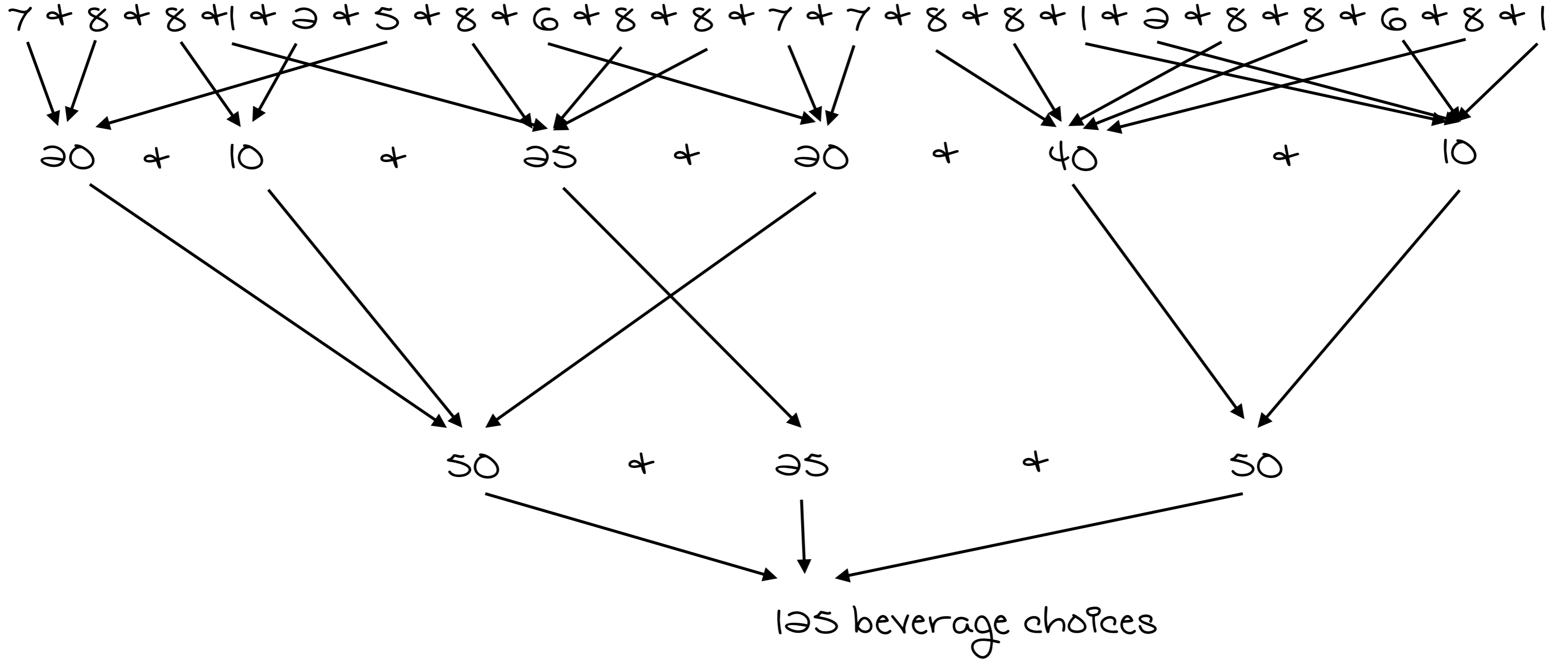
8

no caffeine

8

no caffeine

8



The main attraction for a busload of Dover fifth-graders was supposed to be the Museum of Fine Arts, but that all changed when they stopped by Kelly's Roast Beef and got a glimpse of their soda-drinking future.

At the entrance of Kelly's sat a sleek **Coca-Cola** Freestyle fountain crafted to resemble an old-fashioned vending machine, but with a twist: a touchscreen computer embedded in the machine gives customers **the option of 125 flavors**. You can quench your thirst with a Coke or a Sprite, or try something more exotic — Sprite with Grape or a Hi-C Orange Vanilla.

MODELING EXAMPLES

ELEMENTARY SCHOOL

MIDDLE SCHOOL

HIGH SCHOOL



IVE

FOX
NEWS

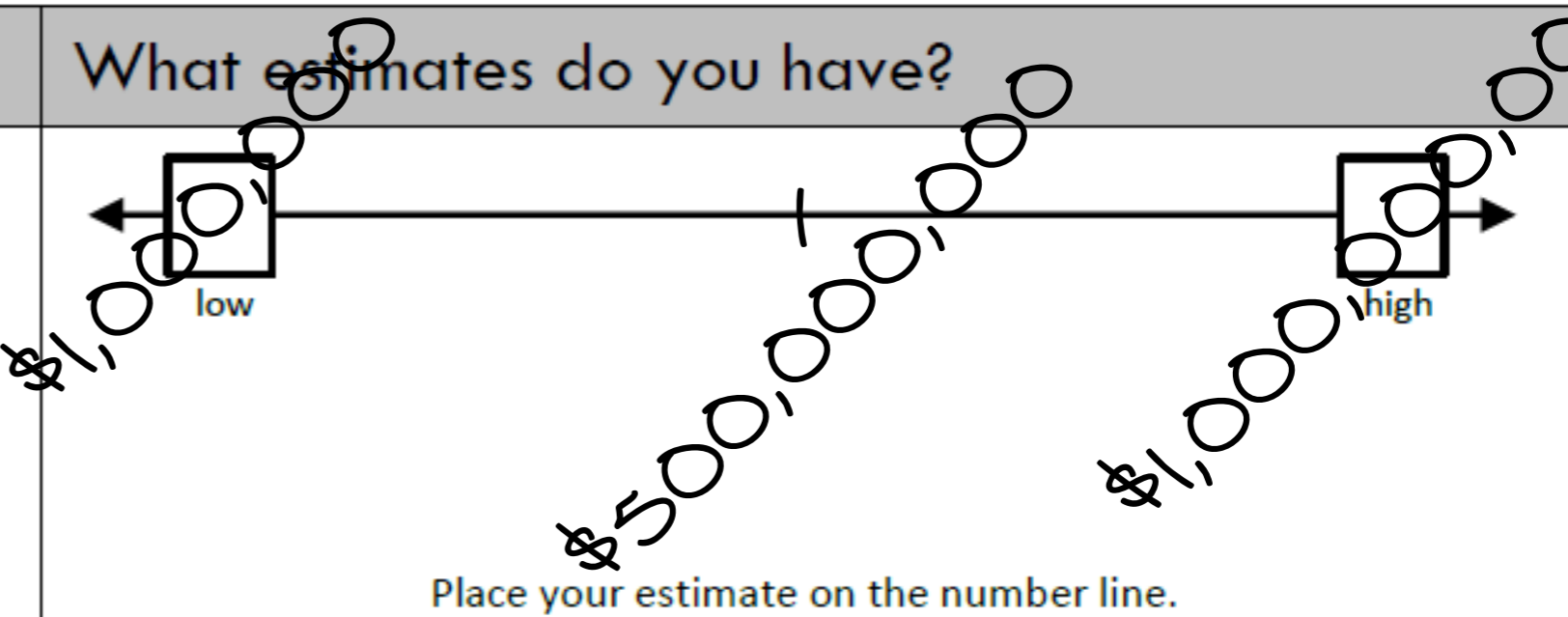
Junction

Spies

Analysts

Model

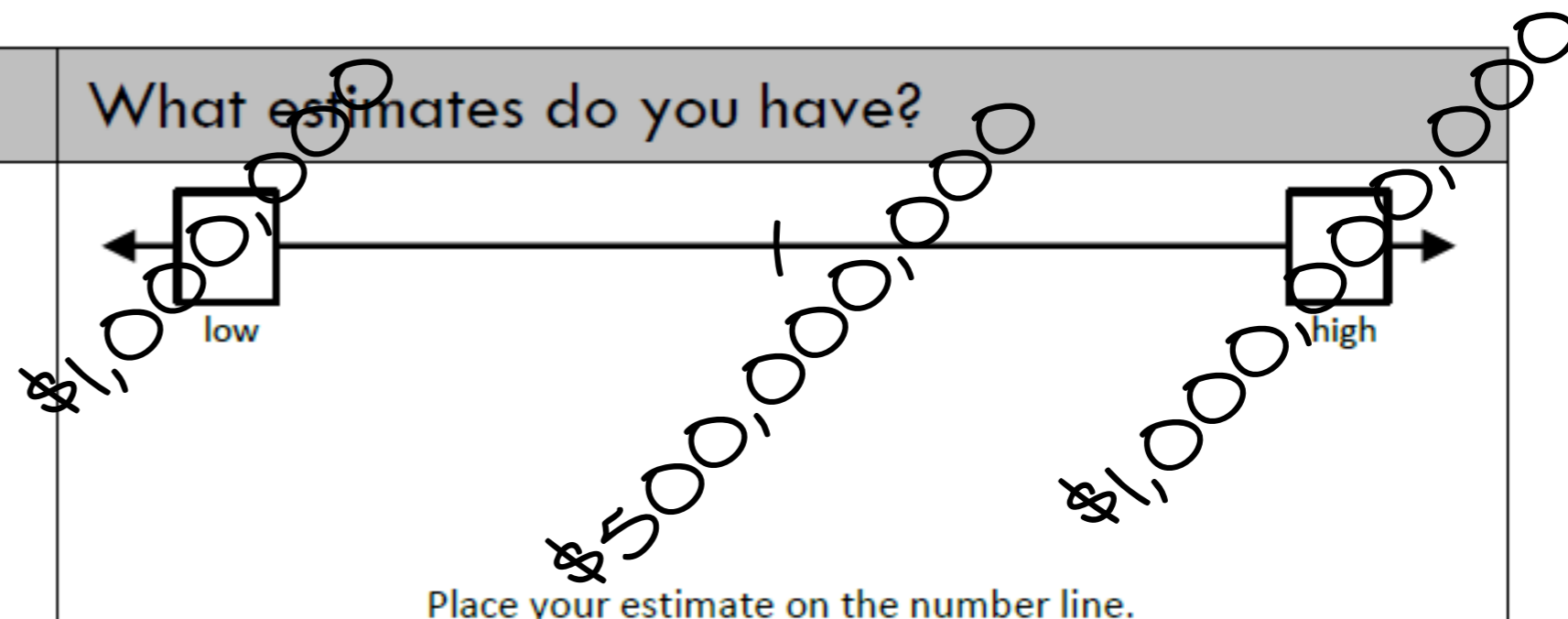
THINKING TIME

What problem are you trying to figure out?	What estimates do you have?
<p>How much money was that?</p>	 <p>Place your estimate on the number line.</p>
What info do you already know about the problem?	What info do you need about the problem?
<ul style="list-style-type: none"> • There is a lot of money. • It is in a pile. • It is in bundles. 	<ul style="list-style-type: none"> • Is it all the same denomination? • How much does one bill weigh? • How much does all the money weigh?
What is your conclusion? How did you reach that conclusion?	

What problem are you trying to figure out?

How much money was that?

What estimates do you have?



What info do you already know about the problem?

- There is a lot of money.
- It is in a pile.
- It is in bundles.

What info do you need about the problem?

- Is it all the same denomination?
- How many rows and columns are there?
- How many bills are in one stack?

What is your conclusion? How did you reach that conclusion?



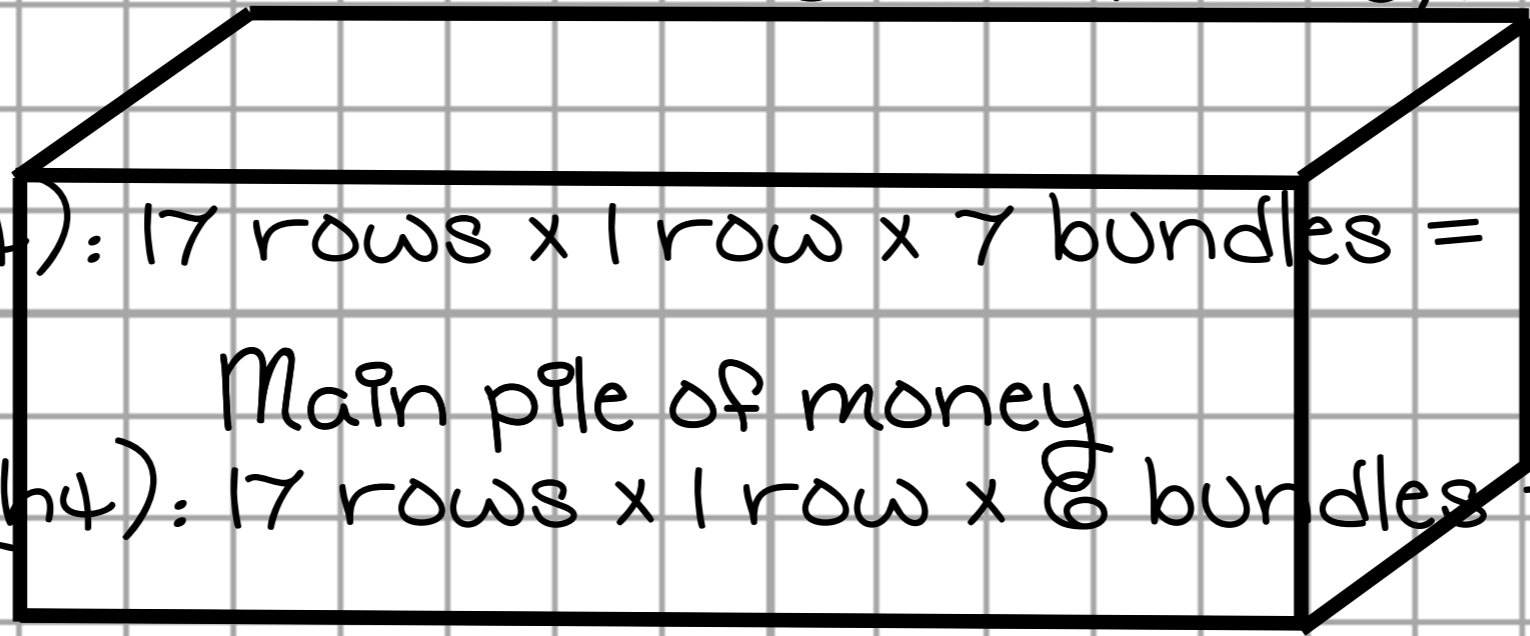


Your work

Main pile: 34 rows x 11 ~~rows~~ ~~bundles~~ = 3,740 bundles

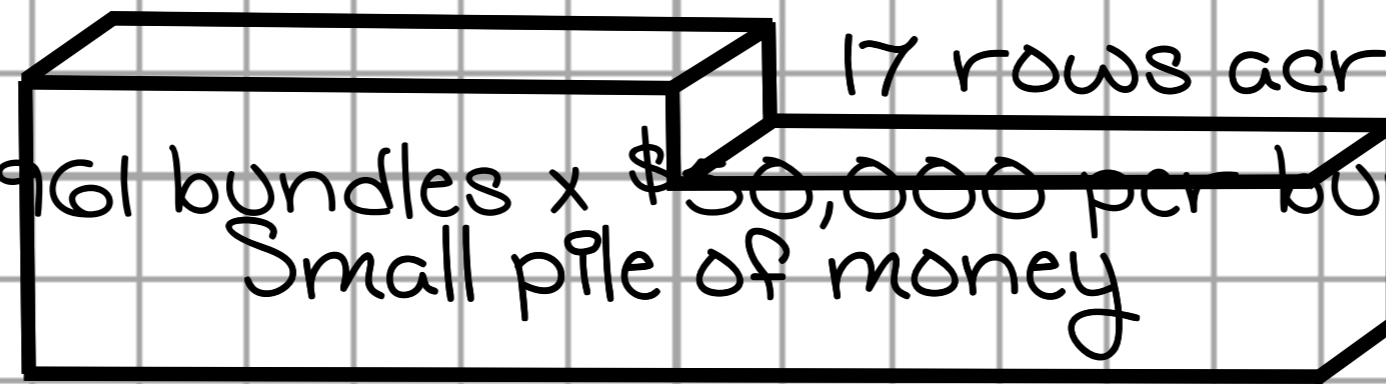
Small pile (left): 17 rows x 1 row x 7 bundles = 19 bundles
10 bundles

Small ^{high} pile (right): 17 rows x 1 row x 8 bundles = 102 bundles
11 rows deep



Total bundles: 3,740 + 19 + 102 = 3,961 bundles
17 rows across

Total money: 3,961 bundles x \$50,000 per bundle = \$198,050,000



8 bundles
high

7 bundles
high

FOX



50%

MODELING EXAMPLES

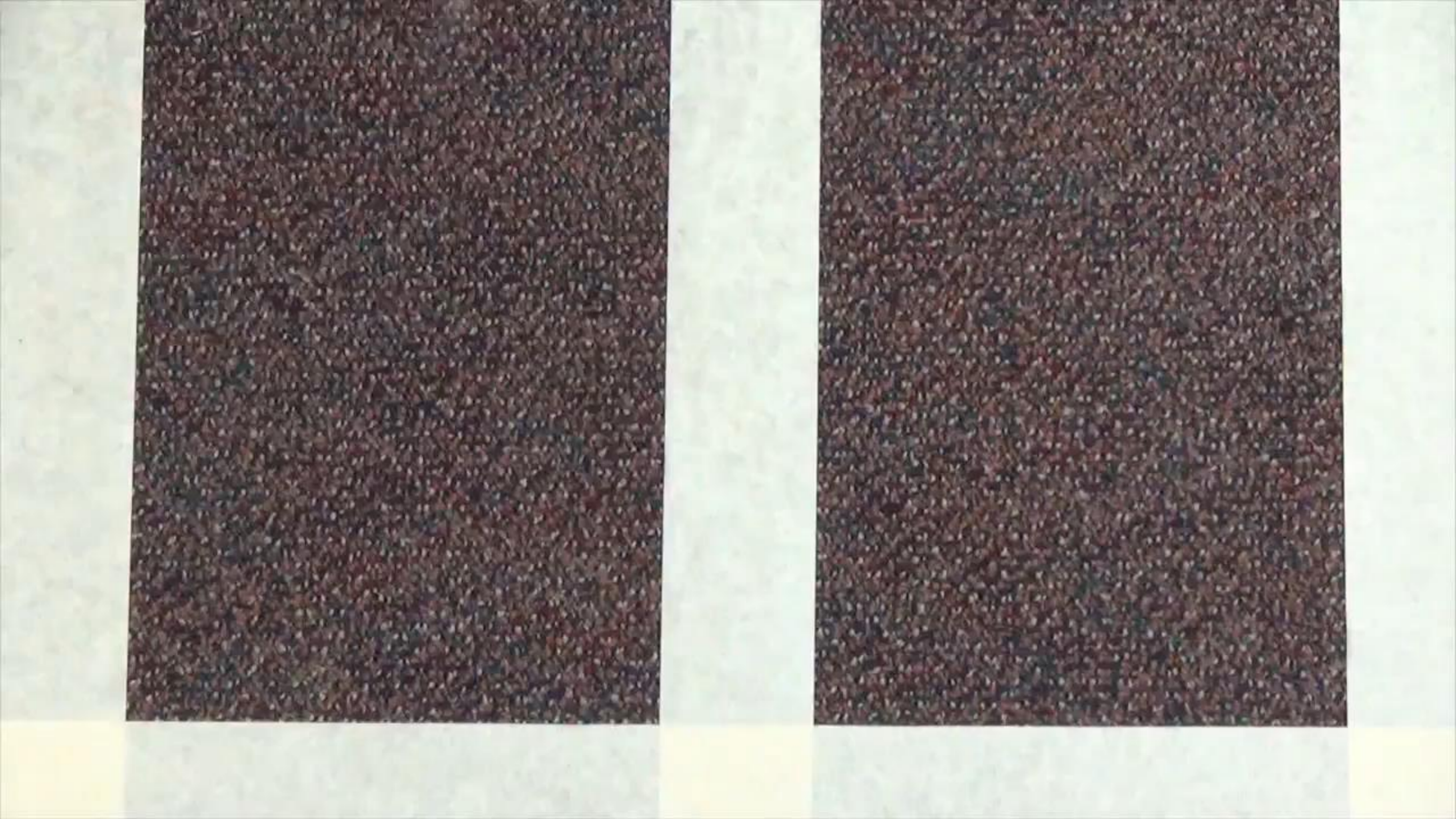
ELEMENTARY SCHOOL

MIDDLE SCHOOL

HIGH SCHOOL

NON-STAGGERED

STAGGERED

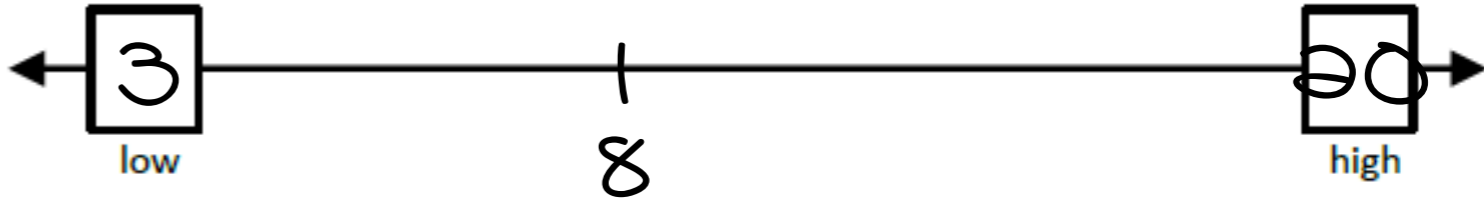


Spies

Analysts

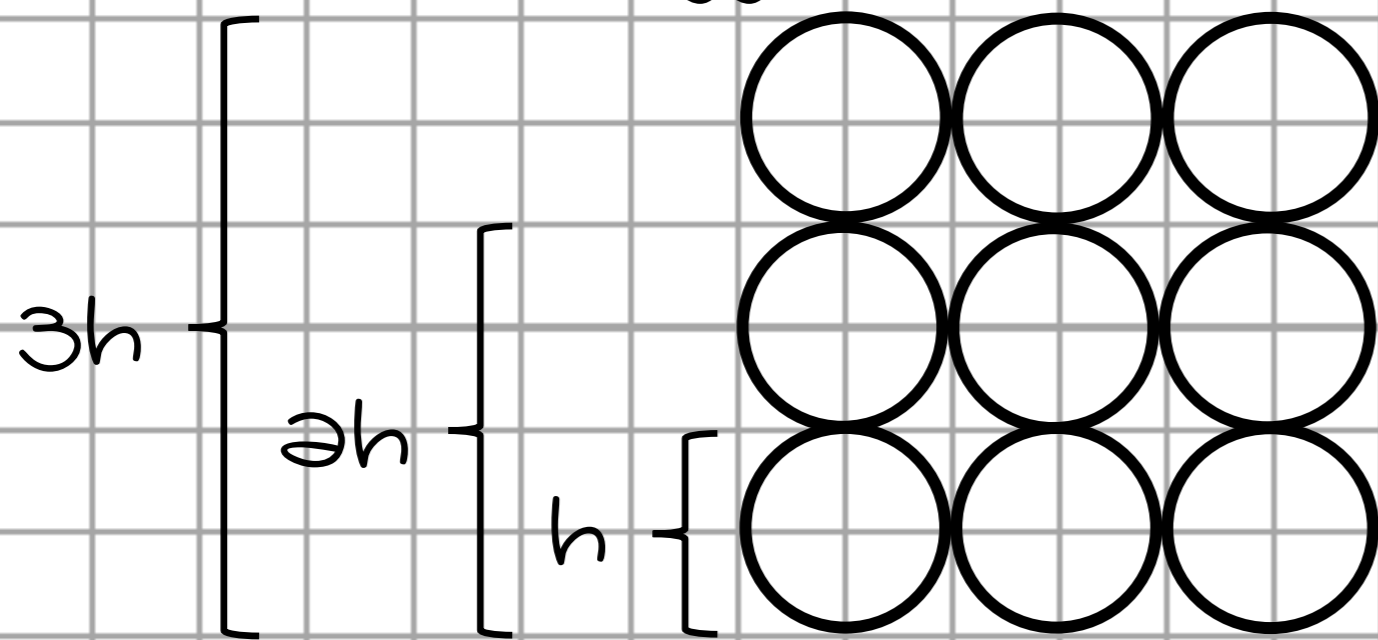
Model

THINKING TIME

What problem are you trying to figure out?	What estimates do you have?
<p>How much shorter are 20 layers of non-staggered pipes?</p>	 <p>(in inches)</p> <p>Place your estimate on the number line.</p>
What info do you already know about the problem?	What info do you need about the problem?
<ul style="list-style-type: none"> • One pile of pipes is staggered. • One pile of pipes is not staggered. • We have to compare 20 layers of each. 	<ul style="list-style-type: none"> • What are the dimensions of a pipe? • What units are we using to measure?
What is your conclusion? How did you reach that conclusion?	



Non-staggered pipes



1 pipe = h cm

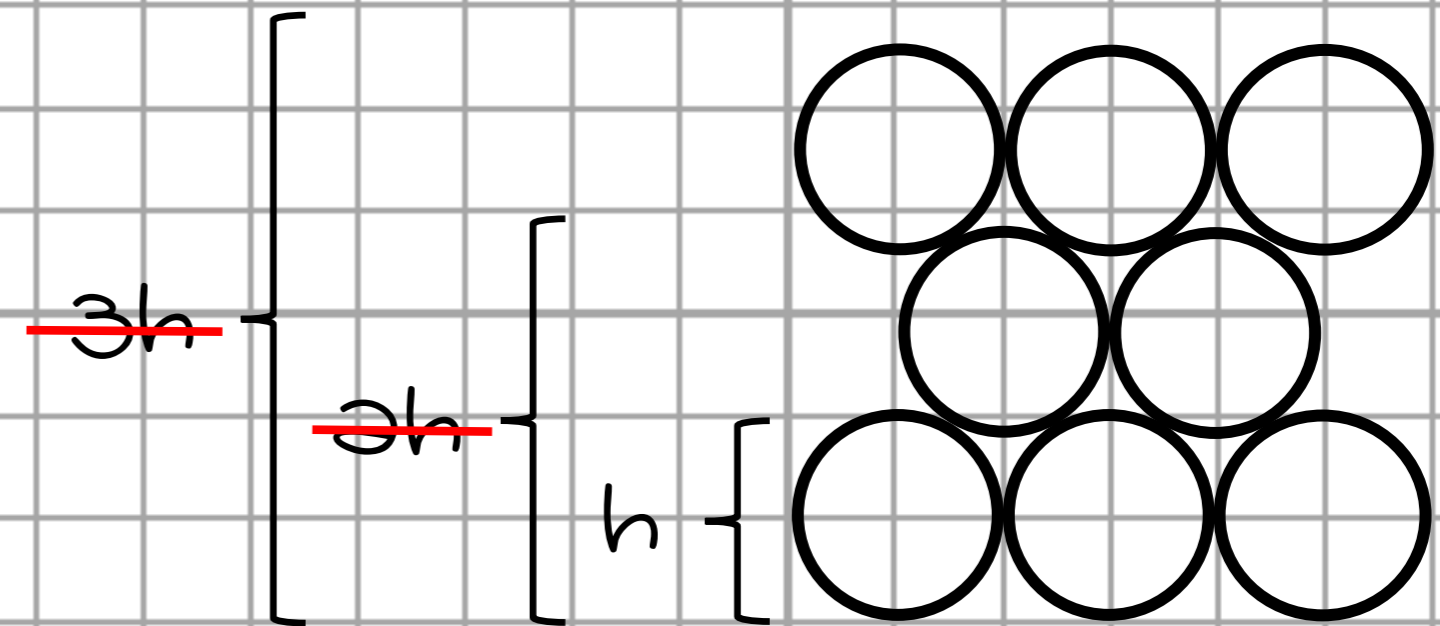
2 pipes = $2h$ cm

3 pipes = $3h$ cm

⋮

n pipes = nh cm

Staggered pipes



1 pipe = h cm

2 pipes = $2h$ cm

3 pipes = $2h$ cm

⋮

n pipes = $2h$ cm

MODELING EXAMPLES

ELEMENTARY SCHOOL

MIDDLE SCHOOL

HIGH SCHOOL

GOALS

HOW DO WE MAKE SENSE OF MATH MODELING?

IS IT JUST ANSWERING QUESTIONS?

HOW DO YOU PROFIT FROM MATH MODELING?

HOW DO WE HELP OUR STUDENTS IMPROVE?

WHERE CAN WE FIND MORE RESOURCES?

PBL RESOURCES

- Problem-based lesson search engine:
robertkaplinsky.com/prbl-search-engine
- My lessons (Elementary, Middle, and High School)
robertkaplinsky.com/lessons
- Dan Meyer (Middle and High School)
threeacts.mrmeyer.com
- Andrew Stadel (Elementary and Middle School)
www.estimated180.com/lessons.html
- Graham Fletcher (Elementary and Middle School)
gfletchy.com/3-act-lessons



Home



How Much Money IS That?!
(Volume of a rectangular prism)

Search

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Do you like the ideas you're reading? If so, you'll love having the best ones sent to you via email!

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First Name

How I Can Help You



Real World Problems

My workshops help teachers implement problem-based lessons by helping them experience them from both student and teacher perspective, leading to increase students' success with performance tasks and the Common Core State Standards.



Depth of Knowledge

Problems at higher depth of knowledge levels have the potential to challenge your most talented student yet remain accessible to everyone. I can help teachers develop best practices for implementing them so that students persevere longer towards finding the solution.

Lessons

- [View all](#)
- [Kinder](#)
- [1st](#)
- [2nd](#)
- [3rd](#)
- [4th](#)
- [5th](#)
- [6th](#)
- [7th](#)
- [8th](#)
- [Alg 1](#)
- [Geo](#)
- [Alg 2](#)



How Much Money Were Those Pennies?



How Can We #SaveNelly?



How Many Chip Bags Will There Be?



How Can We Make Stronger Passwords?

Search

Subscribe for Updates

Do you like the ideas you're reading? If so, you'll love having the best ones sent to you via email!

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If you live in the United States, enter your zip code and I'll use it to let you know about events near you.

First Name

Robert Kaplinsky's Problem-Based Lessons

File Edit View Insert Format Data Tools Add-ons Help All changes saved in Drive

\$ % .0_ .00 123 -
Arial
12
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A

	A	B	C	D	E	F	G	H	
1	Lesson	Concept / Skill	Standard 1	Standard 2	Standard 3	Standard 4	Standard 5	Standard 6	Standard 7
2	How Much Money Were Those Pennies?	Money, Multiplying Decimals, Proportions	4.MD.2	5.NBT.5	5.NBT.7	7.RP.3			
3	How Can We #SaveNelly?	Dividing Decimals	6.NS.3						
4	How Many Chip Bags Will There Be?	Ratio and Proportions, Population Sampling	6.RP.3	6.RP.3c	7.RP.2	7.RP.3	7.SP.1	7.SP.2	
5	How Can We Make Stronger Passwords?	Permutations, Combinations, Probability, Exponents, Exponential Growth	7.SP.8	8.EE.1	S-MD.7	S-CP.5	S-CP.9		
6	How Many Hot Dogs And Buns Should He Buy?	Least Common Multiple (LCM)	6.NS.4						
7	What Does 2000 Calories Look Like?	Unit Rates, Ratios, Solving Equations, and Solving Inequalities	6.EE.3	6.EE.4	6.EE.5	6.EE.6	6.EE.7	6.EE.8	6.RP.2
8	How Much Money Are The Coins Worth?	Decimal Operations and Coin Counting	2.MD.8	5.NBT.7	6.NS.3				
9	How Many Times Will A Case of Paper Jam?	Interpreting Percentages	6.RP.3c	7.RP.3					
10	How Many Soda Combinations Are There On A Coke Freestyle?	Counting, Composing, and Decomposing Numbers	K.CC.5	K.CC.6	K.OA.1	K.OA.2	K.OA.3	K.OA.4	K.NB.1
11	What Should The Freeway Sign Show?	Fractions on Number Lines, Converting Units, Decimal and Fraction Operations	3.NF.1	3.NF.2	3.NF.2a	3.NF.2b	3.NF.3	3.NF.3a	4.MD.1
12	How Fast Was The Fastest Motorcycle Speeding Ticket Ever?	Converting Units and Unit Rates	5.MD.1	6.RP.3d	7.RP.1	N.Q.1			
13	How Much Did Patrick Peterson Lose By Not Cashing His Check?	Compound and/or Simple Interest	7.RP.3	N-RN.2	A-SSE.1	A-SSE.3c	A-SSE.4	A-REI.11	F-IF.4
14	How Many Biscuits Can You Make?	Dividing Fractions and Mixed Numbers	5.NF.7	5.NF.7a	5.NF.7b	5.NF.7c	6.NS.1		
15	How Much Bigger Should They Make Zoolander's School?	Scale and Proportions	5.NF.5A	7.RP.2	7.G.1				
16	Where Is The Freeway Sign Located?	Identifying Fractions on a Number Line	3.NF.1	3.NF.2	3.NF.2a	3.NF.2b	3.NF.3	3.NF.3a	3.NF.3b
17	How Far Apart Are Exits On A Ring Road?	Arc length measures	G-C.5						
18	How Much Is One Third Of A Cup Of Butter?	Identifying Fractions on a Number Line	3.NF.1	3.NF.2	3.NF.2a	3.NF.2b	3.NF.3	3.NF.3a	3.NF.3b
19	How Do Skytypers Write Messages?	Transformations (Rotations, Reflections, Dilations, and Translations)	8.G.1	8.G.2	8.G.3	8.G.4	G-CO.2	G-CO.3	G-CO.4
20	How Big Is The Bermuda Triangle?	Coordinate Geometry: Area of Triangle	G-GPE.7						
21	What Fraction Of Children Are In The Right Car Seat?	Representing and Comparing Fractions	3.NF.1	3.NF.2	3.NF.3	4.NF.1	4.NF.2		
22	How Much Did The Temperature Drop?	Absolute Value	6.NS.7c	7.NS.1c					
23	How Much Shorter Are Staggered Pipe Stacks?	Circles, Pythagorean Theorem, trigonometric ratios, and linear functions	8.G.7	A-CED.1	A-CED.3	A-CED.4	A-SSE.1a	A-SSE.1b	A-SSE.1c
24	How Do You Write A Check To Pay For Something?	Expanded Form	2.NBT.3	4.NBT.2	5.NBT.3a				
25	How Can We Correct The Scarecrow?	Pythagorean Theorem	8.G.6	G-SRT.4					
26	How Much Does A 100x100 In-N-Out Cheeseburger Cost?	Building and Interpreting Linear Functions	8.F.1	8.F.3	8.F.4	8.F.5	F-IF.4	F-IF.5	F-IF.6
27	How Can We Water All Of The Grass?	Circles, Pythagorean Theorem, trigonometric ratios	7.G.4	8.G.7	G-SRT.8	G-MG.1	G-MG.3		
28	How Much Money IS That?!	Volume of rectangular prism	5.MD.3	5.MD.4	5.MD.5	5.MD.5b	5.MD.5c	6.G.2	7.G.6
29	How Much Money Should Dr. Evil Demand?	Exponential Growth	N-RN.2	A-SSE.1	A-SSE.3c	A-SSE.4	A-REI.11	F-IF.4	F-IF.7
30	How Tall Is Mini-Me?	Scale and Dividing Decimals	5.NF.5	5.NF.5a	5.NF.5b	6.NS.3			
31	How Did They Make Ms. Pac-Man?	Transformations (Rotations, Reflections, and Translations)	8.G.1	8.G.2	8.G.3	8.G.4	G-SRT.2	G-CO.4	G-CO.5
32	Which Ticket Option Is The Best Deal?	Unit Rates and Ratios	6.RP.2	6.RP.3	6.RP.3a	6.RP.3b			
33	How Far Apart Are The Freeway Exits?	Fractions on a Number Line and Subtracting Fractions	3.NF.2	3.NF.2b	4.NF.2	4.NF.3a	4.NF.3c	4.NF.3d	5.NF.1
34	Do We Have Enough Paint?	Area	3.MD.5	3.MD.6	3.MD.7				

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Real-World Link



Common Core
State Standards

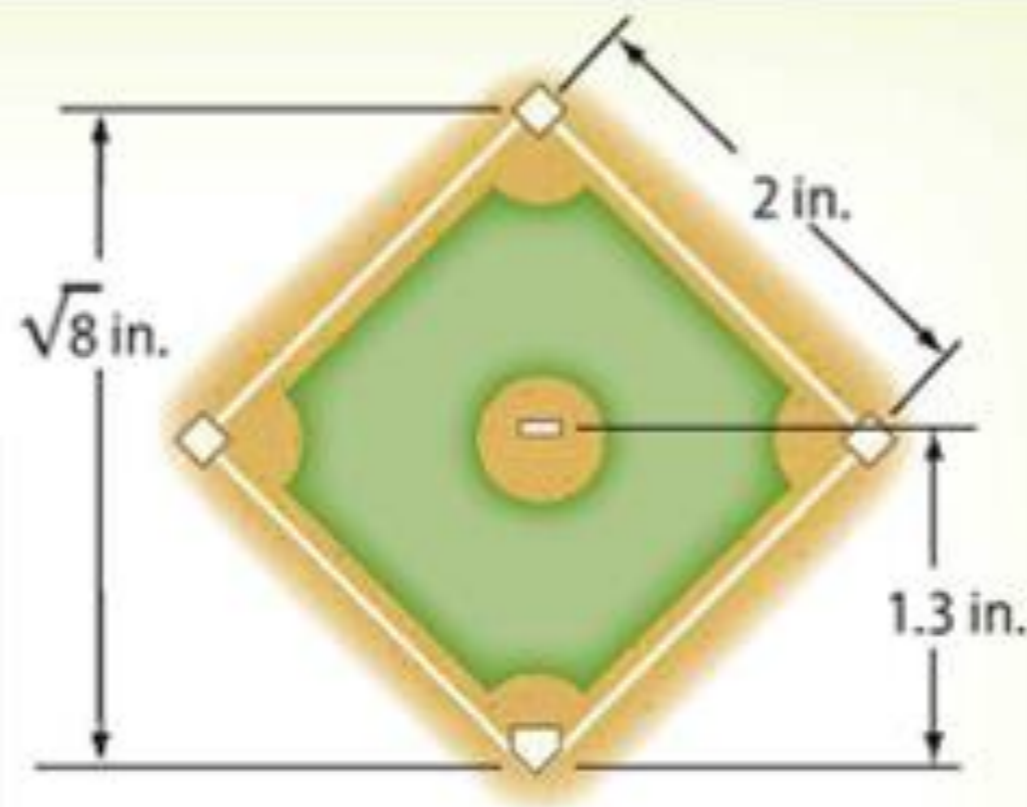
Content Standards

8.NS.1, 8.NS.2, 8.EE.2

Mathematical Practices

1, 3, 4, 6

Sports Major League baseball has rules for the dimensions of the baseball diamond. A model of the diamond is shown.



1. On the model, the distance from the pitching mound to home plate is 1.3 inches. Is 1.3 a rational number? Explain.

2. On the model, the distance from first base to second base is 2 inches. Is 2 a rational number? Explain.

3. The distance from home plate to second base is $\sqrt{8}$ inches. Using a calculator, find $\sqrt{8}$. Does it appear to terminate or repeat?





Real-World Link



Common Core State Standards

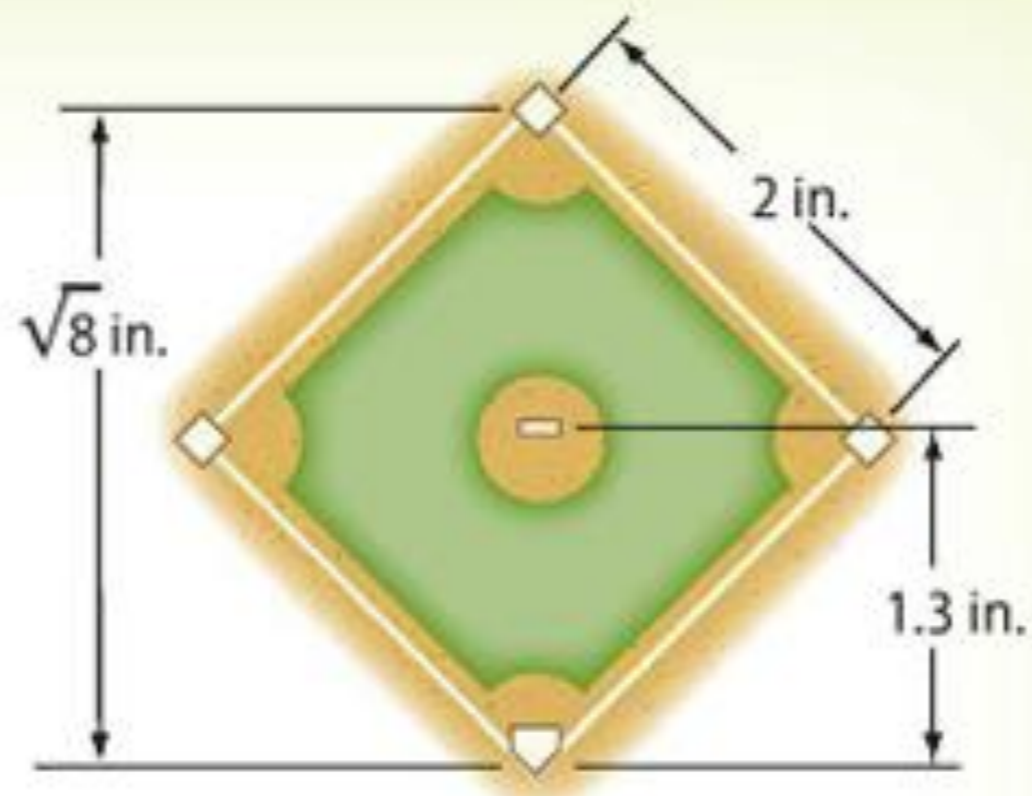
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Scary & Dangerous



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