

OPEN MIDDLE & SPIES AND ANALYSTS

ROBERT KAPLINSKY

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WANT THE RESOURCES?

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HMHWEBINAR

To 44222

GOALS

☐ WHY DO WE NEED OPEN MIDDLE?

☐ HOW ARE THEY DIFFERENT?

☐ WHERE CAN I GET MORE?

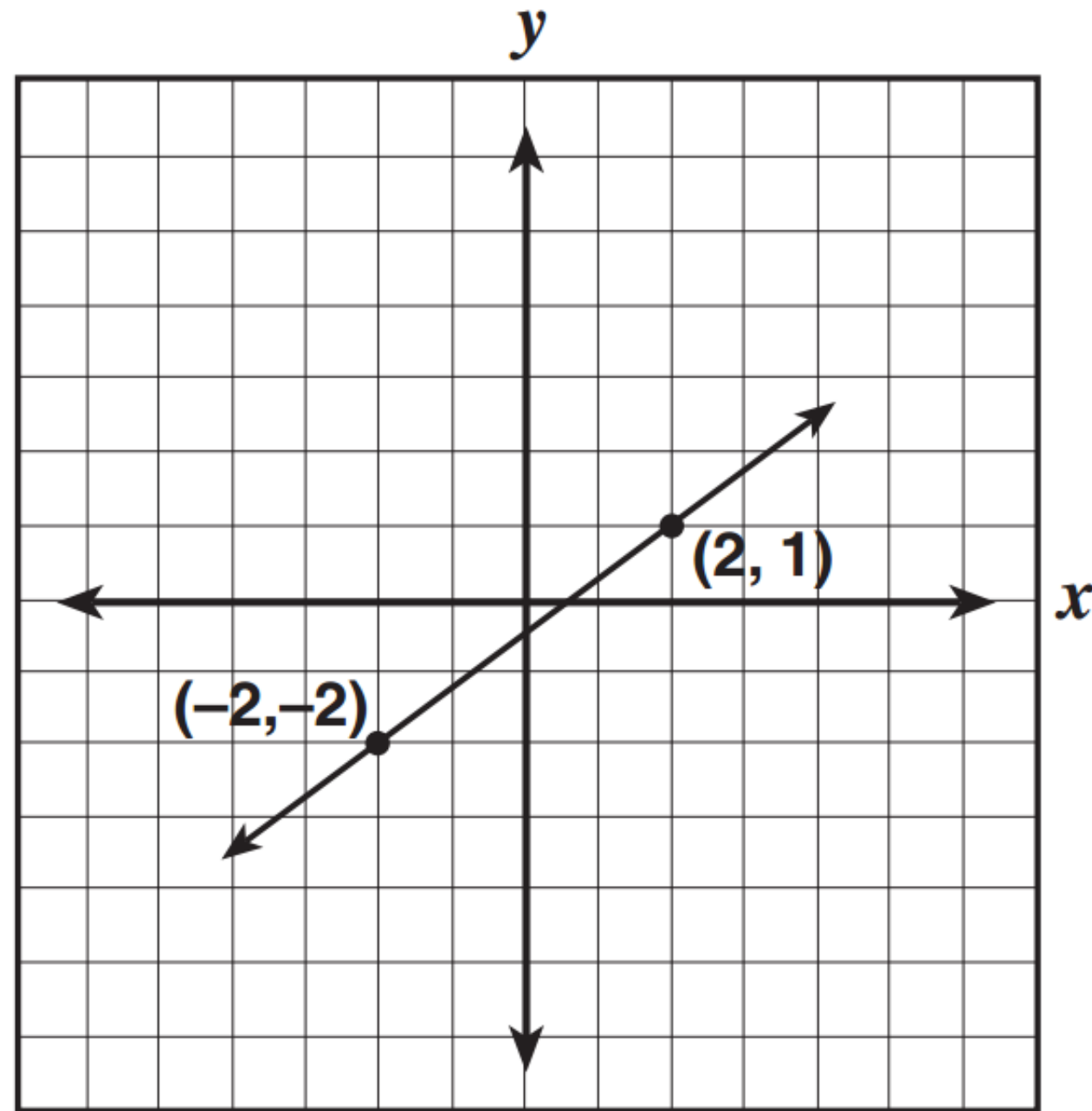
☐ HOW CAN SPIES AND ANALYSTS HELP ME?

☐ WHAT DOES IT LOOK LIKE IN ACTION?

Student NameID Number		Perf. Level	Scaled Score	Mathematics Clusters											
				(Clusters where the percent correct is shown in bold represent proficiency for that cluster.)											
				Rational numbers		Exponents, powers, and roots		Quantitative relationships and evaluating expressions		Multi-step problems, graphing, and functions		Measurement and geometry		Statistics, data analysis, and probability	
Student Name	ID Number	Perf. Level	Scaled Score	Number Correct	Percent Correct	Number Correct	Percent Correct	Number Correct	Percent Correct	Number Correct	Percent Correct	Number Correct	Percent Correct	Number Correct	Percent Correct
ALAN, ALAN	111111	ADV	476	13	93%	8	100%	8	80%	14	93%	12	92%	5	100%
ALAN, ALAN A	111111	ADV	464	13	93%	7	88%	8	80%	15	100%	11	85%	5	100%
ALAN, ALAN	111111	ADV	453	10	71%	8	100%	10	100%	14	93%	11	85%	5	100%
ALAN, ALAN	111111	ADV	453	13	93%	8	100%	9	90%	12	80%	11	85%	5	100%
ALAN, ALAN	111111	ADV	444	14	100%	7	88%	8	80%	13	87%	10	77%	5	100%
ALAN, ALAN	111111	ADV	444	12	86%	8	100%	8	80%	15	100%	10	77%	4	80%
ALAN, ALAN	111111	ADV	444	13	93%	8	100%	8	80%	14	93%	9	69%	5	100%
ALAN, ALAN	111111	ADV	435	12	86%	6	75%	9	90%	14	93%	10	77%	5	100%
ALAN, ALAN	111111	ADV	435	12	86%	6	75%	8	80%	14	93%	11	85%	5	100%
ALAN, ALAN	111111	ADV	435	13	93%	7	88%	9	90%	12	80%	10	77%	5	100%
ALAN, ALAN	111111	ADV	427	13	93%	6	75%	9	90%	12	80%	10	77%	5	100%
ALAN, ALAN	111111	ADV	427	13	93%	7	88%	6	60%	13	87%	11	85%	5	100%
ALAN, ALAN	111111	ADV	427	14	100%	5	63%	7	70%	14	93%	10	77%	5	100%
ALAN, ALAN	111111	ADV	421	13	93%	6	75%	6	60%	14	93%	10	77%	5	100%
ALAN, ALAN	111111	ADV	421	11	79%	5	63%	9	90%	13	87%	11	85%	5	100%
ALAN, ALAN	111111	ADV	414	12	86%	6	75%	8	80%	11	73%	11	85%	5	100%
ALAN, ALAN	111111	ADV	414	12	86%	8	100%	8	80%	13	87%	8	62%	4	80%
ALAN, ALAN	111111	PRO	408	11	79%	6	75%	9	90%	11	73%	10	77%	5	100%
ALAN, ALAN	111111	PRO	402	12	86%	8	100%	9	90%	8	53%	11	85%	3	60%
ALAN, ALAN	111111	PRO	402	8	57%	7	88%	8	80%	13	87%	10	77%	5	100%
ALAN, ALAN	111111	PRO	402	13	93%	6	75%	7	70%	13	87%	8	62%	4	80%
ALAN, ALAN	111111	PRO	402	11	79%	5	63%	7	70%	11	73%	12	92%	5	100%
ALAN, ALAN	111111	PRO	402	13	93%	7	88%	9	90%	10	67%	7	54%	5	100%
ALAN, ALAN	111111	PRO	402	13	93%	7	88%	7	70%	11	73%	8	62%	5	100%
ALAN, ALAN	111111	PRO	396	10	71%	6	75%	9	90%	14	93%	7	54%	4	80%
ALAN, ALAN	111111	PRO	396	12	86%	8	100%	6	60%	9	60%	11	85%	4	80%

52

What is the slope of this line?



A $\frac{1}{2}$

B $\frac{3}{4}$

C 1

D $\frac{4}{3}$



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				Rational numbers		Exponents, powers, and roots		Quantitative relationships and evaluating expressions		Multi-step problems, graphing, and functions		Measurement and geometry		Statistics, data analysis, and probability	
				Number Correct	Percent Correct	Number Correct	Percent Correct	Number Correct	Percent Correct	Number Correct	Percent Correct	Number Correct	Percent Correct	Number Correct	Percent Correct
STUDENT, NAME	111111	ADV	476	13	93%	8	100%	8	80%	14	93%	12	92%	5	100%
STUDENT, NAME 2	111112	ADV	464	13	93%	7	88%	8	80%	15	100%	11	85%	5	100%
STUDENT, NAME3	111113	ADV	453	10	71%	8	100%	10	100%	14	93%	11	85%	5	100%
STUD, NAME	111114					8	100%					11	85%	5	100%
STUDENT, NAME4	111115											10	77%	5	100%
STUDENT, NAME5	111116											10	77%	4	80%
STUDENT, NAME6	111117											9	69%	5	100%
STUDENT, NAME7	111118											10	77%	5	100%
STUD, NAME	111119											11	85%	5	100%
STUDENT, NAME8	111120	ADV				7	88%					10	77%	5	100%
STUDENT, NAME9	111121	ADV				6	75%					10	77%	5	100%
STUDENT, NAME10	111122	ADV				7	88%					11	85%	5	100%
STUDENT, NAME11	111123	ADV				5	63%					10	77%	5	100%
STUDENT, NAME12	111124	ADV	421		93%	6	75%	6		14	93%	10	77%	5	100%
STUDENT, NAME13	111125	ADV	421	11	79%	5	63%	9	90%	13	87%	11	85%	5	100%
STUD, NAME14	111126	ADV	414	12	86%	6	75%	8	80%	11	73%	11	85%	5	100%
STUD, NAME15	111127	ADV	414	12	86%	8	100%	8	80%	13	87%	8	62%	4	80%
STUDENT, NAME16	111128	PRO	408	11	79%	6	75%	9	90%	11	73%	10	77%	5	100%
STUDENT, NAME17	111129	PRO	402	12	86%	8	100%	9	90%	8	53%	11	85%	3	60%
STUDENT, NAME18	111130	PRO	402	8	57%	7	88%	8	80%	13	87%	10	77%	5	100%
STUDENT, NAME19	111131	PRO	402	13	93%	6	75%	7	70%	13	87%	8	62%	4	80%
STUDENT, NAME20	111132	PRO	402	11	79%	5	63%	7	70%	11	73%	12	92%	5	100%
STUDENT, NAME21	111133	PRO	402	13	93%	7	88%	9	90%	10	67%	7	54%	5	100%
STUDENT, NAME22	111134	PRO	402	13	93%	7	88%	7	70%	11	73%	8	62%	5	100%
STUDENT, NAME23	111135	PRO	396	10	71%	6	75%	9	90%	14	93%	7	54%	4	80%
STUD, NAME24	111136	PRO	396	12	86%	8	100%	6	60%	9	60%	11	85%	4	80%

GOALS



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PROBLEM ONE

Solve for x .

$$21 + x = 70$$

PROBLEM TWO

Using the digits 1 to 9, at most one time each, create two equations: one where x has a positive value and one where x has a negative value.

$$\boxed{}\boxed{} + x = \boxed{}\boxed{}$$

PROBLEM THREE

Using the digits 1 to 9, at most one time each, create an equation where x has the greatest possible value.

$$\boxed{}\boxed{} + x = \boxed{}\boxed{}$$



Robert Kaplinsky

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MS & HS #MTBoS Ts, please ask your Ss these 3 ?s and put the % who answered correctly here:

docs.google.com/forms/d/e/1FAI Answers at top of form.

PROBLEM ONE

Solve for x.

$$21 + x = 7$$

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PROBLEM TWO

Using the digits 1 to 9, at most one time each, create two equations: one where x has a positive value and one where x has a negative value.

$$\square\square + x = \square\square$$

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PROBLEM THREE

Using the digits 1 to 9, at most one time each, create an equation where x has the greatest possible value.

$$\square\square + x = \square\square$$

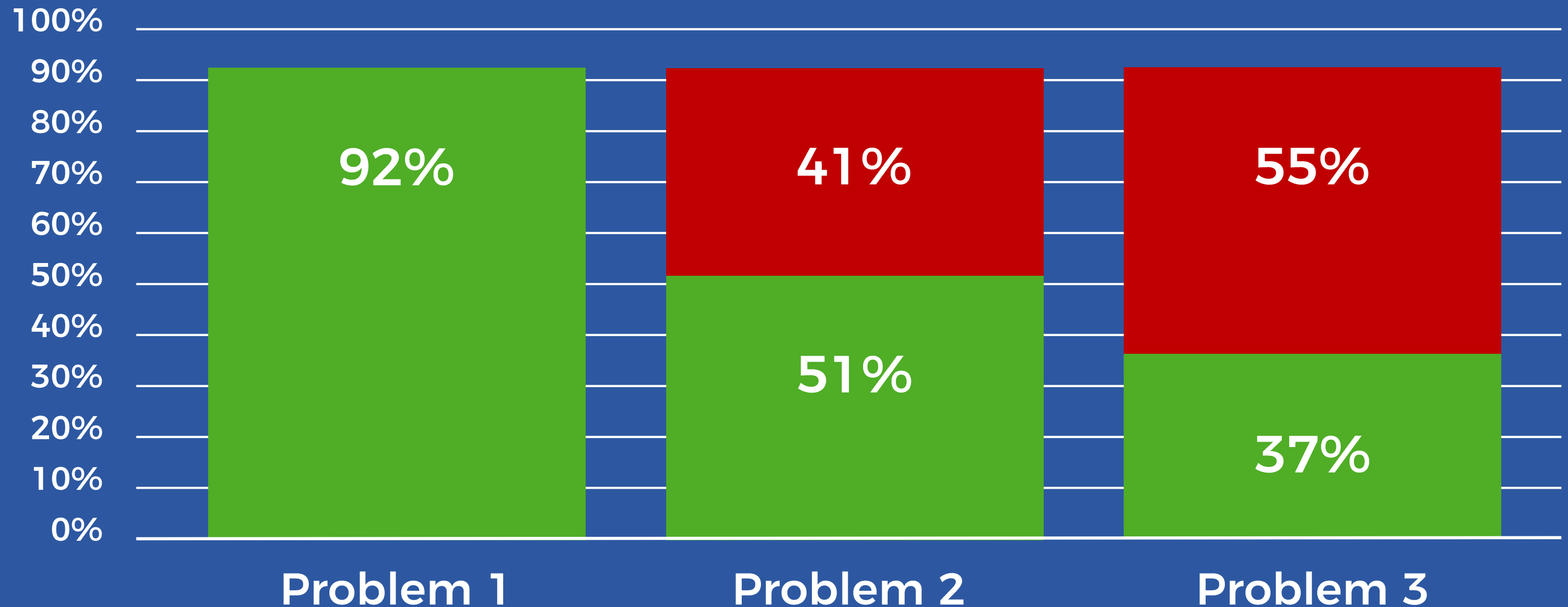
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RETWEETS
36

LIKES
54



PROBLEM RESULTS



GOALS

☒ WHY DO WE NEED OPEN MIDDLE?

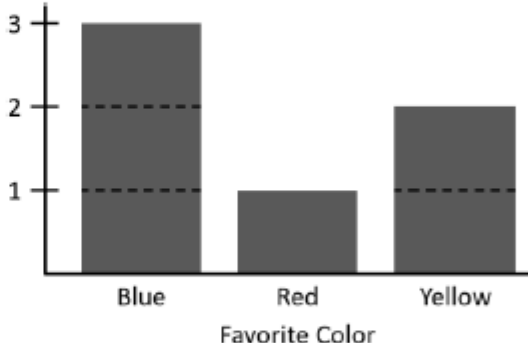
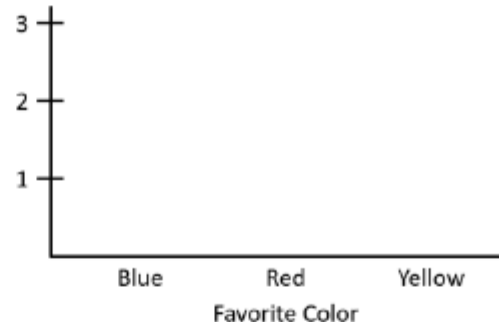
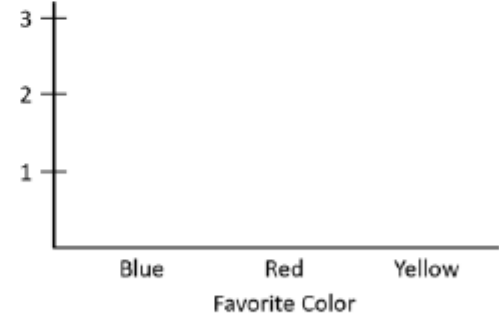
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Depth of Knowledge Matrix - Elementary Math

Topic	Adding 1-Digit Numbers (< 5)	Equality	Interpreting Data	Money								
CCSS Stand.	<ul style="list-style-type: none">K.OA.5	<ul style="list-style-type: none">1.OA.7	<ul style="list-style-type: none">1.MD.4	<ul style="list-style-type: none">2.MD.8								
DOK 1 Example	Solve. $3 + 1 =$	Determine whether the number sentence is true or false. $4 + 1 = 5 - 2$	How many people were surveyed?  <table><caption>Favorite Color Data</caption><tr><th>Color</th><th>Count</th></tr><tr><td>Blue</td><td>3</td></tr><tr><td>Red</td><td>1</td></tr><tr><td>Yellow</td><td>2</td></tr></table>	Color	Count	Blue	3	Red	1	Yellow	2	If you have 1 quarter, 4 dimes, 2 nickels, and 3 pennies, how many cents do you have?
Color	Count											
Blue	3											
Red	1											
Yellow	2											
DOK 2 Example	Use the digits 1 to 5, at most one time each, to fill in the boxes to create two true number sentences. $\square + \square = \square$	Use the digits 1 to 9, at most one time each, to fill in the boxes to create two true number sentences. $\square + \square = \square - \square$	Make a graph that shows a possible result of 7 students' favorite color. 	Make 72¢ in two different ways with either quarters, dimes, nickels, or pennies.								
DOK 3 Example	Use the digits 1 to 5, at most one time each, to fill in the boxes to create a true number sentence with the greatest possible sum. $\square + \square = \square$	Use the digits 1 to 9, at most one time each, to fill in the boxes to create a true number sentence with the greatest possible value. $\square + \square = \square - \square$	Make a graph that shows a possible result of 7 students' favorite color with red being the most popular color. 	Make 72¢ using exactly 9 coins that are either quarters, dimes, nickels, or pennies.								

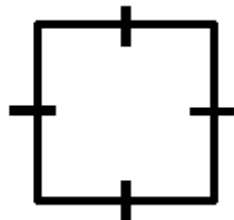
Depth of Knowledge Matrix - Elementary Math

Topic	Subtracting 3-Digit Numbers	Operations with Time	Comparing Fractions	Multiplying Decimals
CCSS Stand.	• 3.NBT.2	• 3.MD.1	• 4.NF.2	• 5.NBT.7
DOK 1 Example	Solve. $821 - 357 =$	What time will it be 14 minutes after 1:27 pm?	Place a < or > between the two fractions to make a true number sentence. $\frac{4}{7}$ $\frac{3}{5}$	Solve. $3.4 \times 2.5 =$
DOK 2 Example	Use the digits 1 to 9, at most one time each, to fill in the boxes to make two different pairs of three-digit numbers that form a true number sentence. $\square\square\square - 291 = \square\square\square$	Use the digits 1 to 9, at most one time each, to fill in the boxes to make a time that is 4:37 pm. $\square\square$ minutes after $\square:\square\square$ pm	Use the digits 1 to 9, at most one time each, to fill in the boxes to create two different fractions: one that is less than one half and one that is more than one half. $\frac{\square}{\square} < \frac{1}{2}$ and $\frac{\square}{\square} > \frac{1}{2}$	Use the digits 1 to 9, at most one time each, to fill in the boxes to make a true number sentence. $\square.\square \times 3.2 = \square.\square$
DOK 3 Example	Use the digits 1 to 9, at most one time each, to fill in the boxes to make a difference that is as close to 329 as possible. $\square\square\square - \square\square\square =$	Use the digits 1 to 9, at most one time each, to fill in the boxes to make the latest possible time. $\square\square$ minutes after $\square:\square\square$ pm	Use the digits 1 to 9, at most one time each, to fill in the boxes to create a fraction that is as close to 5/11 as possible. $\frac{\square}{\square}$	Use the digits 1 to 9, at most one time each, so that the product is as close to 50 as possible. $\square.\square \times \square.\square =$


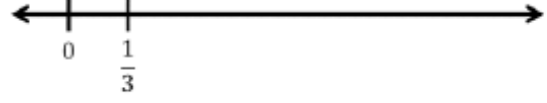
Depth of Knowledge Matrix - Secondary Math

Topic	Dividing Fractions	Solving Two-Step Equations	Exponents	Solving Equations with Variables on Both Sides
CCSS Standard(s)	<ul style="list-style-type: none"> 6.NS.1 	<ul style="list-style-type: none"> 7.EE.4a 	<ul style="list-style-type: none"> 8.EE.1 	<ul style="list-style-type: none"> 8.EE.8 A-REI.3
DOK 1 Example	Evaluate. $\frac{4}{9} \div \frac{2}{5}$	Solve for x. $2x + 3 = 9$	Evaluate. 3^4	Solve for x. $3x + 2 = -2x + 4$
DOK 2 Example	Use the digits 1 to 9, at most one time each, to fill in the boxes to make two different pairs of fractions that have a quotient of $\frac{2}{3}$. $\frac{\square}{\square} \div \frac{\square}{\square} = \frac{2}{3}$	Use the digits 1 to 9, at most one time each, to create two equations: one where x has a positive value and one where x has a negative value. $\square x + \square = \square$	Use the digits 1 to 9, at most one time each, to fill in the boxes to make two true number sentences. $\square^{\square} = 64$	Use the digits 1 to 9, at most <u>two</u> times each, to fill in the boxes to make an equation with no solutions. $\square x + \square = \square x + \square$
DOK 3 Example	Use the digits 1 to 9, at most one time each, to fill in the boxes to make two fractions that have a quotient that is as close to $\frac{4}{11}$ as possible. $\frac{\square}{\square} \div \frac{\square}{\square}$	Use the digits 1 to 9, at most one time each, to create an equation where x has the greatest possible value. $\square x + \square = \square$	Use the digits 1 to 9, at most one time each, to fill in the boxes to make a result that has the greatest value possible. $\square^{\square} = \square\square\square$	Use the digits 1 to 9, at most one time each, to fill in the boxes so that the solution is closest to zero. $\square x + \square = \square x + \square$

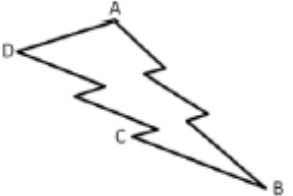
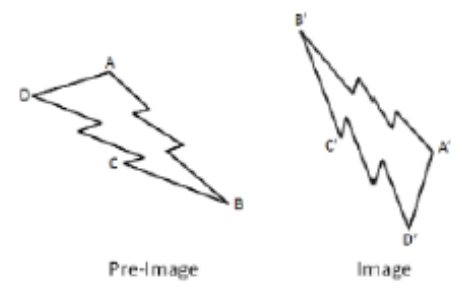
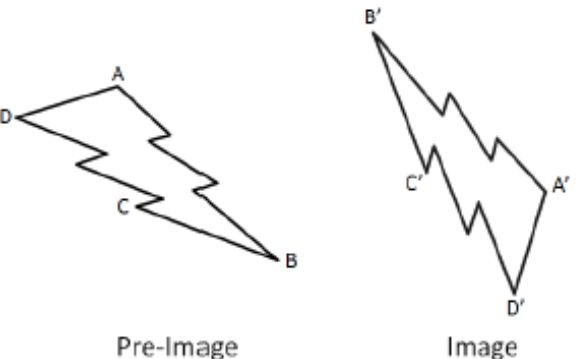
Depth of Knowledge Matrix - Secondary Math

Topic	Geometric Proofs	Complex Numbers	Trigonometric Functions	Definite Integral
CCSS Standard(s)	<ul style="list-style-type: none"> G-CO.11 	<ul style="list-style-type: none"> N-CN.2 	<ul style="list-style-type: none"> F-TF.3 	<ul style="list-style-type: none"> N/A
DOK 1 Example	Add one geometric marking to demonstrate the quadrilateral is a square. 	Multiply the binomials. $(3 + 4i)(2 + 3i)$	Evaluate. $\sin \frac{\pi}{3}$	Solve. $\int_2^6 x^3 dx$
DOK 2 Example	Use exactly 5 geometric markings to show that a quadrilateral is a square.	Use the integers -9 to 9, at most one time each, to fill in the boxes twice: once to make a positive real number product and once to make a negative real number product. $(\square + \square i)(\square + \square i)$	Use the digits 1 to 9, at most one time each, to fill in the boxes and make two true number sentences. $\sin \frac{\square \pi}{\square} = 0$	Use the digits 1 to 9, at most one time each, to fill in the boxes and make a positive and a negative solution. $\int_{\square}^{\square} x^{\square} dx$
DOK 3 Example	What is the least number of geometric markings needed to demonstrate that a quadrilateral is a square?	Use the integers -9 to 9, at most one time each, to fill in the boxes and make a real number product with the greatest value. $(\square + \square i)(\square + \square i)$	Use the digits 1 to 9, at most one time each, so that the function has the greatest possible value. $\sin \frac{\square \pi}{\square} = \frac{\sqrt{\square}}{\square}$	Use the digits 1 to 9, at most one time each, to fill in the boxes and make a solution that is as close to 100 as possible. $\int_{\square}^{\square} x^{\square} dx$

Depth of Knowledge Matrix - Elementary & Secondary Math

Topic	Adding Whole Numbers	Money	Fractions on a Number Line	Area and Perimeter	Subtracting Mixed Numbers
CCSS Standard(s)	<ul style="list-style-type: none"> 1.NBT.4 2.NBT.5 	<ul style="list-style-type: none"> 2.MD.8 	<ul style="list-style-type: none"> 3.NF.2 	<ul style="list-style-type: none"> 3.MD.8 4.MD.3 	<ul style="list-style-type: none"> 5.NF.1
DOK 1 Example	<p>Find the sum.</p> $44 + 27 =$	<p>If you have 2 dimes and 3 pennies, how many cents do you have?</p>	<p>Which point is located at $\frac{7}{12}$ below?</p> 	<p>Find the perimeter of a rectangle that measures 4 units by 8 units.</p>	<p>Find the difference.</p> $5\frac{1}{2} - 4\frac{2}{3} =$
DOK 2 Example	<p>Fill in the boxes below using the whole numbers 1 through 9, no more than one time each, so that you make a true equation.</p> $\square\square + 53 = \square\square$	<p>Make 47¢ in three different ways with either quarters, dimes, nickels, or pennies.</p>	<p>Label the point where $\frac{3}{4}$ belongs on the number line below. Be as precise as possible.</p> 	<p>List the measurements of three different rectangles that each has a perimeter of 20 units.</p>	<p>Create three different mixed numbers that will make the equation true by using the whole numbers 1 through 9, no more than one time each. You may reuse the same whole numbers for each of the three mixed numbers.</p> $5\frac{4}{5} - \square\square\square = 3\frac{1}{20}$
DOK 3 Example	<p>Make the largest sum by filling in the boxes below using the whole numbers 1 through 9, no more than one time each.</p> $\square\square + \square\square =$	<p>Make 47¢ using exactly 6 coins with either quarters, dimes, nickels, or pennies.</p>	<p>Create 5 fractions using the whole numbers 0 through 9, exactly one time each as numerators and denominators, and place them all on a number line.</p>	<p>What is the greatest area you can make with a rectangle that has a perimeter of 24 units?</p>	<p>Make the smallest difference by filling in the boxes below using the whole numbers 1 through 9, no more than one time each.</p> $\square\square\square - \square\square\square =$

Depth of Knowledge Matrix - Elementary & Secondary Math

Topic	Surface Area and Volume	Probability	Transformations	Factoring Quadratics	Quadratics in Vertex Form
CCSS Standard(s)	<ul style="list-style-type: none"> 6.G.4 7.G.6 	<ul style="list-style-type: none"> 7.SP.5 7.SP.7 	<ul style="list-style-type: none"> 8.G.1 G-CO.5 	<ul style="list-style-type: none"> A-SSE.3a 	<ul style="list-style-type: none"> F-IF.7a
DOK 1 Example	Find the surface area of a rectangular prism that measures 3 units by 4 units by 5 units.	What is the probability of rolling a sum of 5 using two 6-sided dice?	Rotate the image below 90° counterclockwise about point D and reflect it across a horizontal line. 	Find the factors: $2x^2 + 7x + 3$	Find the roots and maximum of the quadratic equation below. $y = -3(x - 4)^2 - 3$
DOK 2 Example	List the measurements of three different rectangular prisms that each have a surface area of 20 square units.	What value(s) have a 1/12 probability of being rolled as the sum of two 6-sided dice?	List three sequences of transformations that take pre-image ABCD to image A'B'C'D'. 	Find three different integers to put in the blank that will make the quadratic expression factorable. $x^2 + __x + 4$	Create three equations for quadratics in vertex form that have roots at 3 and 5 but have different maximum and/or minimum values.
DOK 3 Example	What is the greatest volume you can make with a rectangular prism that has a surface area of 20 square units?	Fill in the blanks to complete this sentence using the whole numbers 1 through 9, no more than one time each. Rolling a sum of $__$ on two $__$ -sided dice is the same probability as rolling a sum of $__$ on two $__$ -sided dice.	What is the fewest number of transformations needed to take pre-image ABCD to image A'B'C'D'? 	Fill the blank by finding the largest and smallest integers that will make the quadratic expression factorable. $2x^2 + 3x + __$	Create a quadratic equation with the largest maximum value using the whole numbers 1 through 9, no more than one time each. $y = -\square(x - \square)^2 + \square$

GOALS

☒ WHY DO WE NEED OPEN MIDDLE?

☒ HOW ARE THEY DIFFERENT?

☒ WHERE CAN I GET MORE?

☐ HOW CAN SPIES AND ANALYSTS HELP ME?

☐ WHAT DOES IT LOOK LIKE IN ACTION?









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

Analysts

Model

GOALS

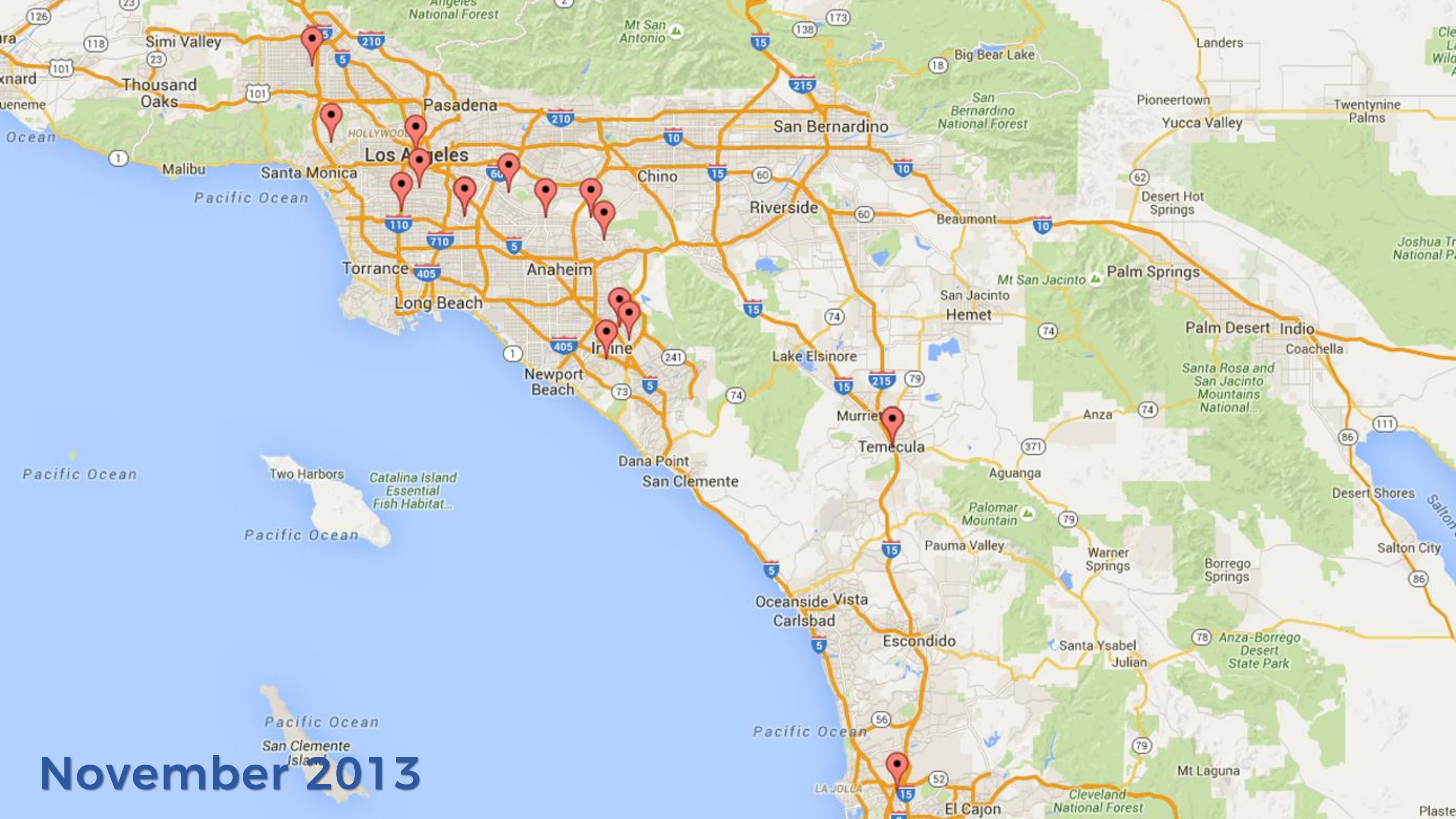
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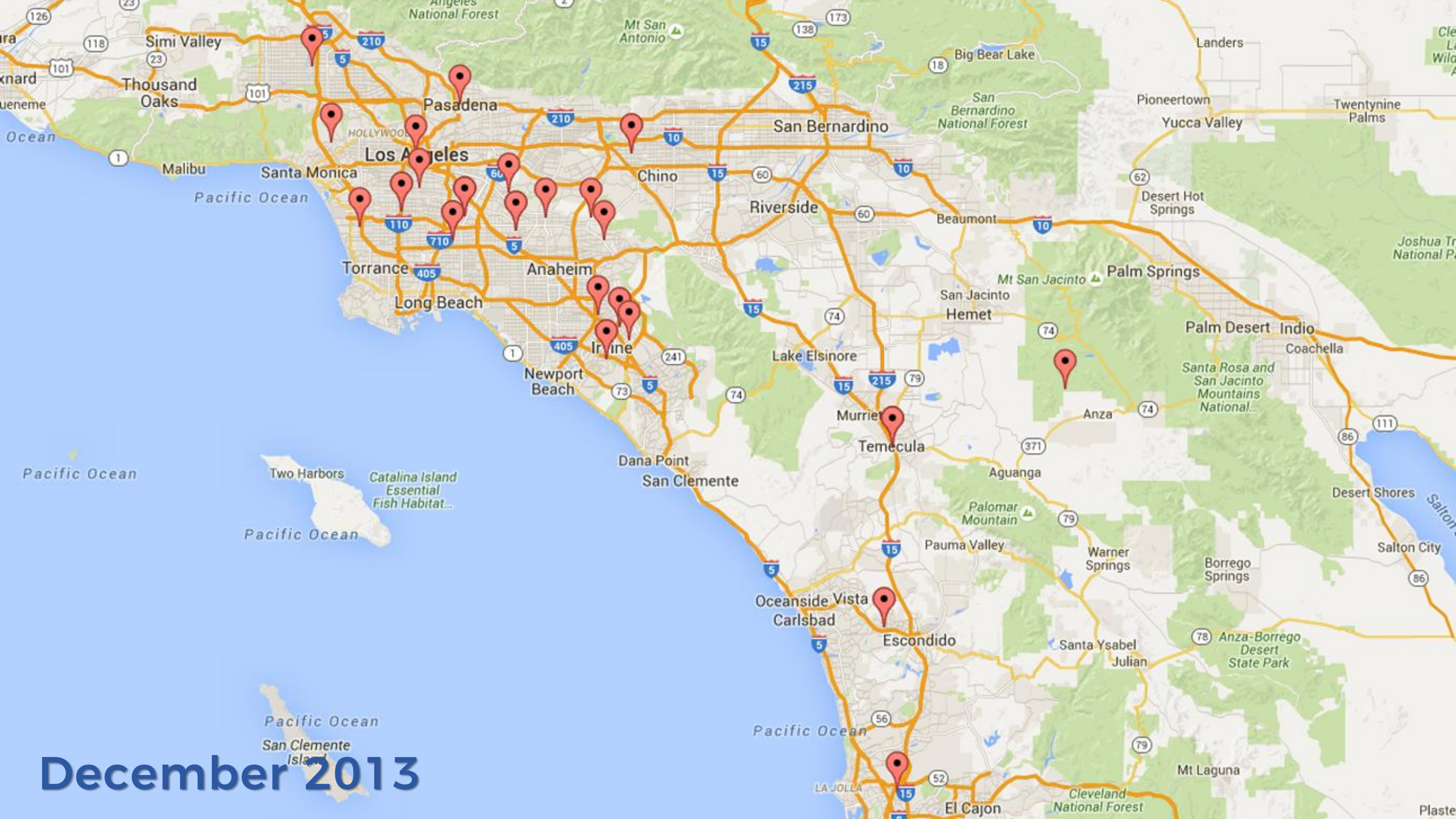
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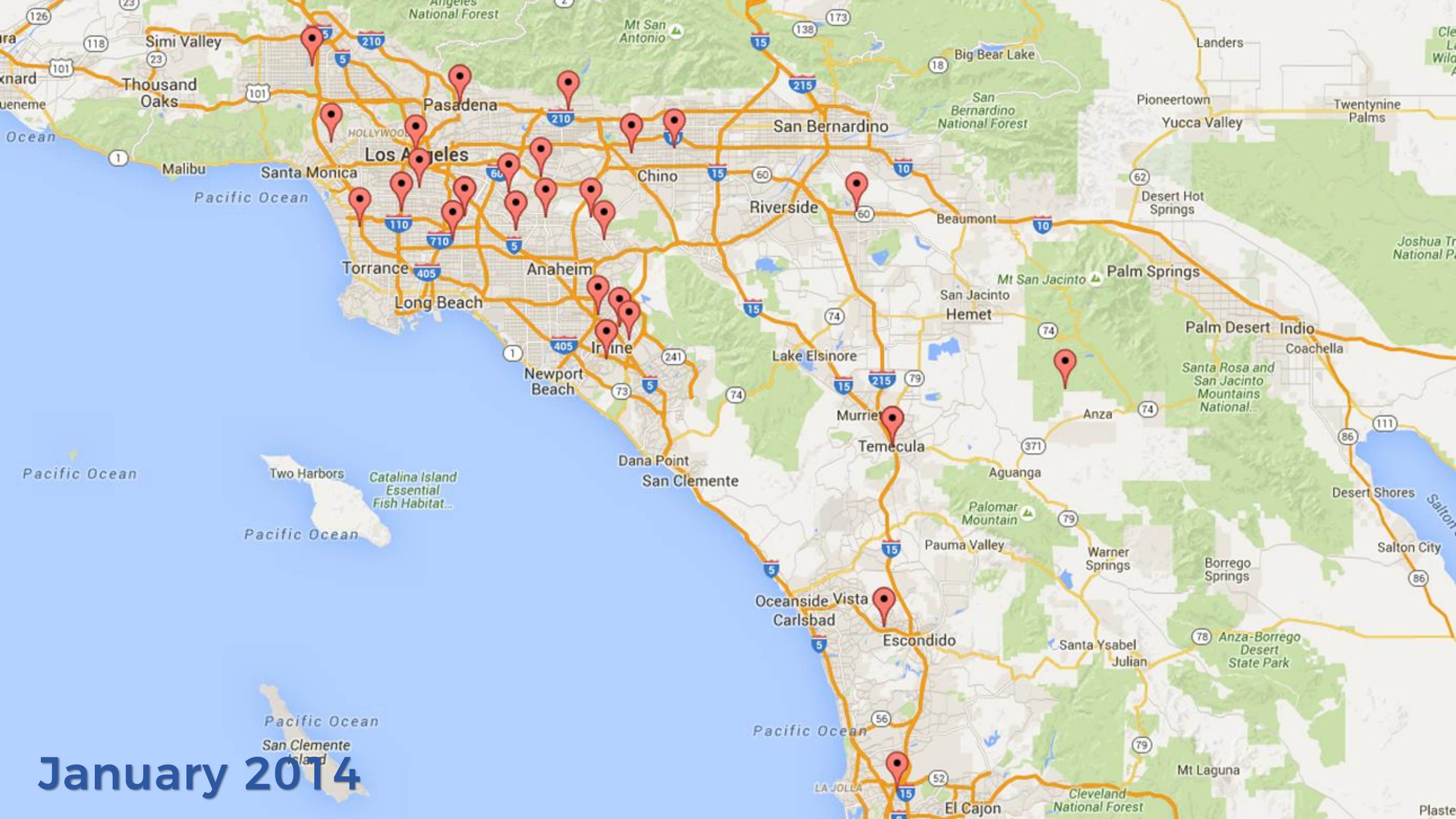
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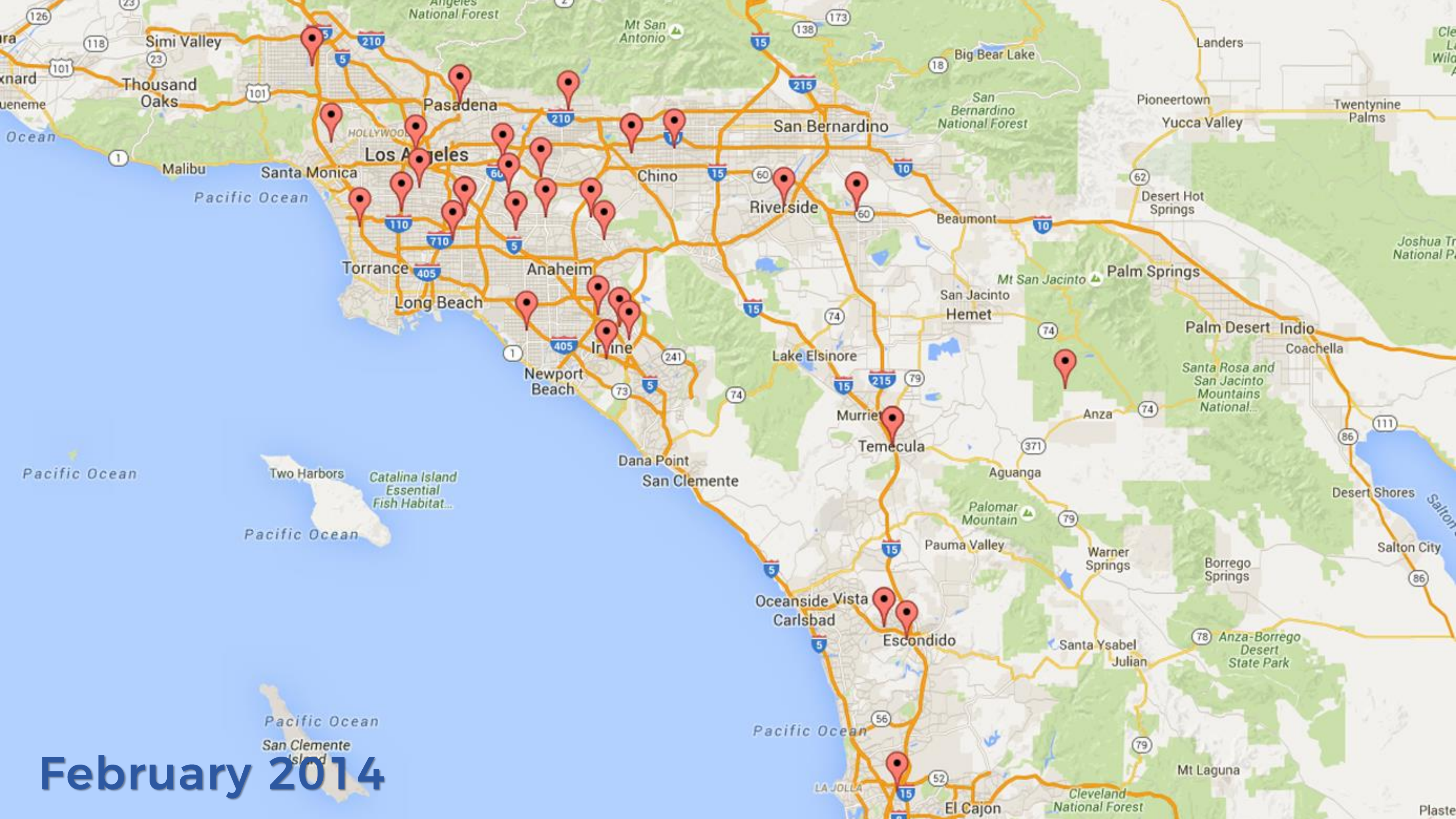
November 2013



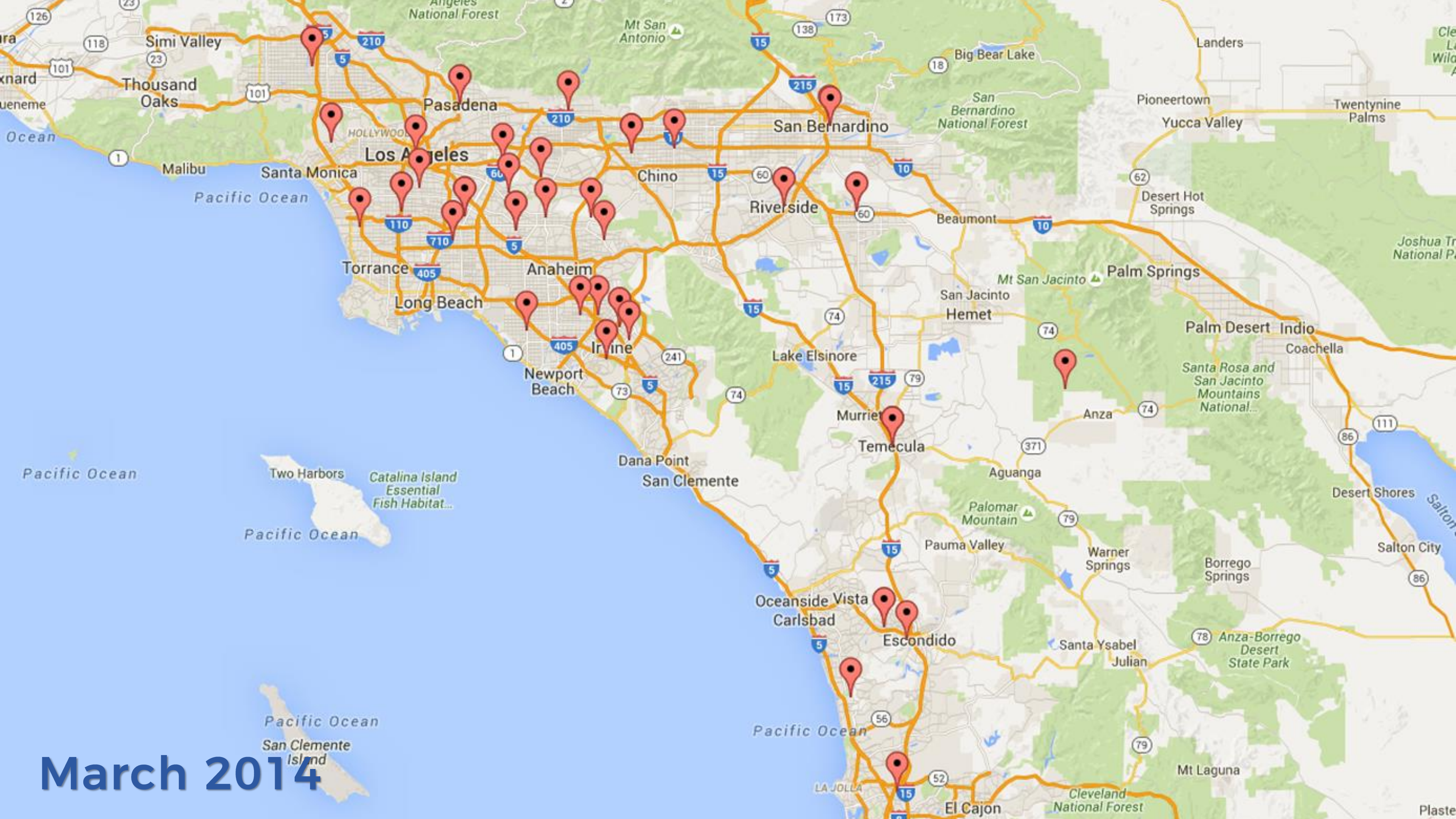
December 2013



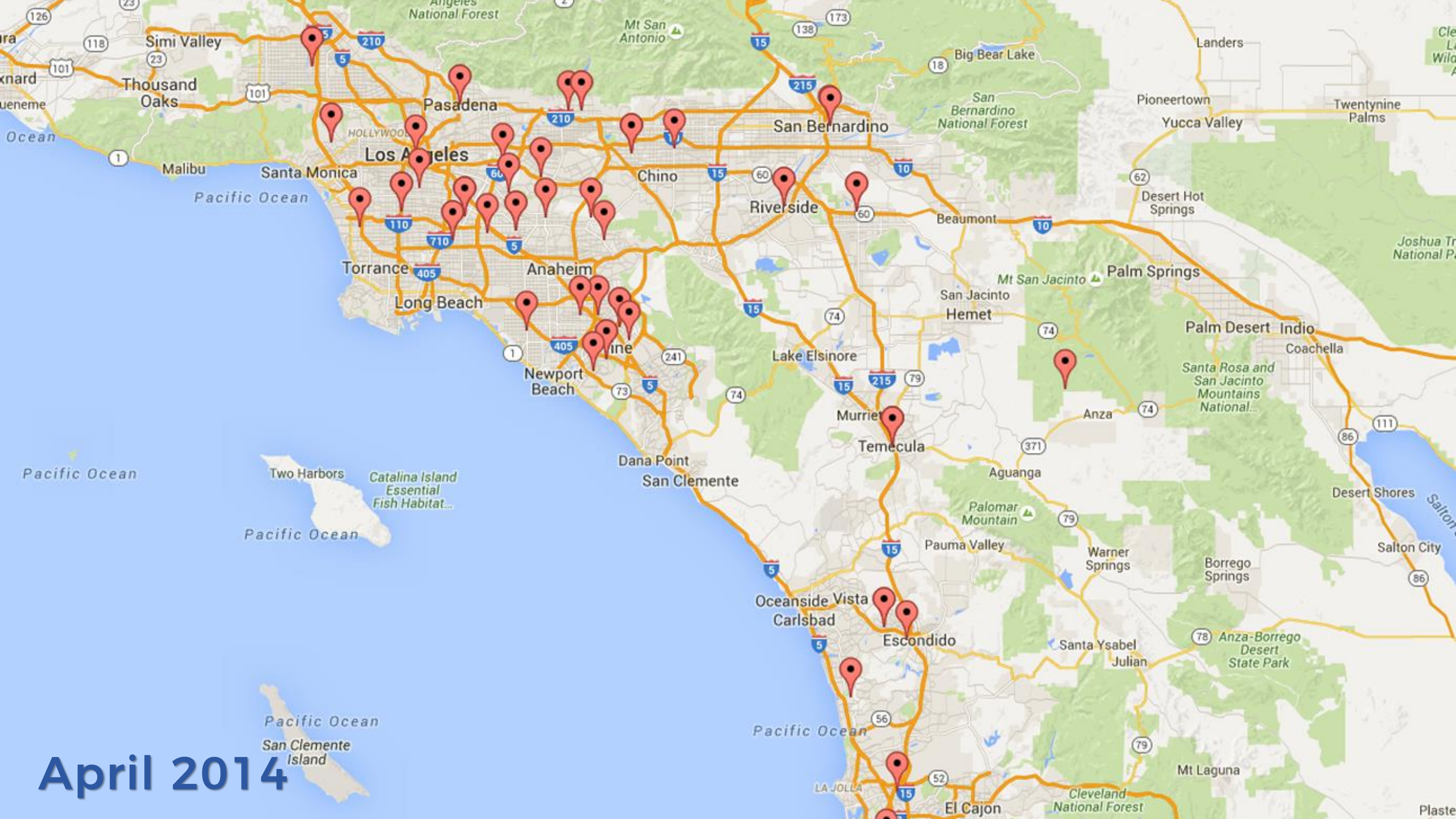
January 2014



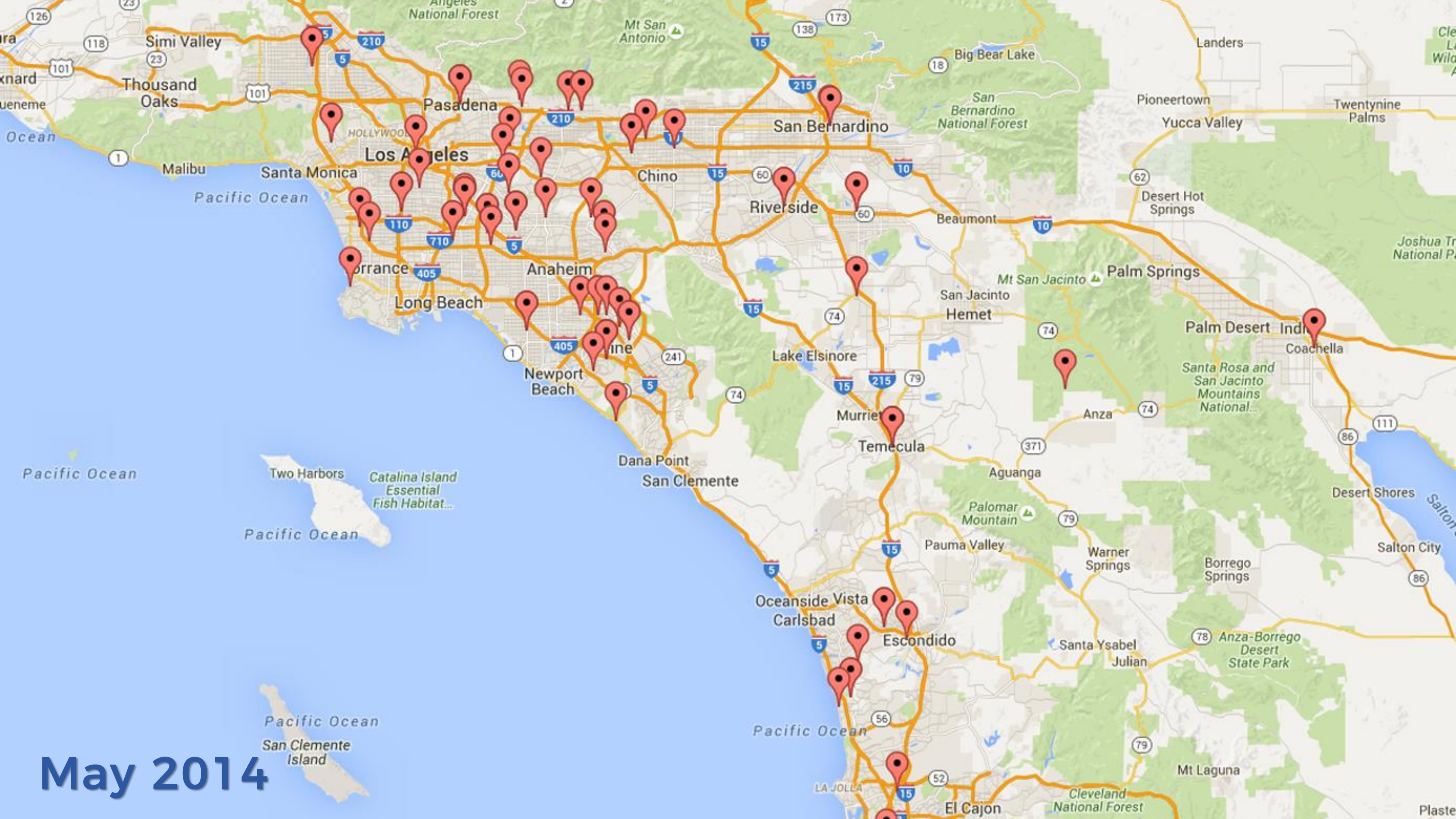
February 2014



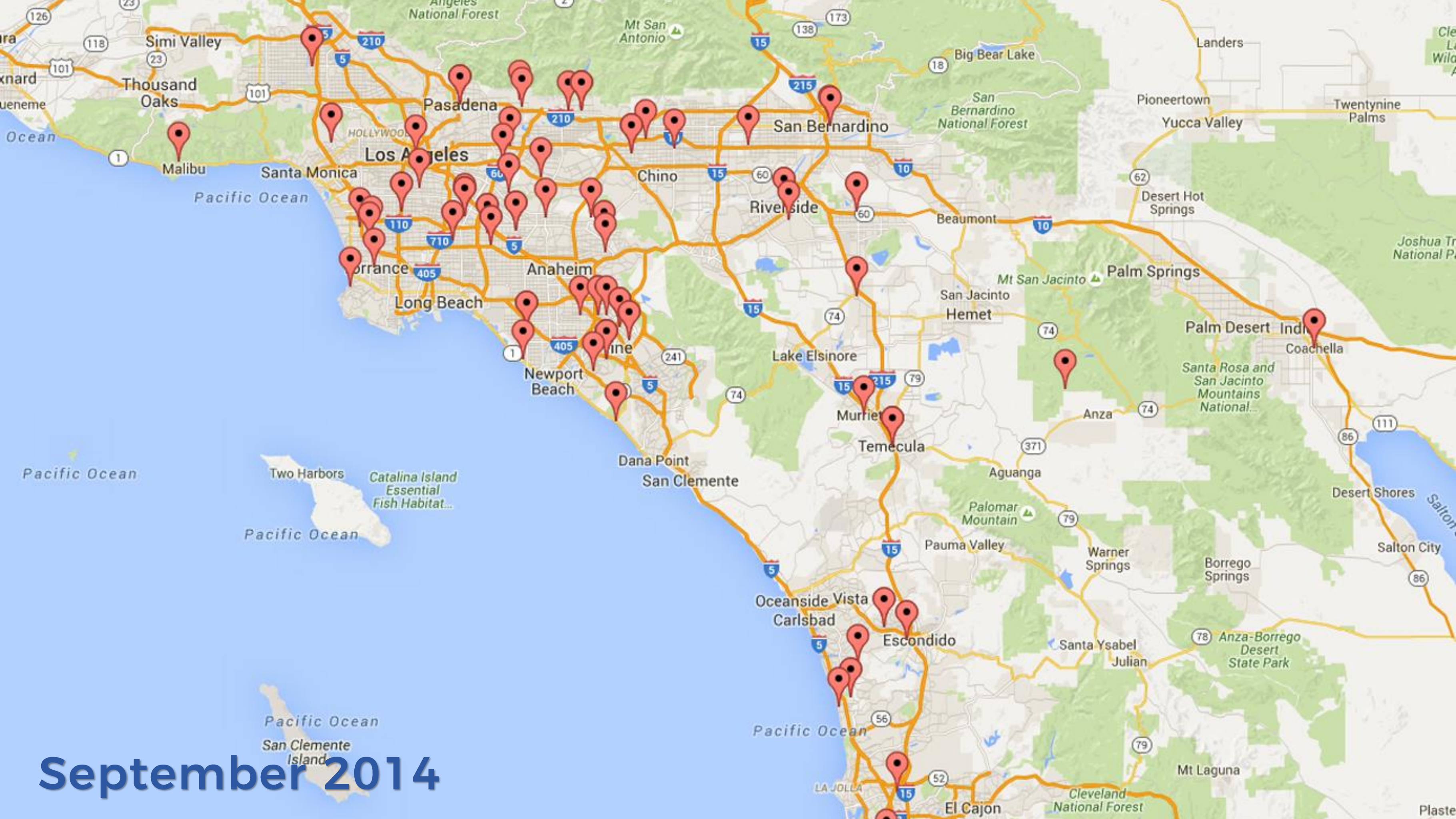
March 2014



April 2014

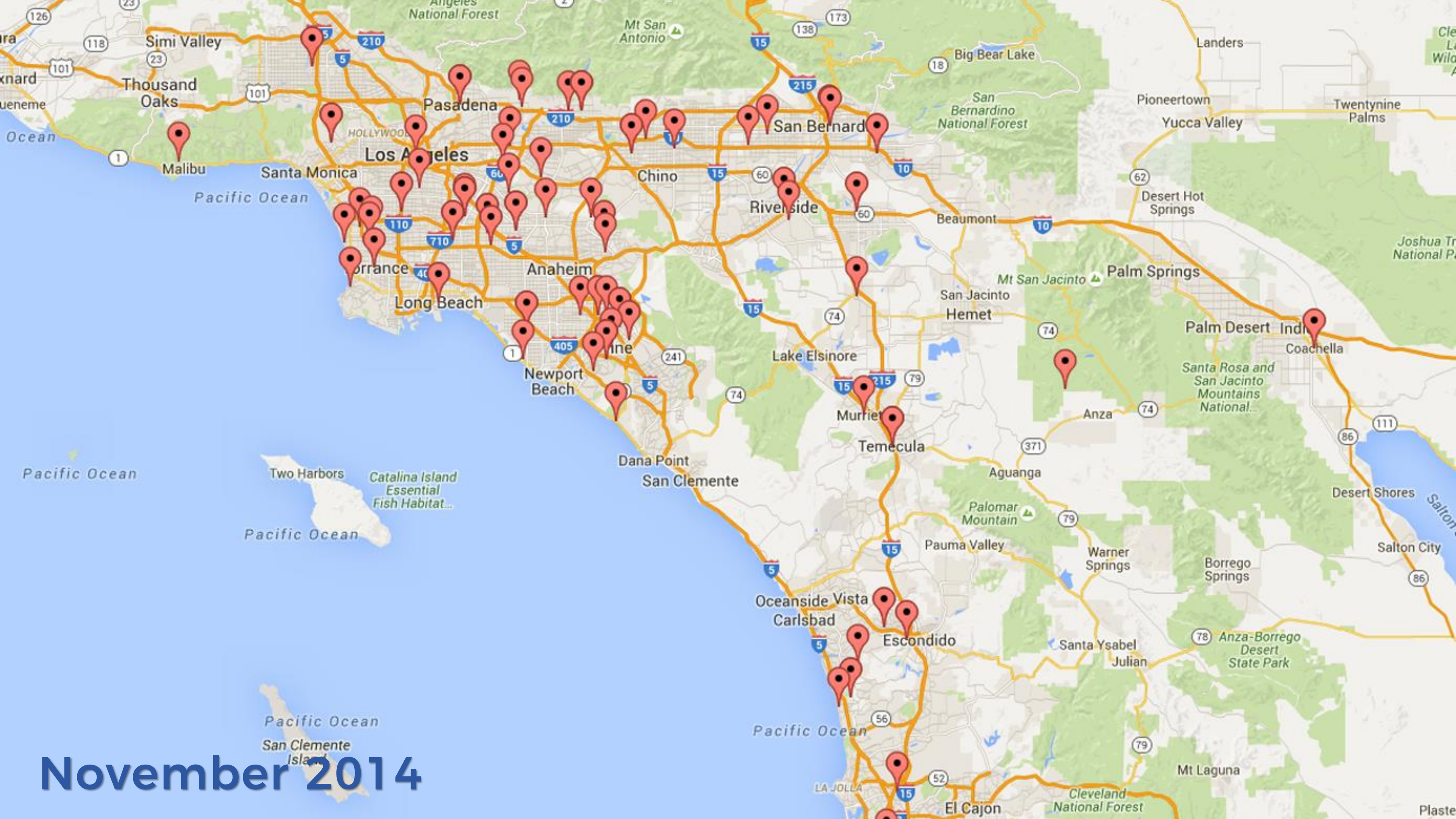


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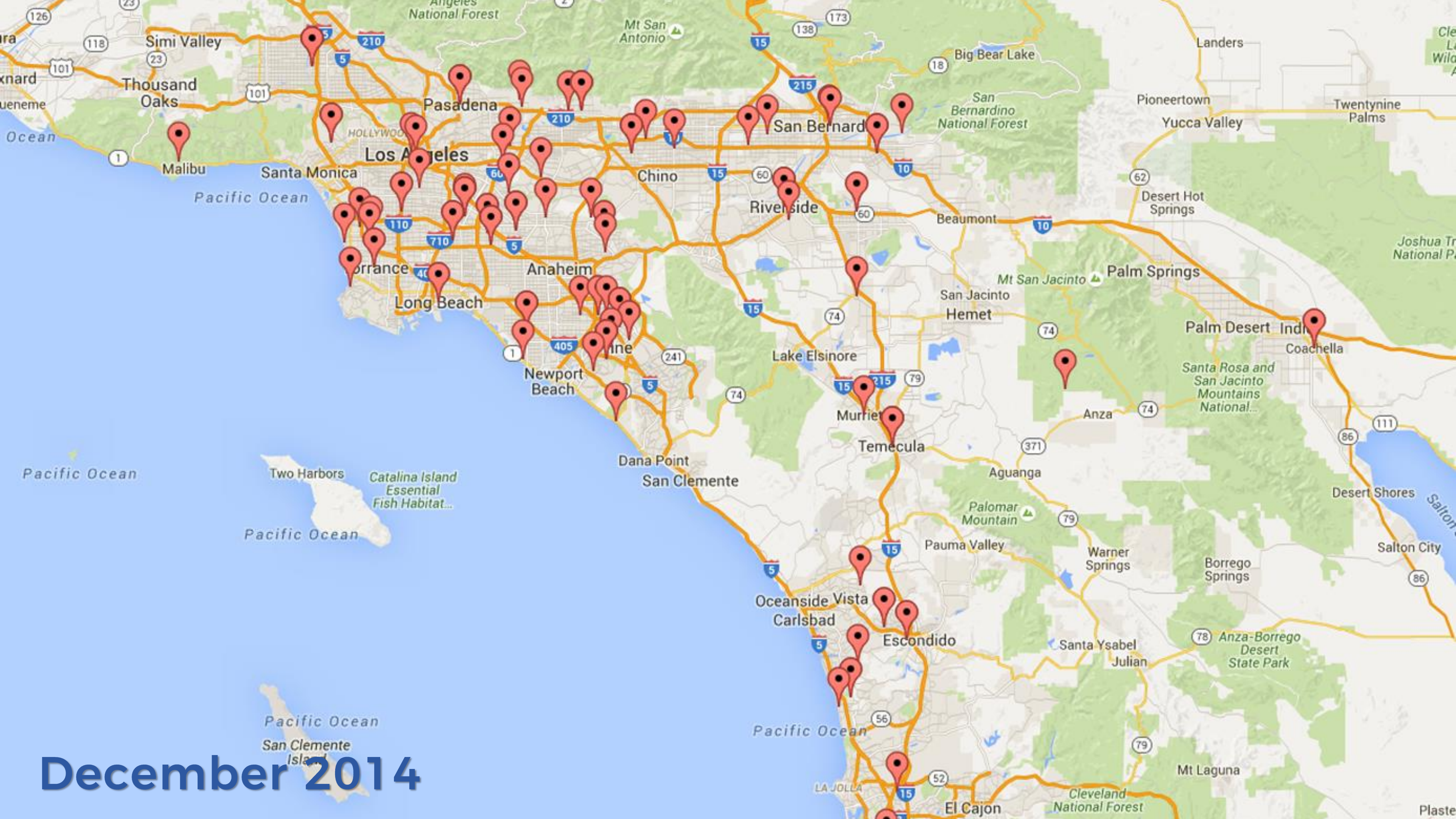


September 2014

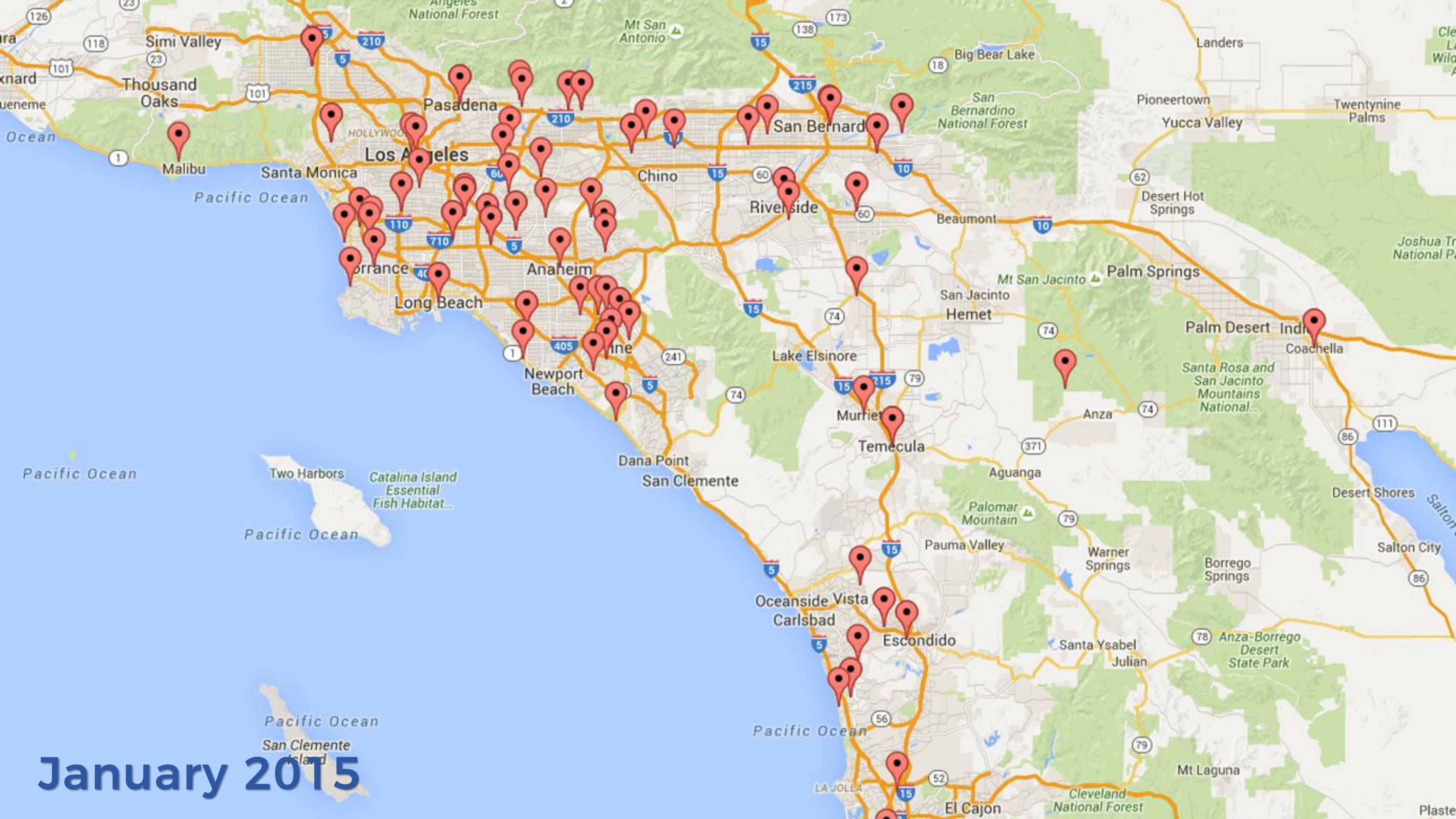




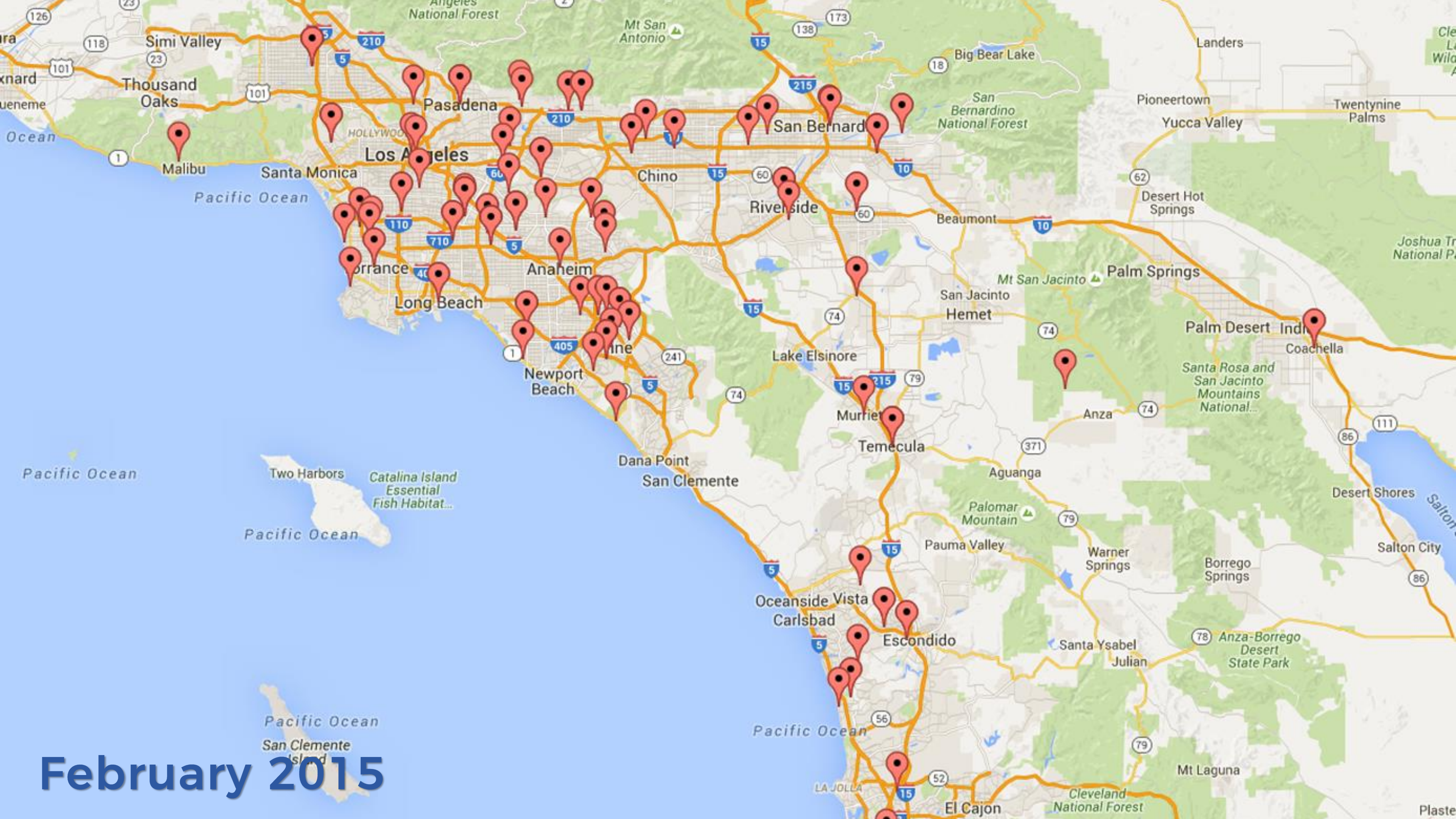
November 2014



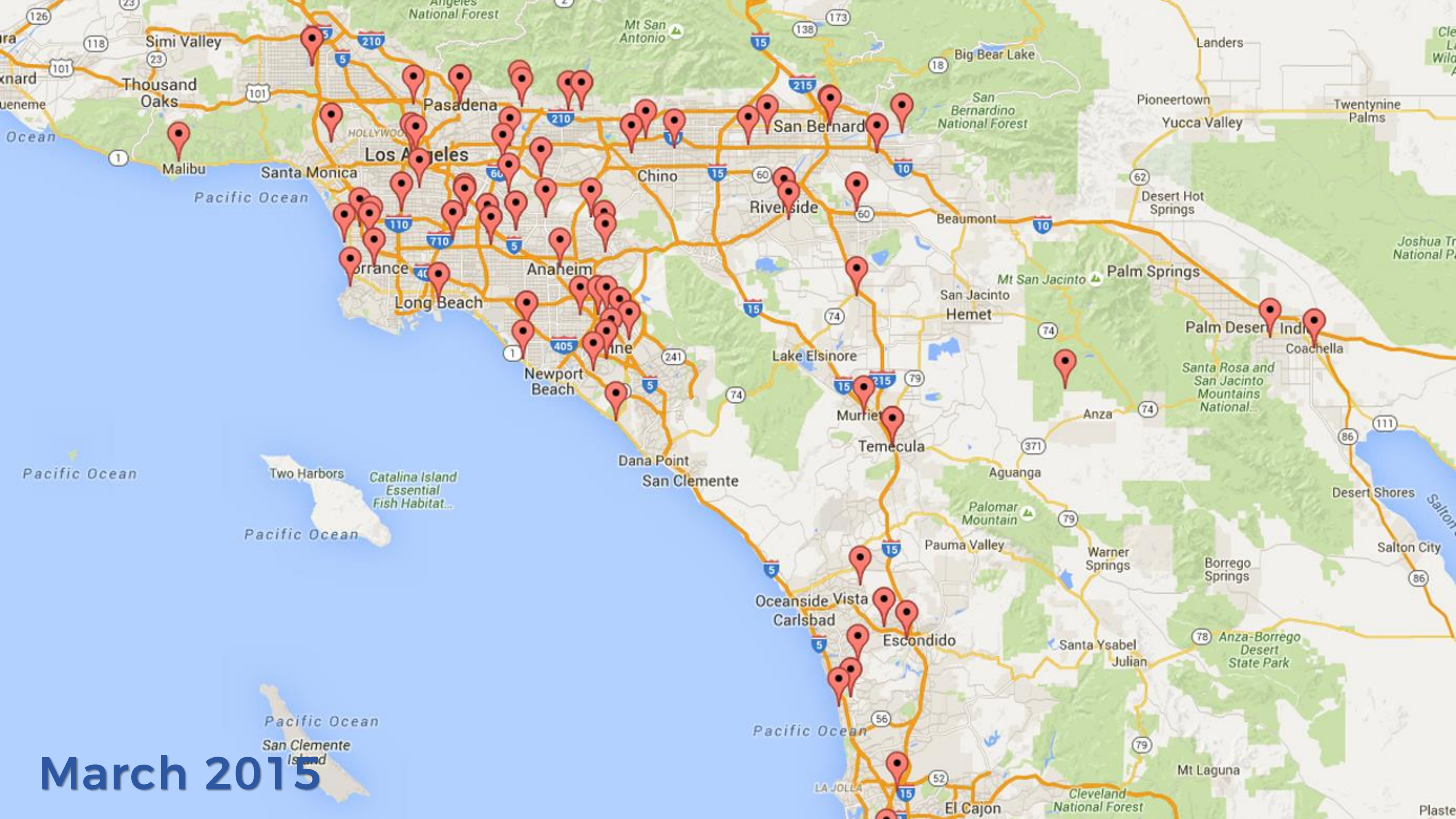
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January 2015



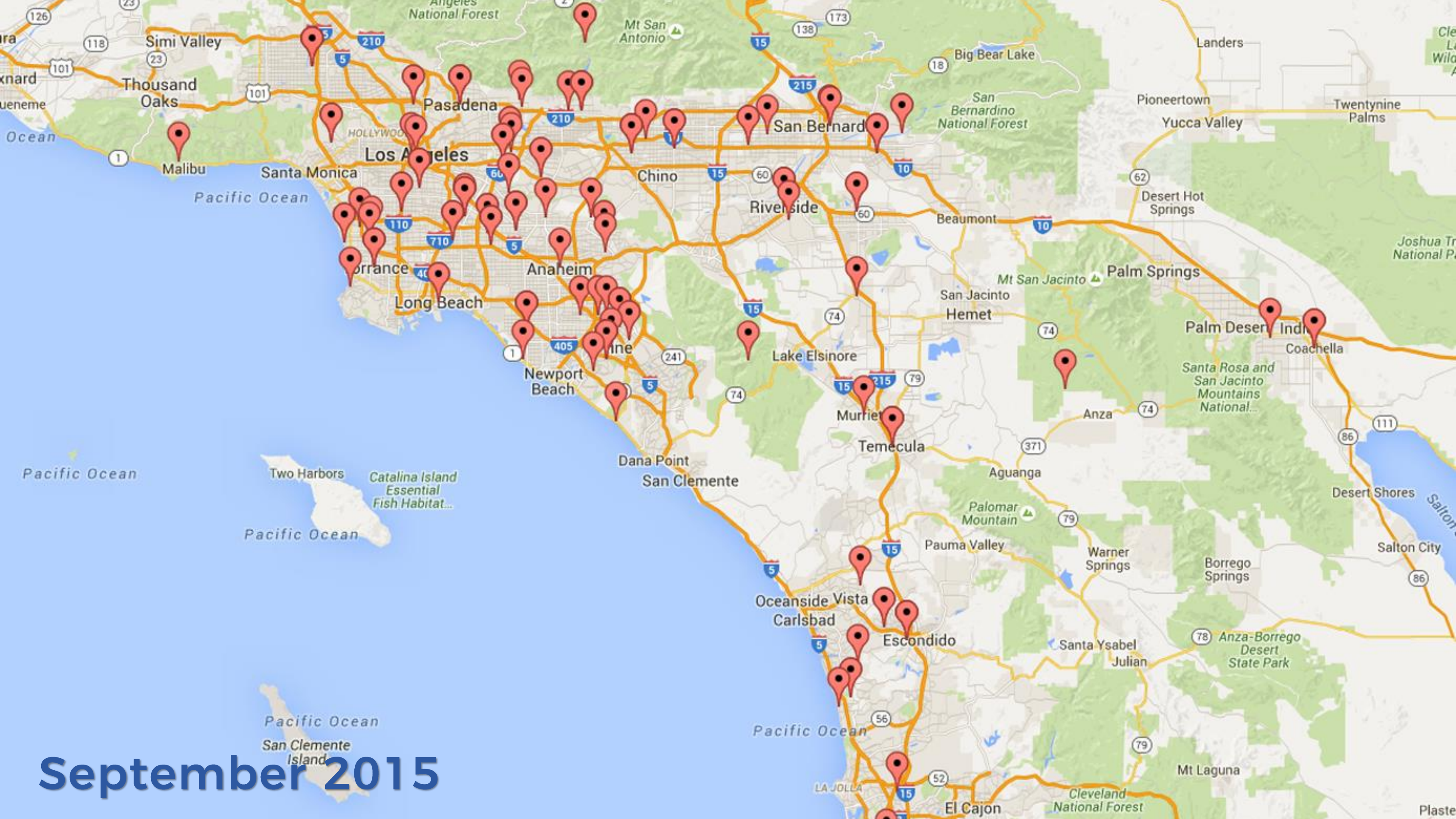
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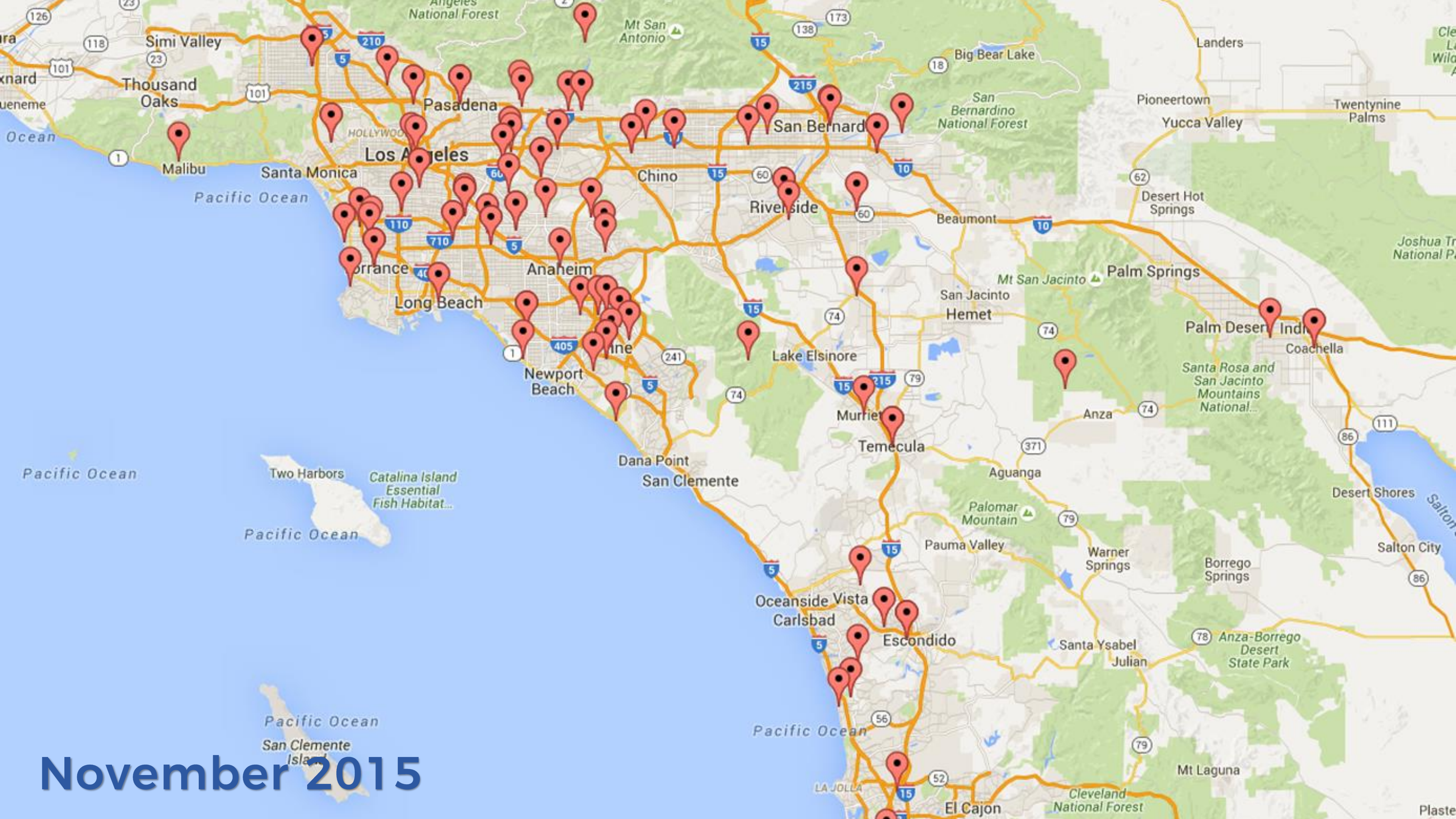
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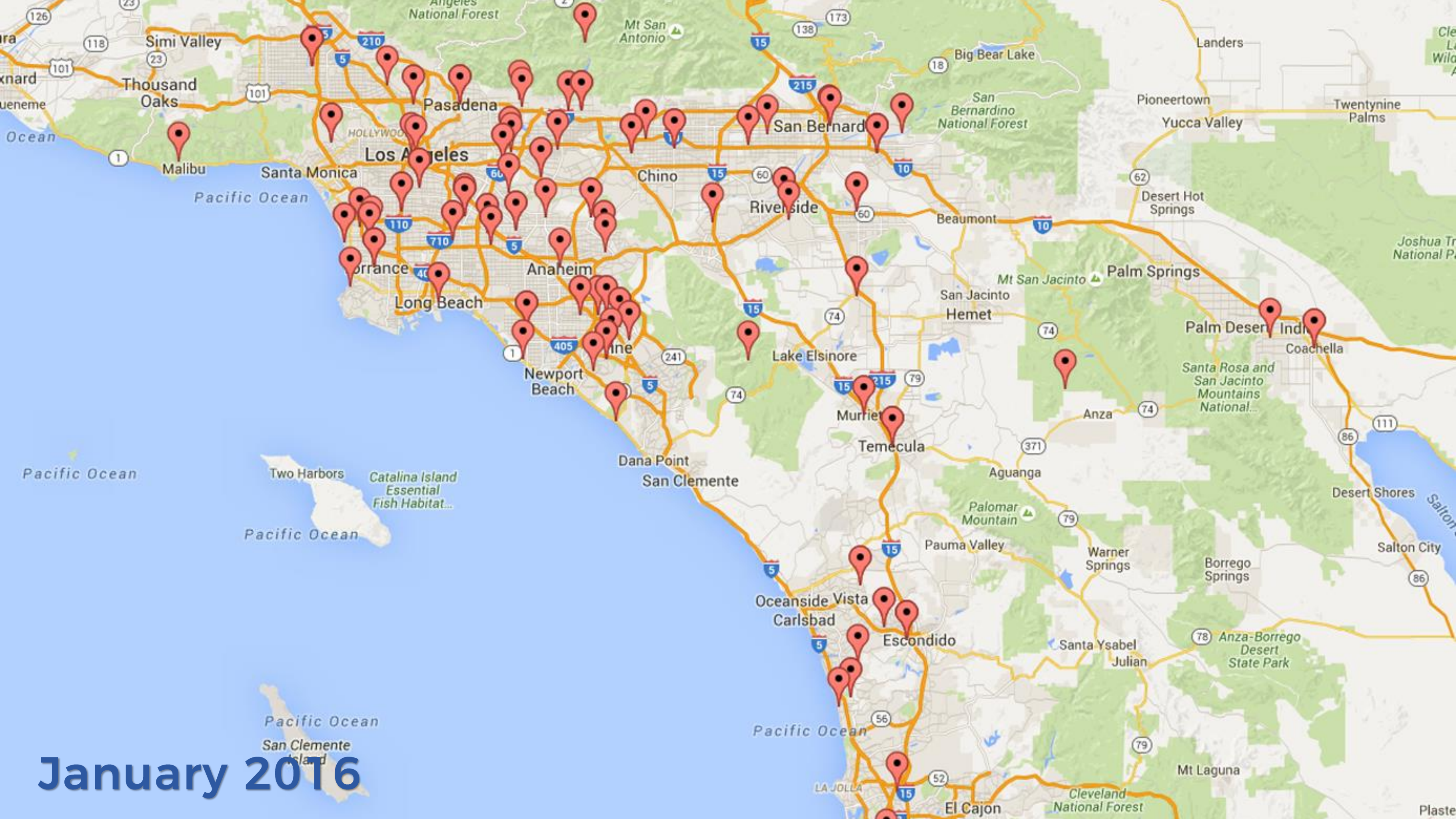




September 2015



November 2015



January 2016



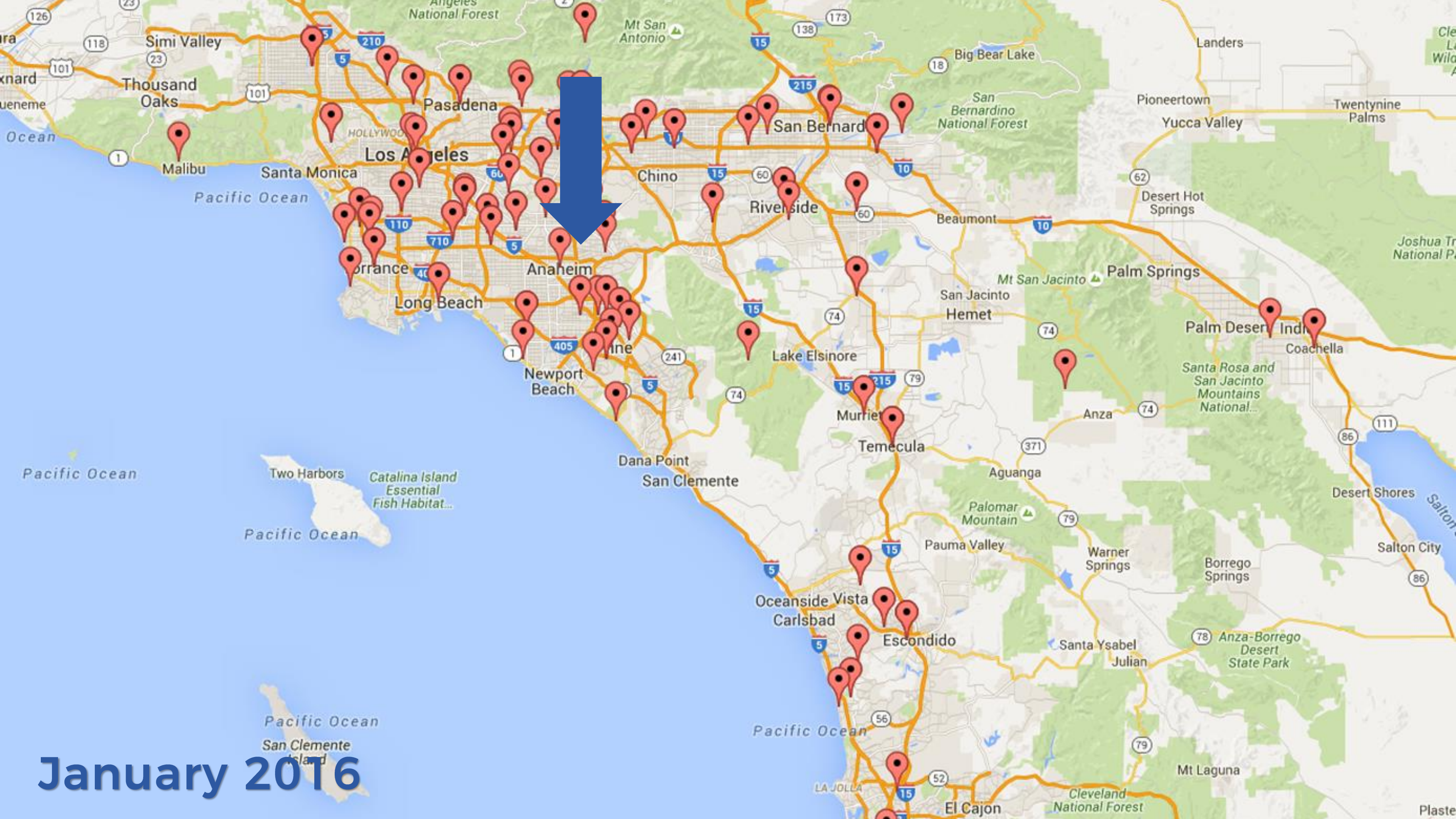


```
graph TD; Spies --> Analysts; Analysts --> Model;
```

Spies

Analysts

Model



January 2016

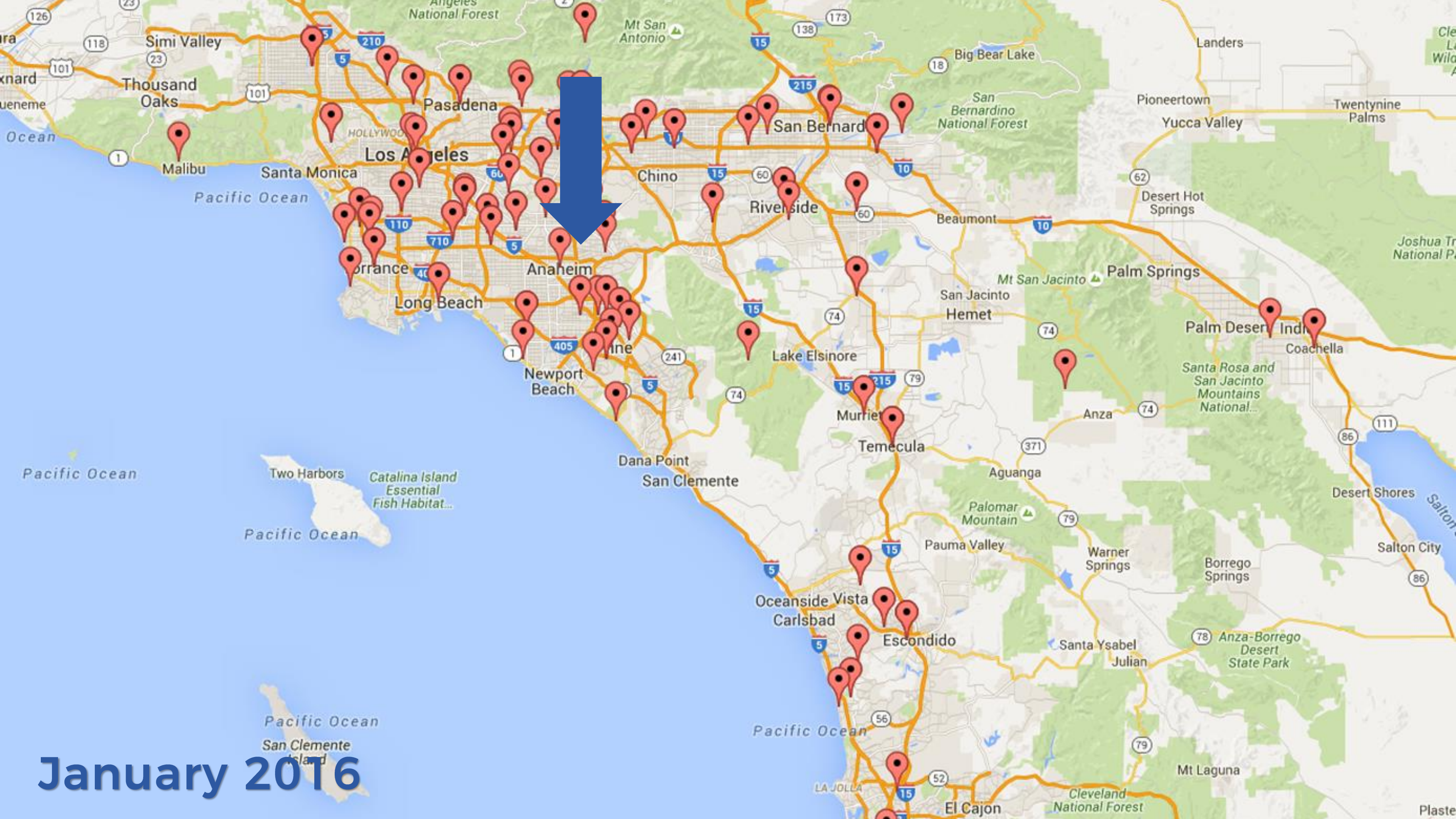


```
graph TD; Spies --> Analysts; Analysts --> Model; Model --> Spies;
```


Spies

Analysts

Model



January 2016



All models are
wrong, but some
are useful.

GEORGE E. P. BOX

GOALS

✓ **WHY DO WE NEED OPEN MIDDLE?**

✓ **HOW ARE THEY DIFFERENT?**

✓ **WHERE CAN I GET MORE?**

✓ **HOW CAN SPIES AND ANALYSTS HELP ME?**

✓ **WHAT DOES IT LOOK LIKE IN ACTION?**

OPEN MIDDLE & SPIES AND ANALYSTS

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