THE EV Project

Information Dissemination Plan Presentation

June 10, 2013

Agenda

Introductions & Logistics – Tom Garetson	10:00-10:10
DoE Perspective – Lee Slezak	10:10-10:15
Process Overview – Don Karner	10:15-10:30
Data Collection – Jim Francfort	10:30-10:45
Vehicle Utilization– John Smart	10:45-11:05
Charger Utilization – Steve Schey	11:05-11:25
Lessons Learned – Tom Garetson	11:25-11:45
Final Remarks – Tom Garetson	11:45-12:00

Lee Slezak

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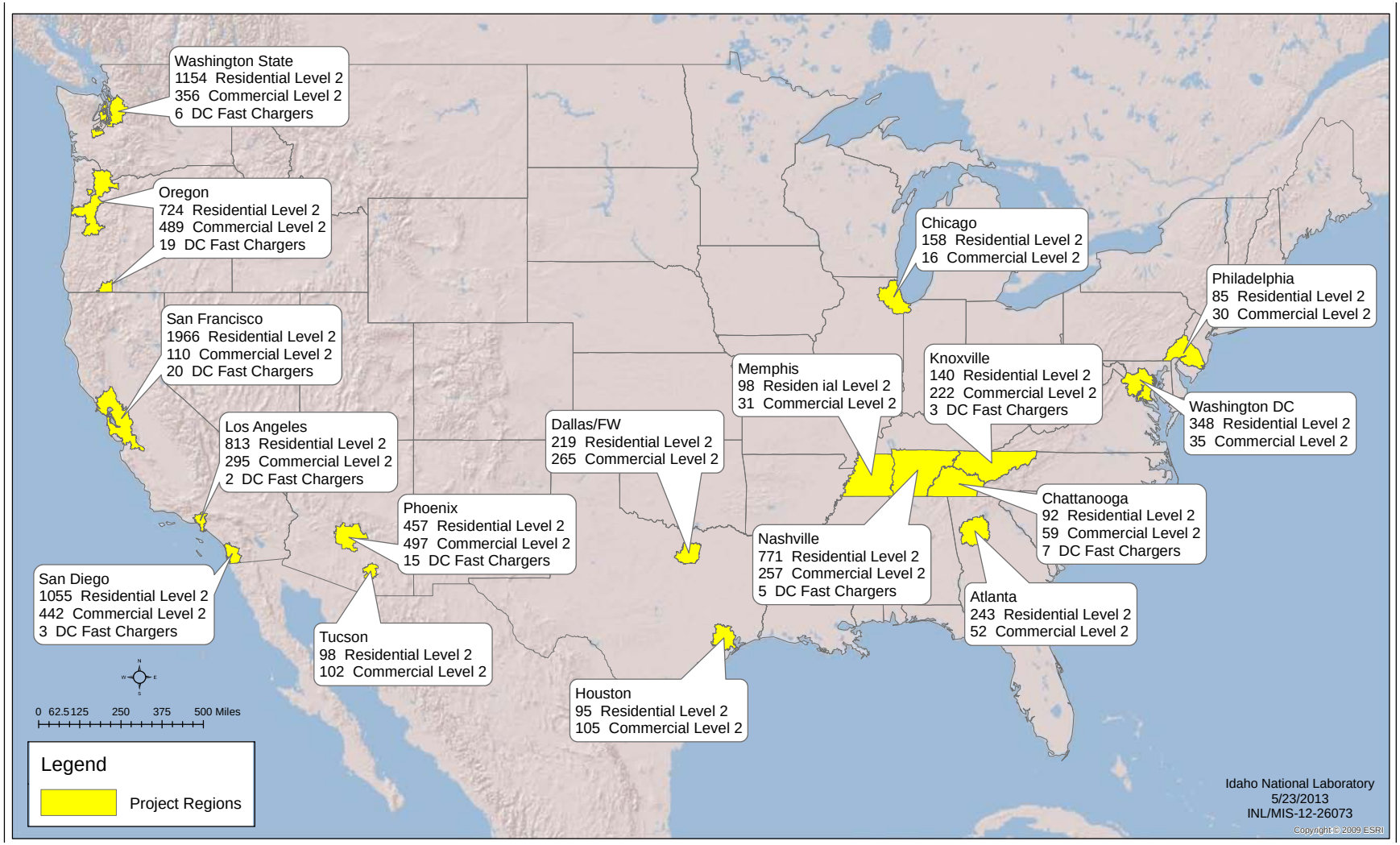
Process Overview

EV Project Objectives

- Develop mature charge infrastructure “laboratories”,
- Collect and analyze data characterizing vehicle and infrastructure utilization,
- Demonstrate measures to minimize impacts of charging on the grid,
- Conduct trials of payment systems,
- Evaluate business models for non-residential charging infrastructure, and
- Document and disseminate the results of the Project.

Deployment Status



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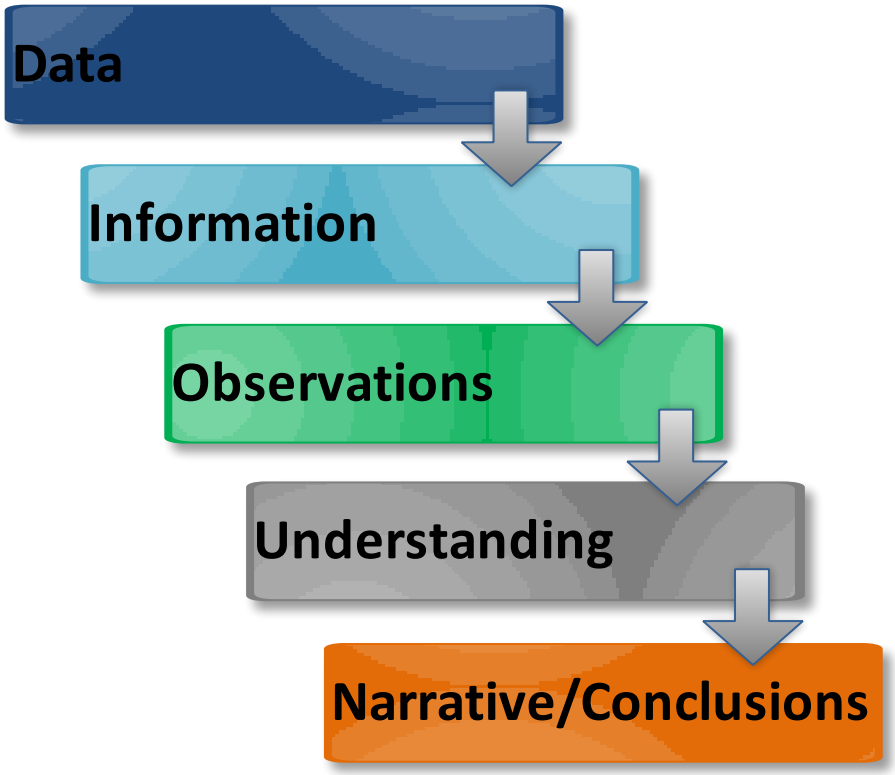
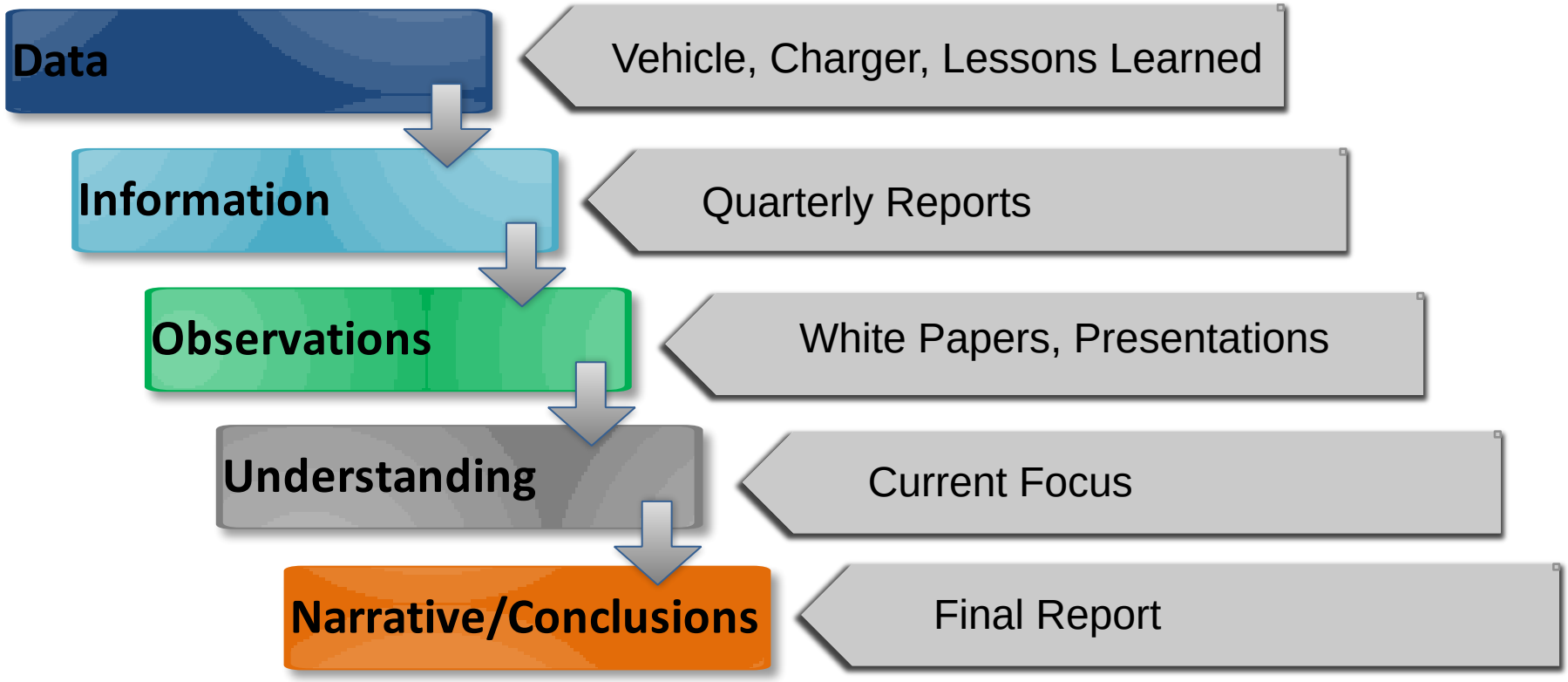
Information Dissemination Plan

- Plan Requirements
  - Handle multiple data types
    - Electronic
      - Vehicle
      - Charger
    - Experiential
      - Deployment
      - Operations
      - Surveys
  - Address multiple audiences
    - Government
    - Vehicle owners
    - Charger hosts
    - Electric utilities
    - Vehicle OEMs
    - EVSPs



Information Dissemination Plan



Understanding

- **Look From Bottom Up**
  - Synergize Data, Information & Observations
  - Look for a specific result
  - Facilitate a specific action to be taken
- **Focus On Stakeholder Audiences**
  - View EV Project resources from audience perspective
  - Develop potential "Use" for Understanding
- **Derive "Questions" Necessary To Achieve Understanding**
  - Broad audience application
  - Within scope of EV Project

Dissemination Plan Development

- **Understanding Developed Through Stakeholder Workshops**
  - Live workshop in Phoenix
    - Stakeholder audiences invited to participate
    - "Uses" & "Questions" gathered in breakout sessions
  - Webinar workshops
- **Questions Prioritized & Selected For Analysis**
  - Contractual requirement
  - Within limitations of EV Project data
  - Broad audience application
- **Method Of Presentation Selected**

Dissemination Plan Presentation

- **Data Collection & Information**
  - Jim Francfort
- **Observations**
  - **www.TheEVProject.com**
- **Understanding**
  - Questions presented in three areas
  - Vehicle utilization
  - Charger utilization
  - Lessons Learned
- **Conclusions**
  - Final Report 3/31/14

Data Collection

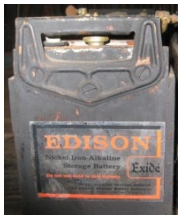
Presentation Outline

- Data Collection and Security History
- Today's Vehicle/EVSE Data Management Process
- Today's Data Collection Security
- EVSE Data Parameters Collected per Charge Event
- Vehicle Data Parameters Collected per Start/Stop Event
- EV Project Data Management Systems
- EV Project Databases
- Data Handling Requirements
- Data Collection Summary

Data Collection and Security History

- In 1993 the AVTA used then state-of-art 386 PCs and the USPS to collect data from 300 EVs
- In 1994 hand-held, optical probes (with lithium batteries) connected to laptops read ABB meters on vehicles and EVSE (electric vehicle supply equipment)
- Since 1994, reporting has never identified PII and no secondary raw data has been released outside the AVTA test partners

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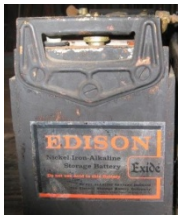
Data Collection and Security History – cont'd

- 2007 data downloading starts via the www for 44 PEVs
- Major 2008 data collection advancement with use of cellular onboard vehicle data loggers in 28 states and three countries for 200 PEVs
  - NDAs continue to protect PII and raw data
- Twenty year history of data security





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Current Vehicle/EVSE Data Management Process

Process Driven by Disclosure Agreements

HICEVs

HEVs

PHEVs

BEVs & EREVs

EVSE & Chargers

File server

SQL Server data warehouse

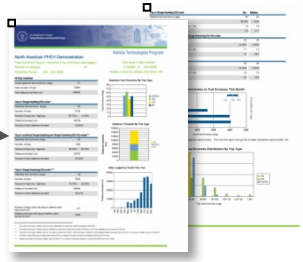
Report generator

INL Vehicle Data Management System

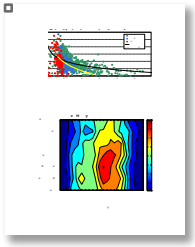
Data quality reports

Individual vehicle reports

Fleet summary Reports - Public



Focused technical analyses and custom reports



Modeling and simulation input

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Current Data Collection Security

- All vehicle, EVSE (electric vehicle supply equipment), and PII (personally identifiable information) data is legally protected by NDAs (Non Disclosure Agreements)
  - Limitations on how proprietary and personally identifiable information can be stored and distributed
  - Raw data, in both electronic and printed formats, is not shared with DOE in order to avoid exposure to FOIA
- Vehicle and EVSE data collection would not occur unless the data collection partners trust (and have legal assurance) that ECOtality North American (ECOtality) and the Idaho National Laboratory (INL) will strictly adhere to all NDAs and confidentially agreements regarding the non-release of data

Current Data Collection Security – cont'd

- EV Project NDAs are required between
  - ECOtality
  - INL
  - OnStar
  - Nissan
  - Car2Go
- 12,000 vehicle owners, and public EVSE and DC fast charger hosts have signed confidentiality agreements
- 20,000 networked vehicle, EVSE & DCFC data sources
- Vehicle and EVSE data collection would not occur unless the data collection partners trust (and have legal assurance) ECOtality and INL will strictly adhere to all NDAs and confidentially agreements regarding the non-release of data

Data Parameters Collected per Charge Event

- Data from ECOtality's Blink EVSE network
  - Connect and Disconnect Date/Time
  - Start and End Charge Date/Time
  - Maximum Instantaneous Peak Power
  - Average Power
  - Total energy (kWh) per charging event
  - Rolling 15 Minute Average Power
  - Unique ID for Charging Event
  - Unique ID Identifying the EVSE
  - And other non-dynamic EVSE information (GPS, ID, type, contact info, etc.)

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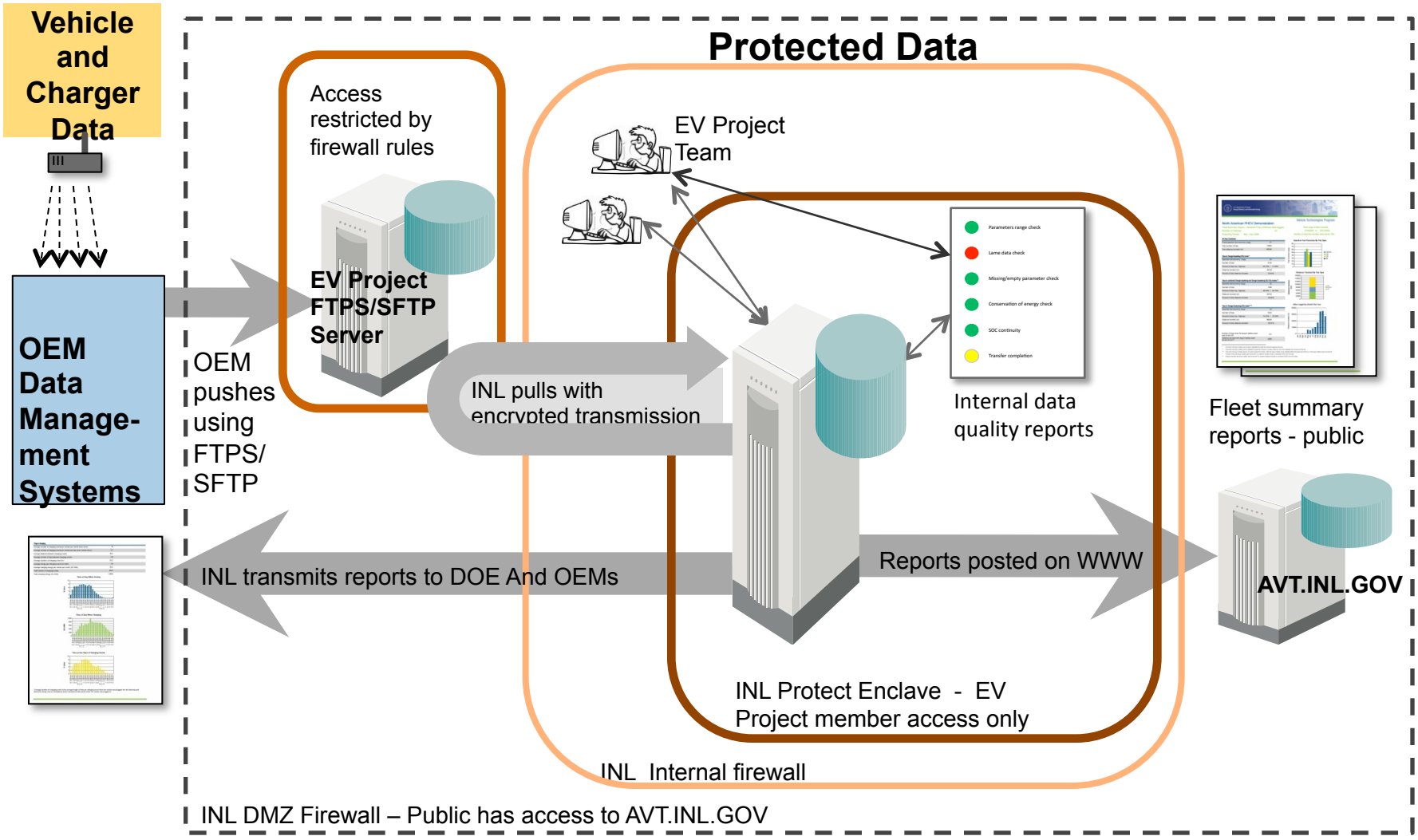
Data Parameters Collected per Key Event

- **Vehicle data is received via telematics providers from Chevrolet Volts and Nissan Leafs**
  - **Odometer**
  - **Battery state of charge (Indicated)**
  - **Date/Time Stamp**
  - **Vehicle ID**
  - **Event type (Key on / Key off)**
  - **Electric-only odometer (Volt only)**
  - **Gasoline consumption (Volt only)**
  - **GPS (longitude and latitude)**
  - **Recorded for each Key-on and Key-off event**

- **Data is received monthly from Car2go for the Smart EVs**
  - **Odometer reading, date and VIN**

EV Project Data Management System



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EV Project Databases

- The EV Project has 44 Databases (DB)
  - Nissan Leaf
  - GM/OnStar Volt
  - ECOtality Blink EVSE
  - Aerovironment EVSE
  - EPRI EVSE
  - Admin (look up tables, territories, zips codes, QA parameters, etc.)
    - Each of the above six DBs has three versions (process, stage & production) = 18 DBs
  - Four GIS DBs for the Leafs, Volts, Blink EVSEs, and Base (streets, utility service territory areas, etc.)
  - The above 22 (18 + 4) DBs exist on two systems = 44 DBs
- This is not a flat file experience = this is NOT a simple task

Data Handling Requirements

- Hundreds of Algorithms are required to process incoming data from all sources and generate reports
- EVSE data has approximately 60 QA checks. Examples include:
  - Checking for empty events
  - Duplicate records
  - Time stamps misordered
  - Nesting - second events must start after prior event completes
  - Missing energy
  - Inaccurate load factors
  - Is the new EVSE and PEV owner showing off how to insert the J1772 connector over beers in the driveway? Is each one a new charge event?

Data Handling Requirements – cont'd

- **Vehicle data has approximately 15 QA checks. Examples include:**
  - **Minimum trip distances**
  - **Miles missing**
  - **Mileage gaps**
  - **Erroneous miles**
  - **State of charge jumps and spikes (up and down)**
  - **Nested trips**
  - **If you "Key On" to roll up the vehicle windows, the data logger records a new "Trip". What should the minimum trip distance be?**

Data Handling Requirements – cont'd

- Data completeness must be checked. Examples include:
  - How many vehicles and EVSE don't send or stop sending data
  - Vehicles must be successfully paired with "at home" EVSE at the same locations to generate the quarterly Infrastructure Report
    - EVSE cannot be sited in Spain or vehicles parked west of California
    - Problems of unknown PEVs at home charging locations
- In-house GIS mapping service has been developed for territory reporting
- Clustering algorithms developed to pair vehicles and EVSE
- Reporting algorithms generate more than 56,000 parameters that populate the four quarterly reports (120 pages)
  - Accomplished via the use of several thousand lines of code
- Multiple raw data streams allow for data quality comparisons

Data Collection Summary

- Requires reporting quarterly results and trends before completing the EV Project data collection process
- The EV Project requires obtaining data from sources that never shared or even stored data before
- Required signing up 12,000 data partners that agreed to pay for data collection channels and provide PII
- The INL builds nuclear reactors, depleted uranium armor, and plutonium batteries
  - All are data and process dependent processes
  - It is this legacy for quality and excellence of data collection, analysis and reporting that drives the EV Project process

Data Collection Summary – cont'd

- The EV Project would never fly if we did not legally promise our partners that we would control and not release the raw data
- Legal restrictions on releasing PII and proprietary raw data will always be adhered to by the EV Project partners. So, please don't ask (again)
- The EV Project has not been for the *faint of heart*

What I looked like at the EV Project start

Vehicle Utilization

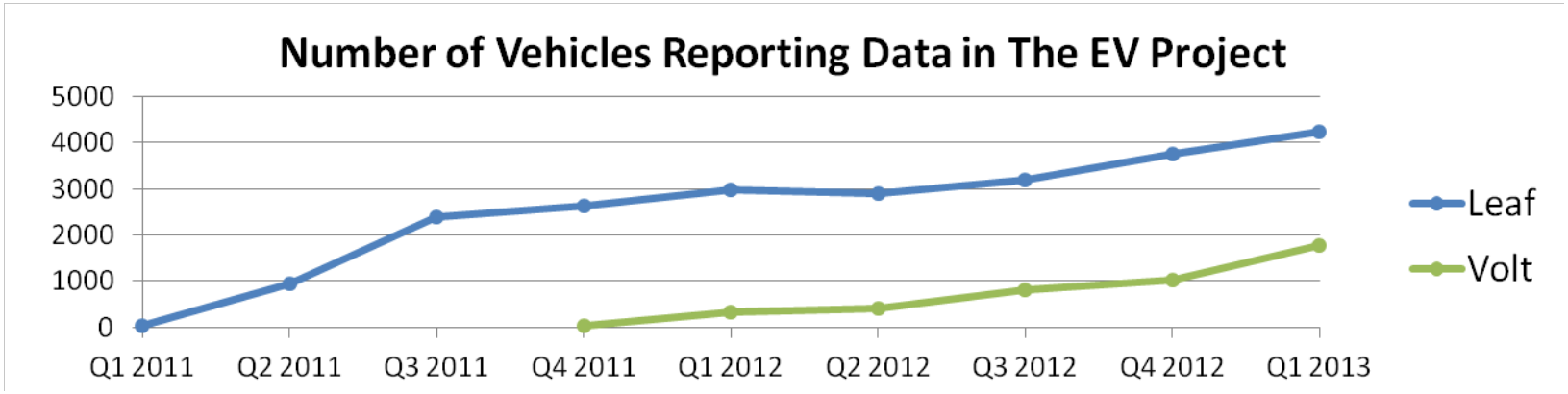
Vehicle Utilization

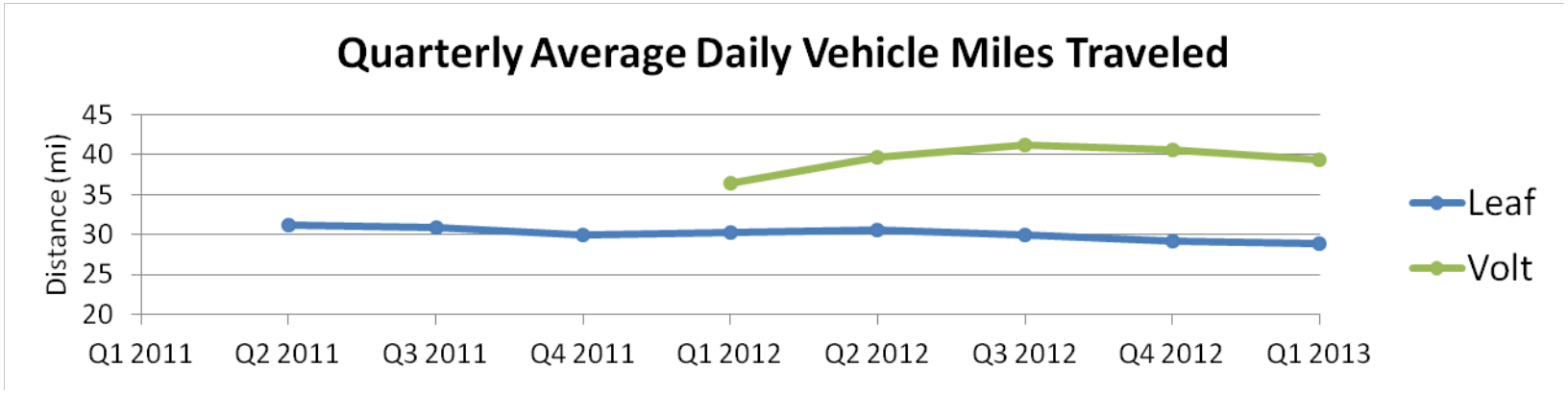
How has Leaf and Volt vehicle usage changed over time?

- Uses
  - Vehicle Operators
  - Utilities
  - Vehicle OEMs
  - Government
- Methodology
  - Analyze selected driver data
  - Trend over time
- Dissemination
  - Report

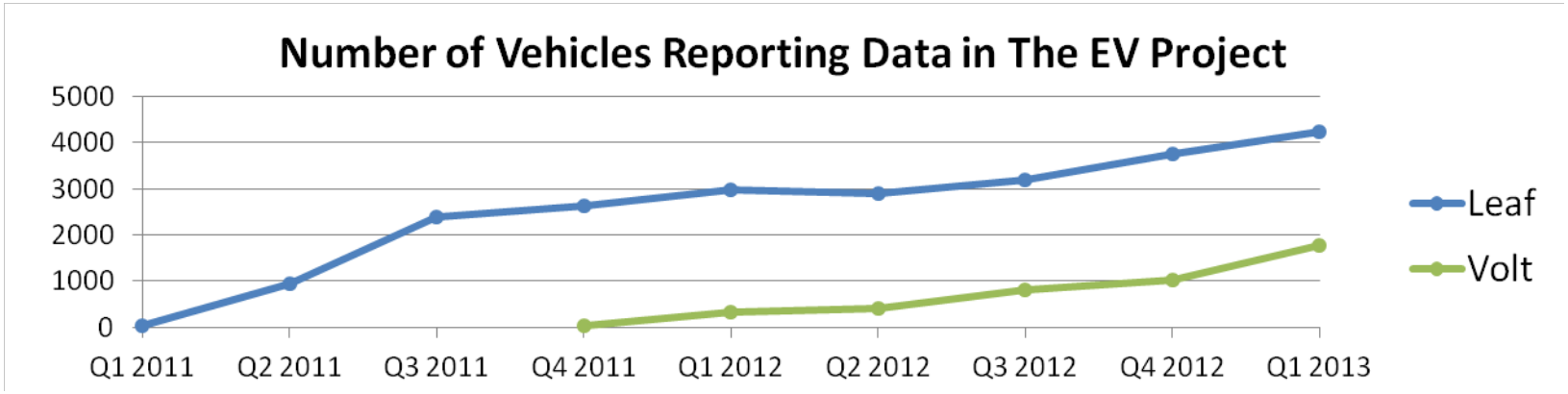
- Analyze usage with metrics such as:
  - DVMT
  - Miles between charging events
  - Percent of charging at home vs. away from home
  - Battery state of charge prior to charging
  - Dwell time at public charging locations
  - Geographic coverage area

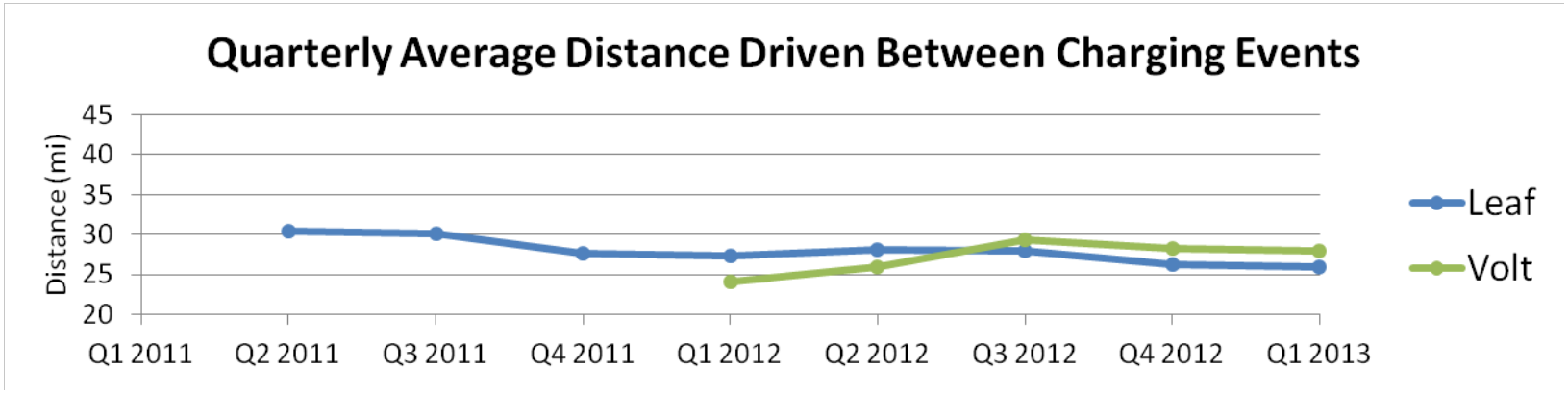
Example: Leaf and Volt DVMT over time





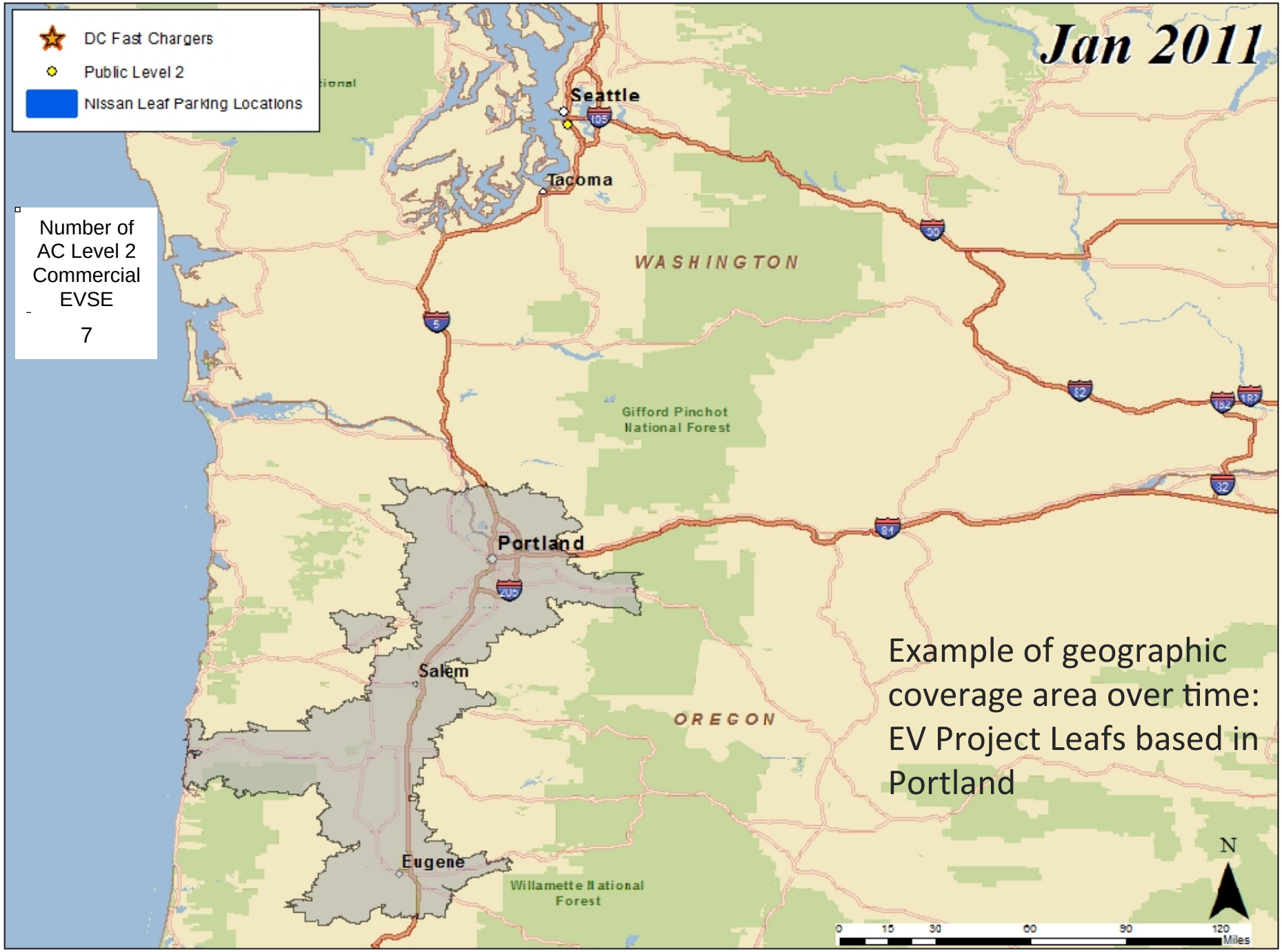
Example: Miles between charging events over time

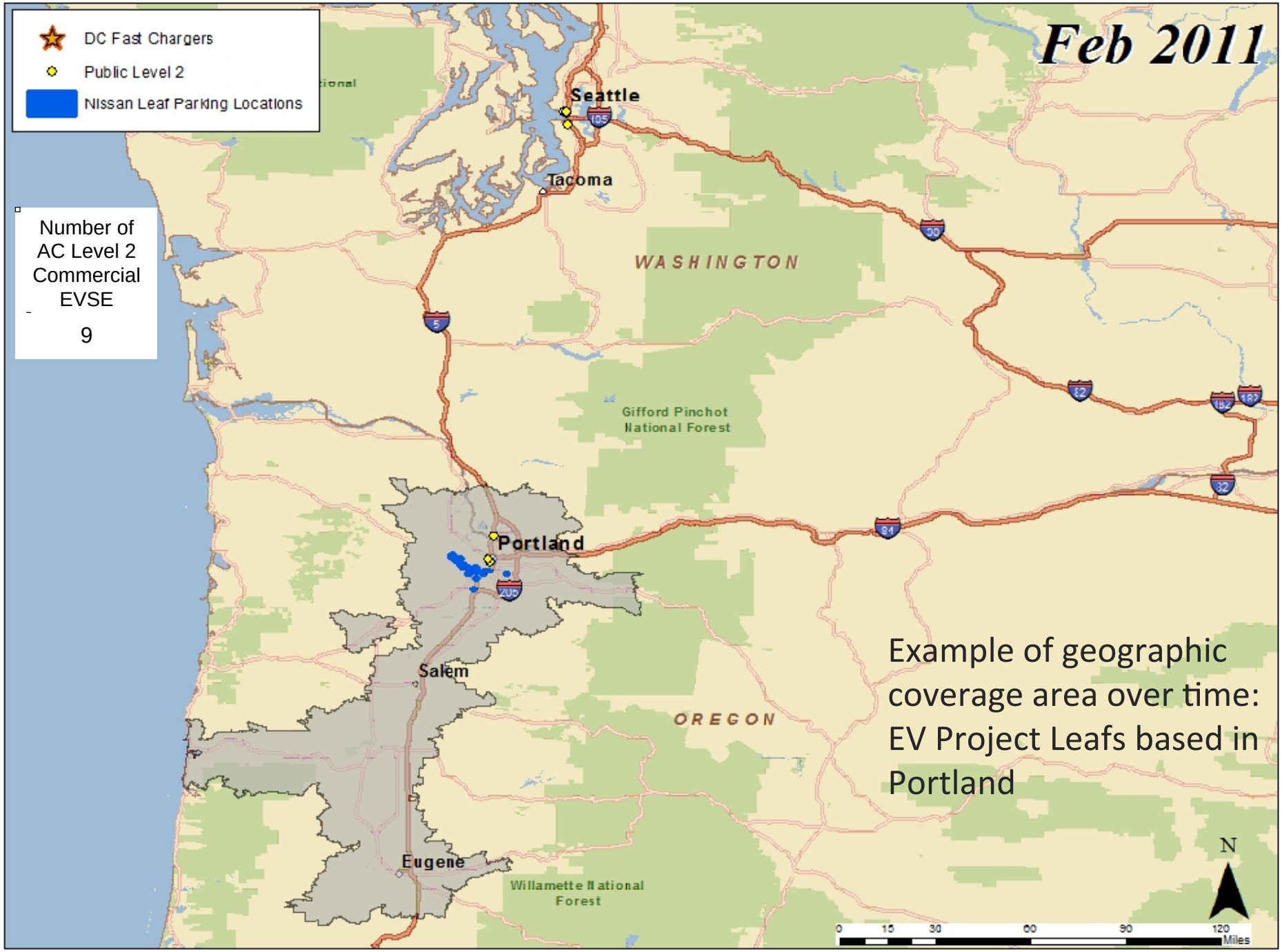




Vehicle Utilization

Example of geographic coverage area over time: EV Project Leafs based in Portland


DC Fast Chargers
Public Level 2
Nissan Leaf Parking Locations
Jan 2011
Number of AC Level 2 Commercial EVSE
7
Seattle
Tacoma
WASHINGTON
Gifford Pinchot National Forest
Portland
Salem
OREGON
Eugene
Willamette National Forest
Example of geographic coverage area over time: EV Project Leafs based in Portland
N
0 15 30 60 90 120
Miles


DC Fast Chargers
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Nissan Leaf Parking Locations
Feb 2011
Number of AC Level 2 Commercial EVSE
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Tacoma
WASHINGTON
Gifford Pinchot National Forest
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Example of geographic coverage area over time: EV Project Leafs based in Portland
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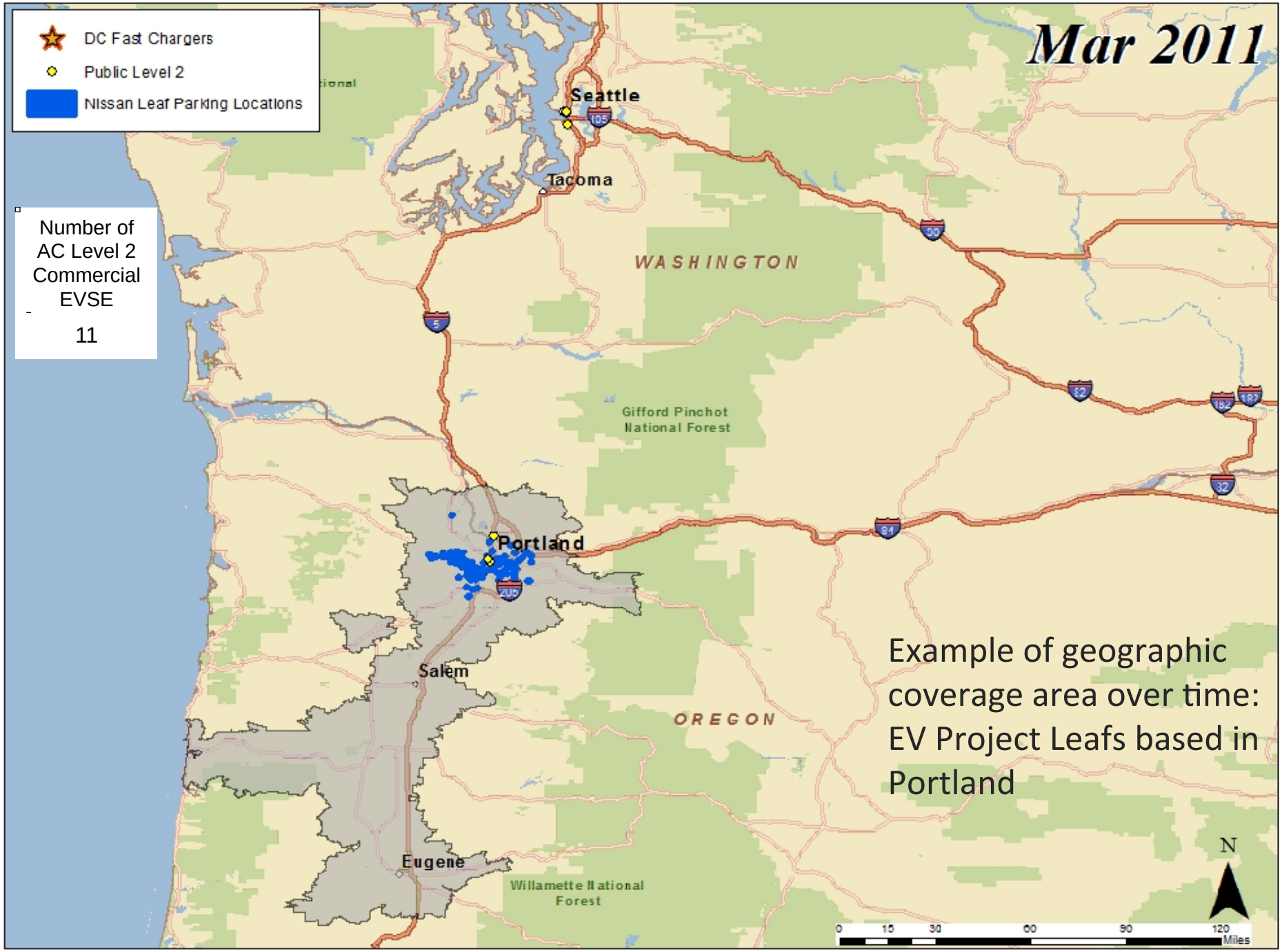
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Nissan Leaf Parking Locations
Mar 2011
Number of AC Level 2 Commercial EVSE
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WASHINGTON
Gifford Pinchot National Forest
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OREGON
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Example of geographic coverage area over time: EV Project Leafs based in Portland
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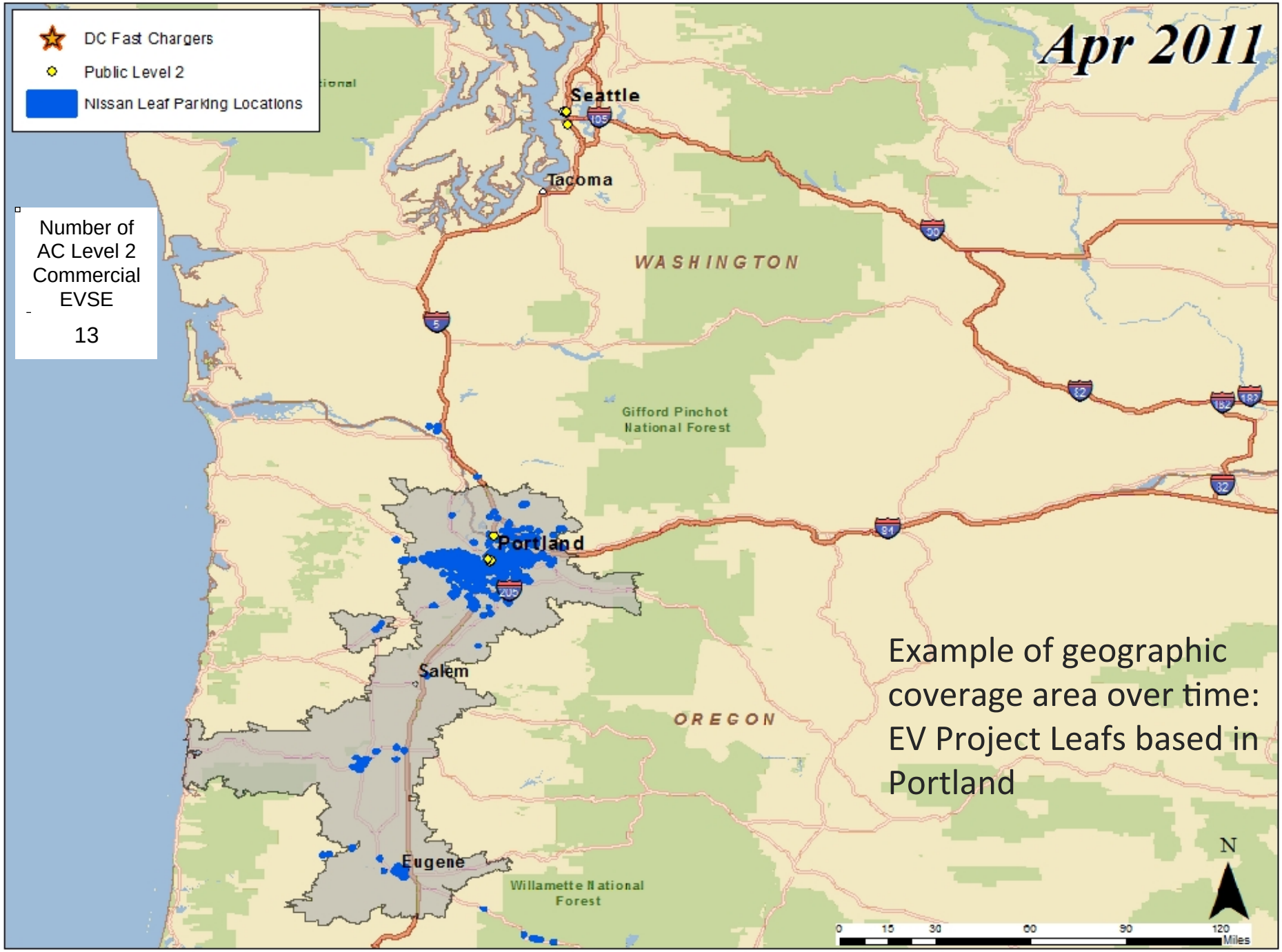
Miles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Apr 2011
Number of AC Level 2 Commercial EVSE
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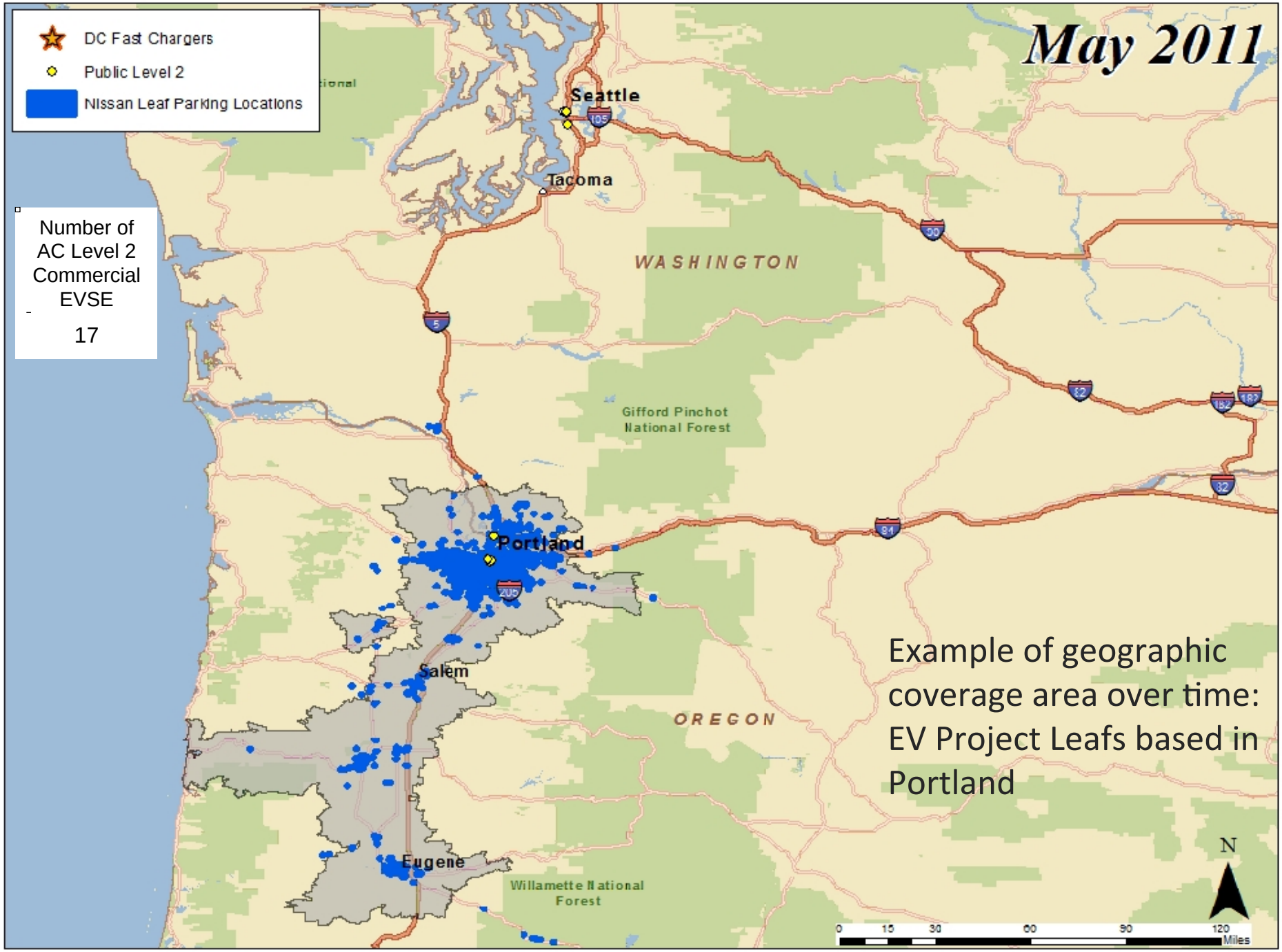
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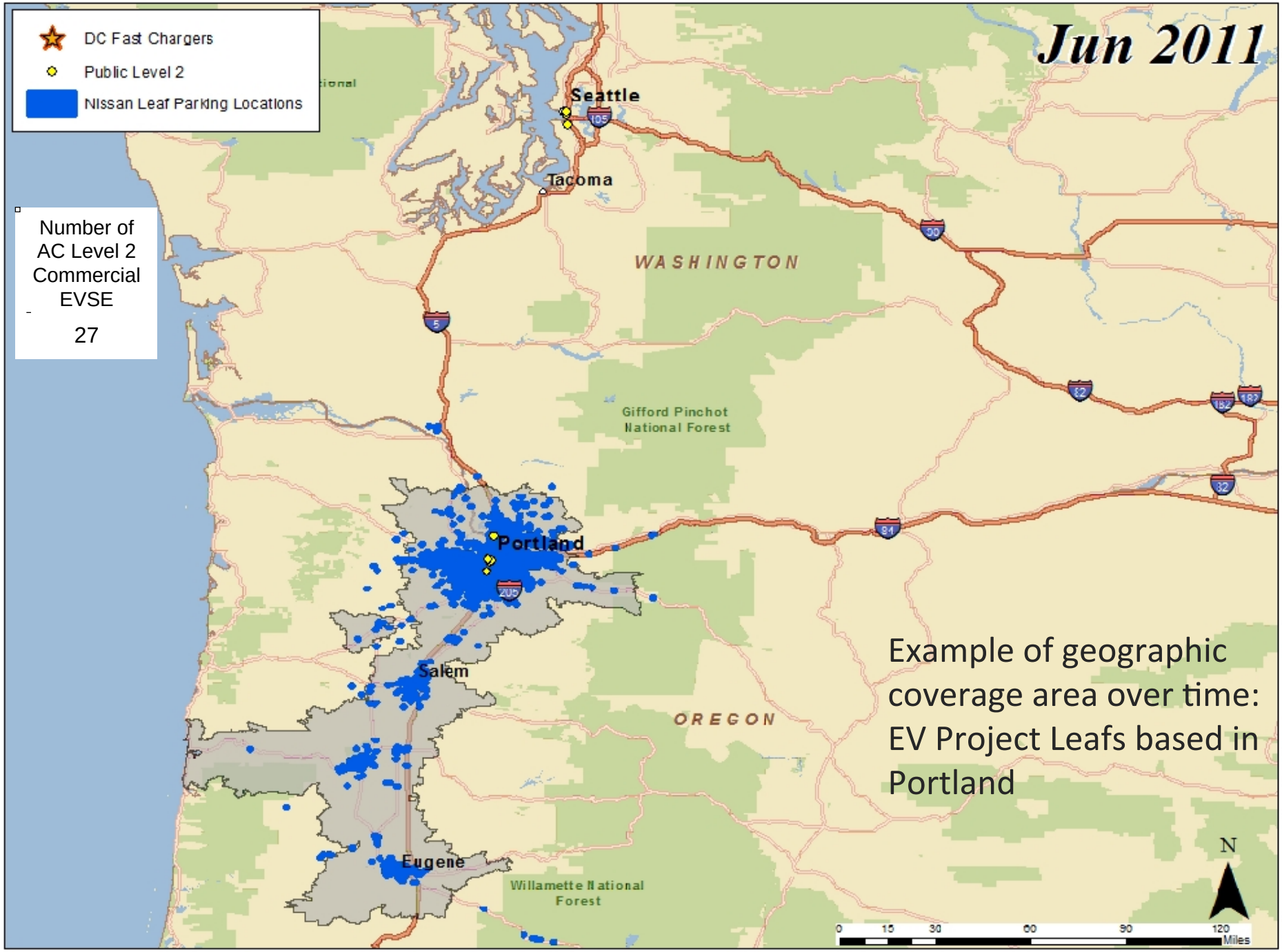
Miles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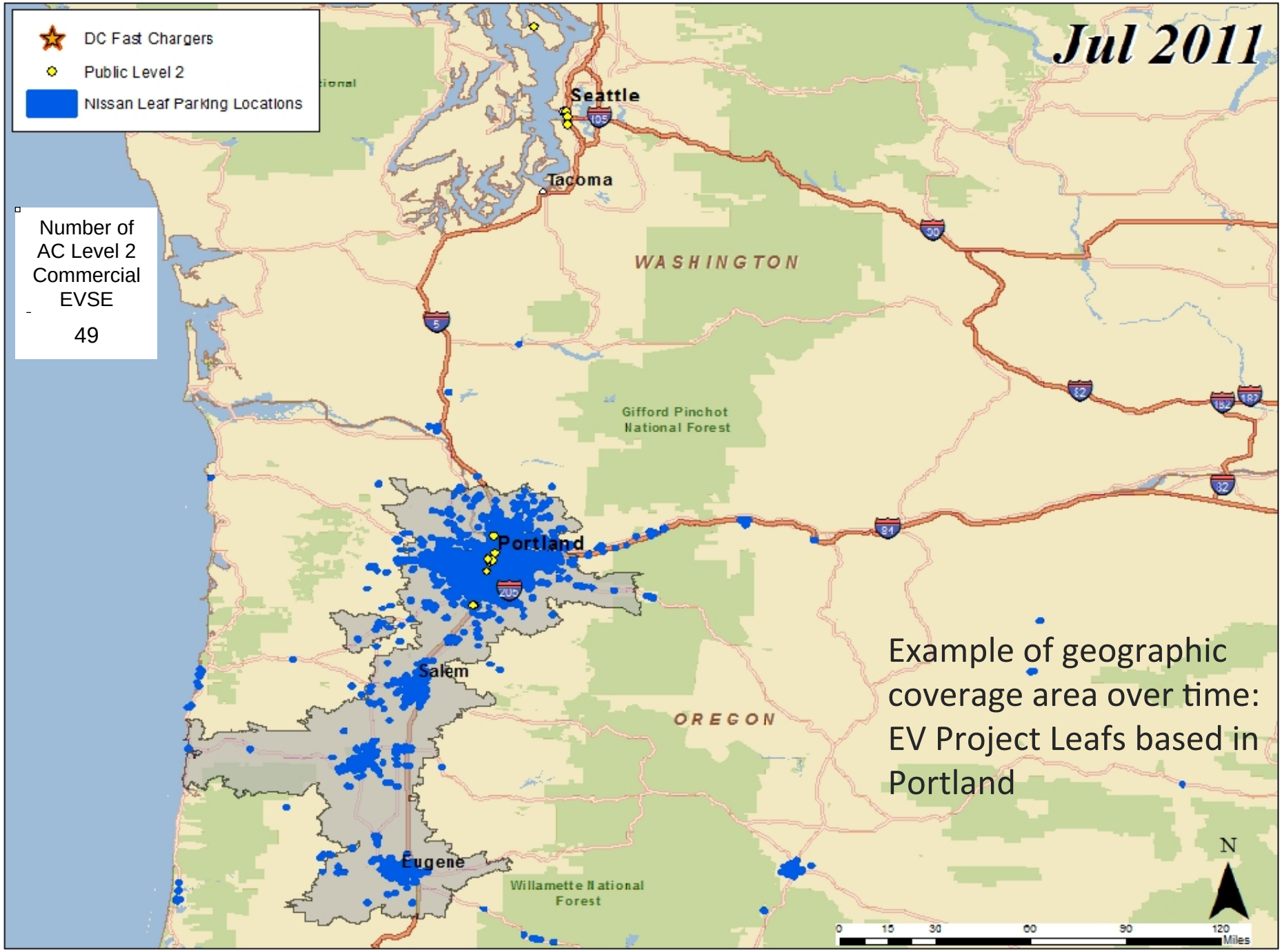
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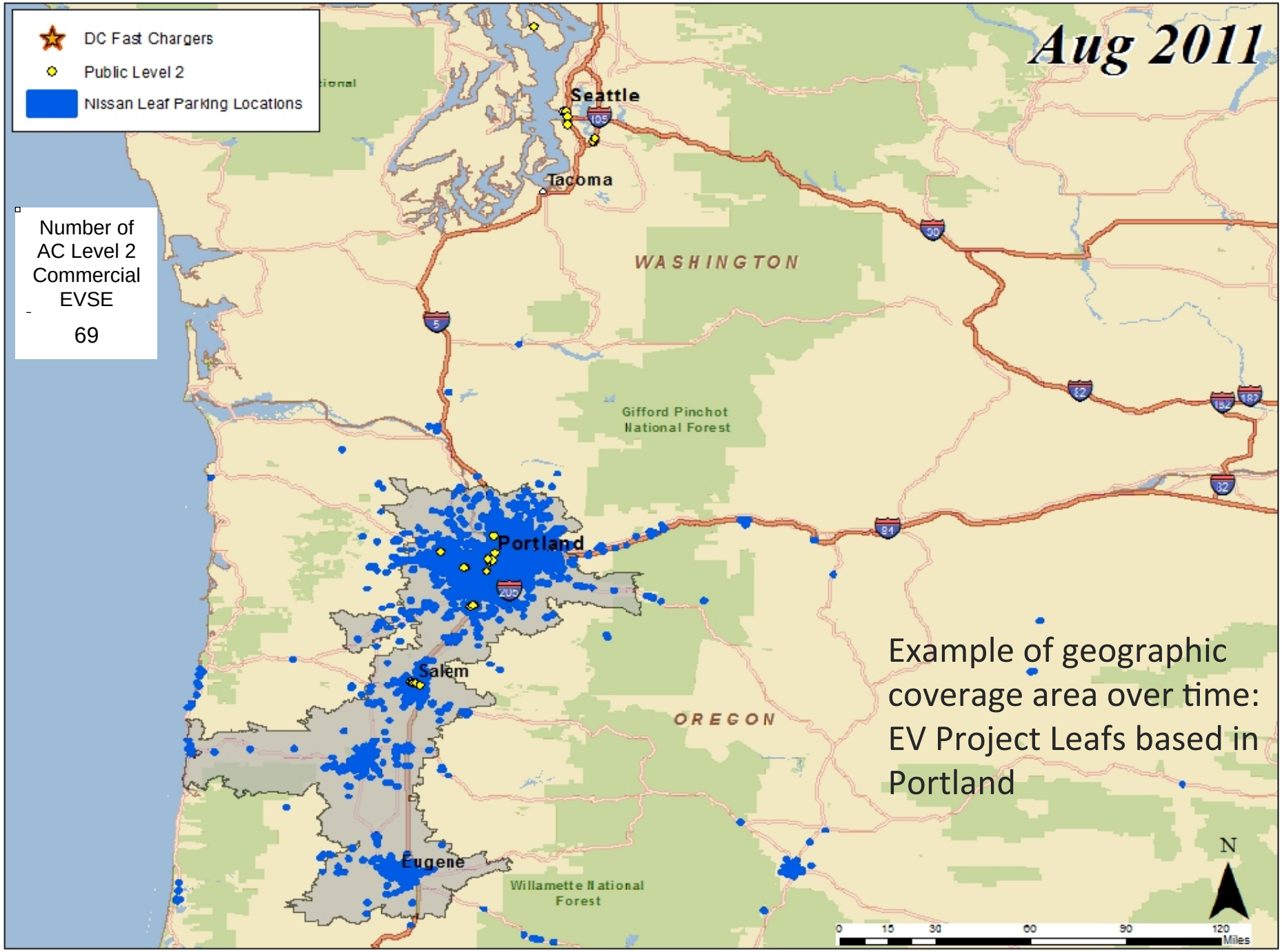
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Number of AC Level 2 Commercial EVSE
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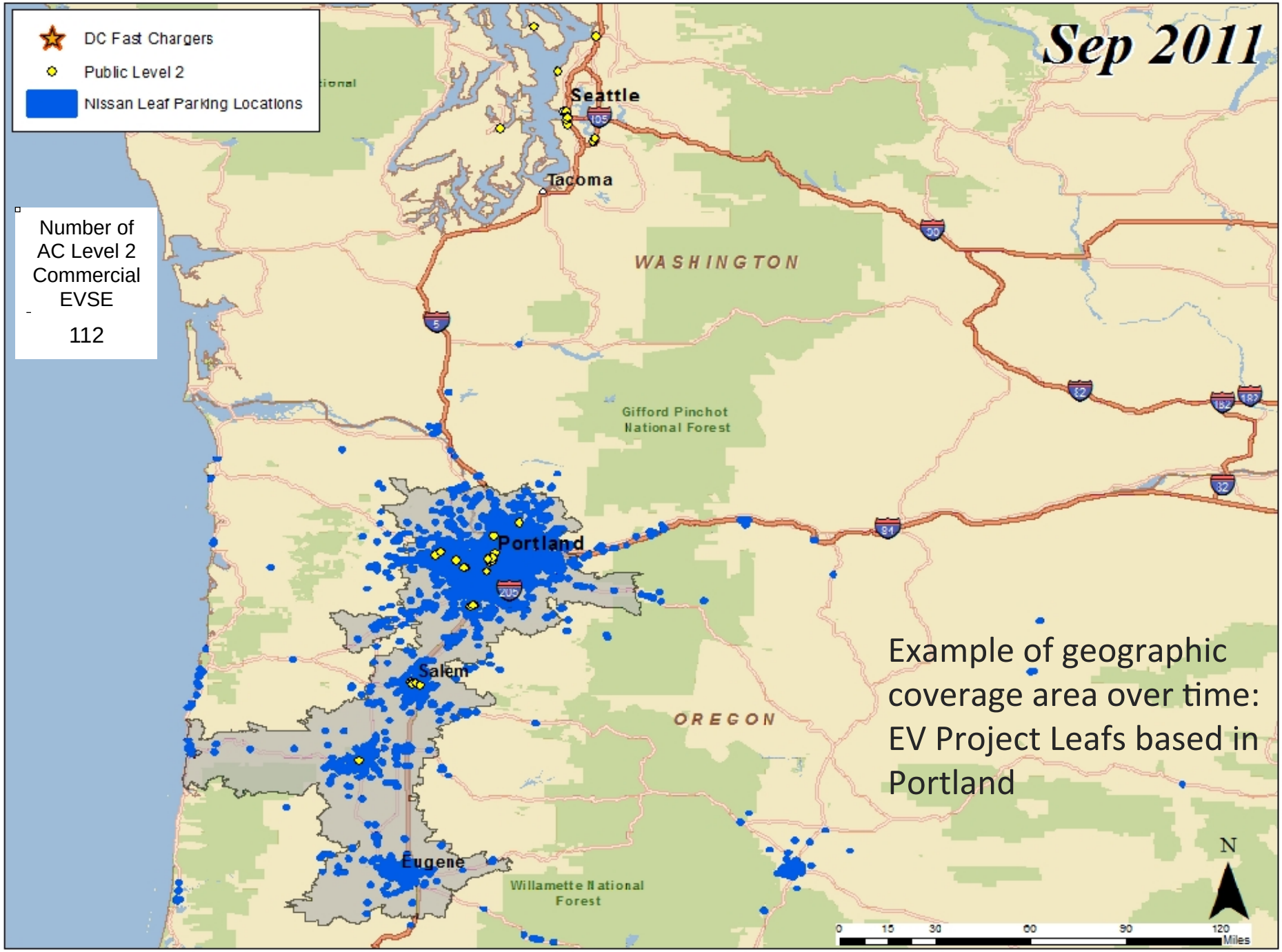
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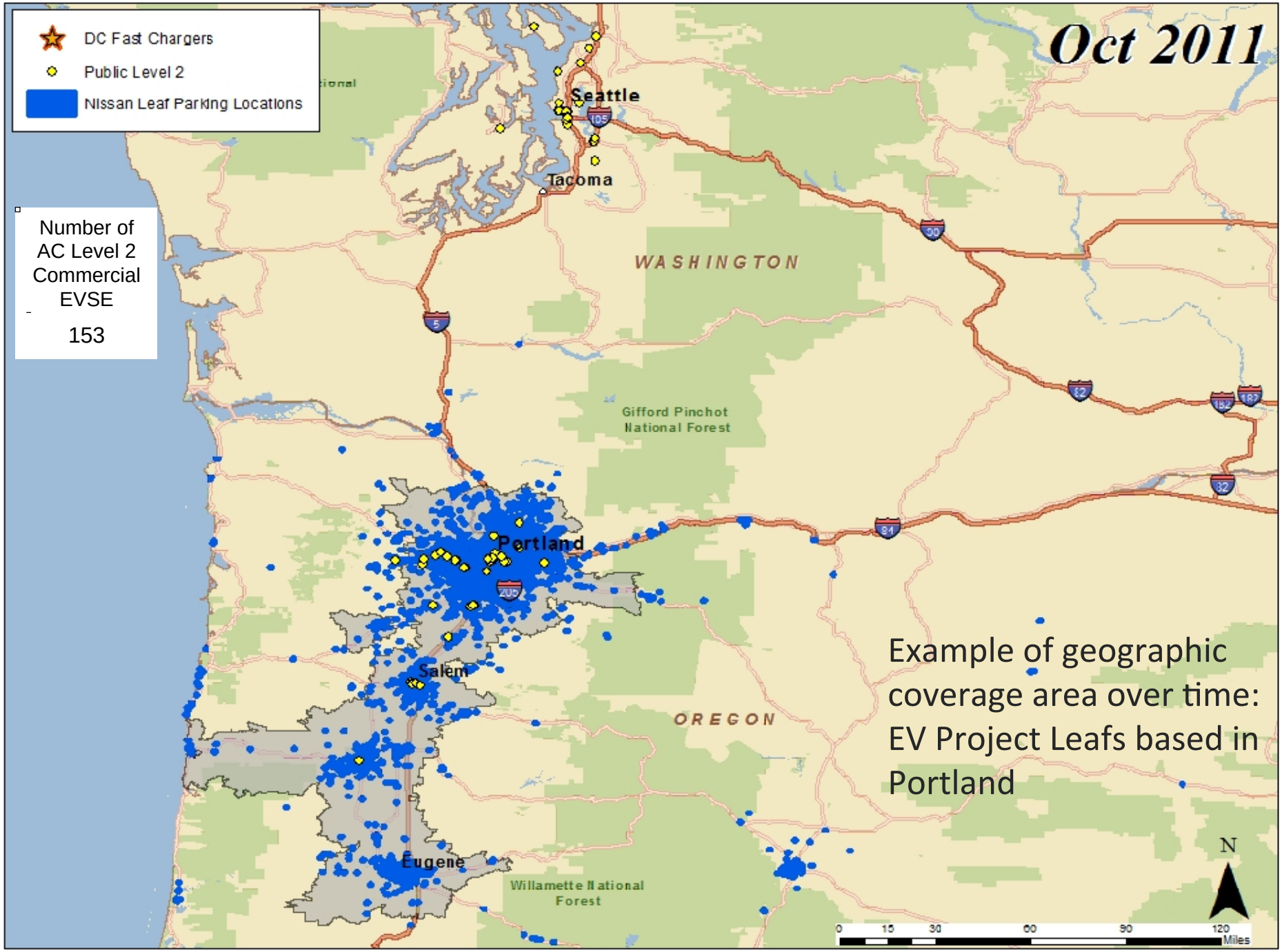
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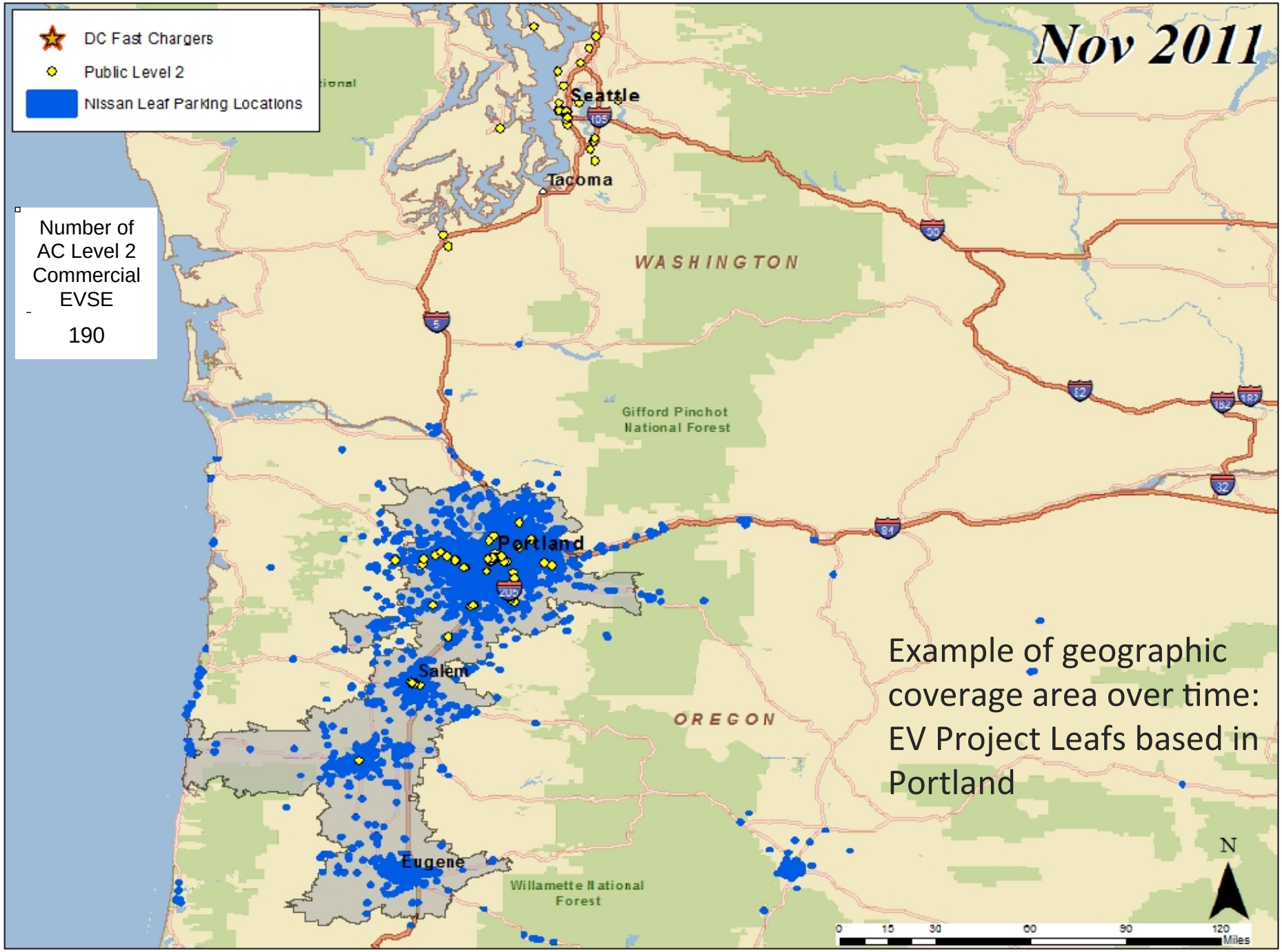
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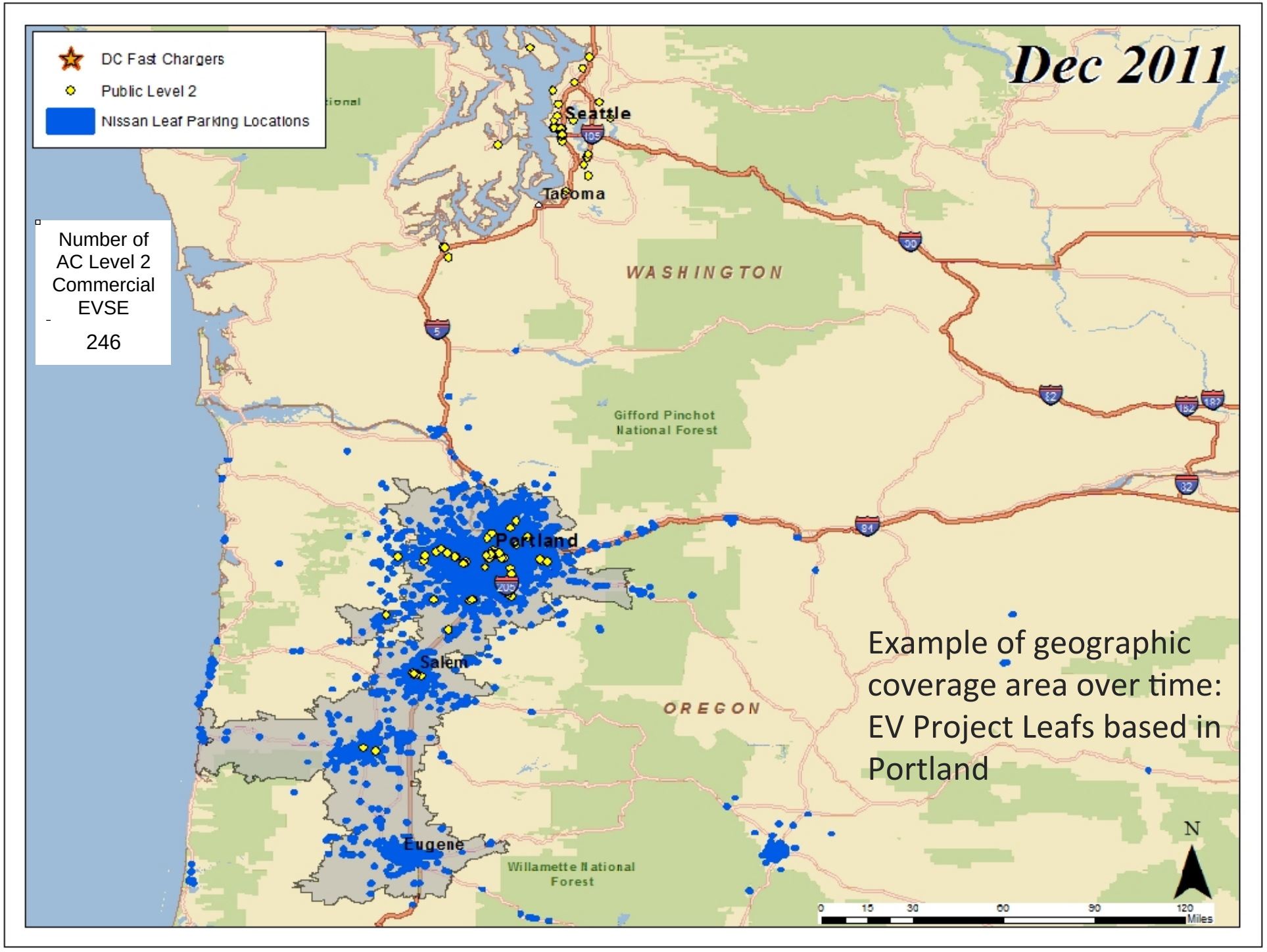
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Dec 2011
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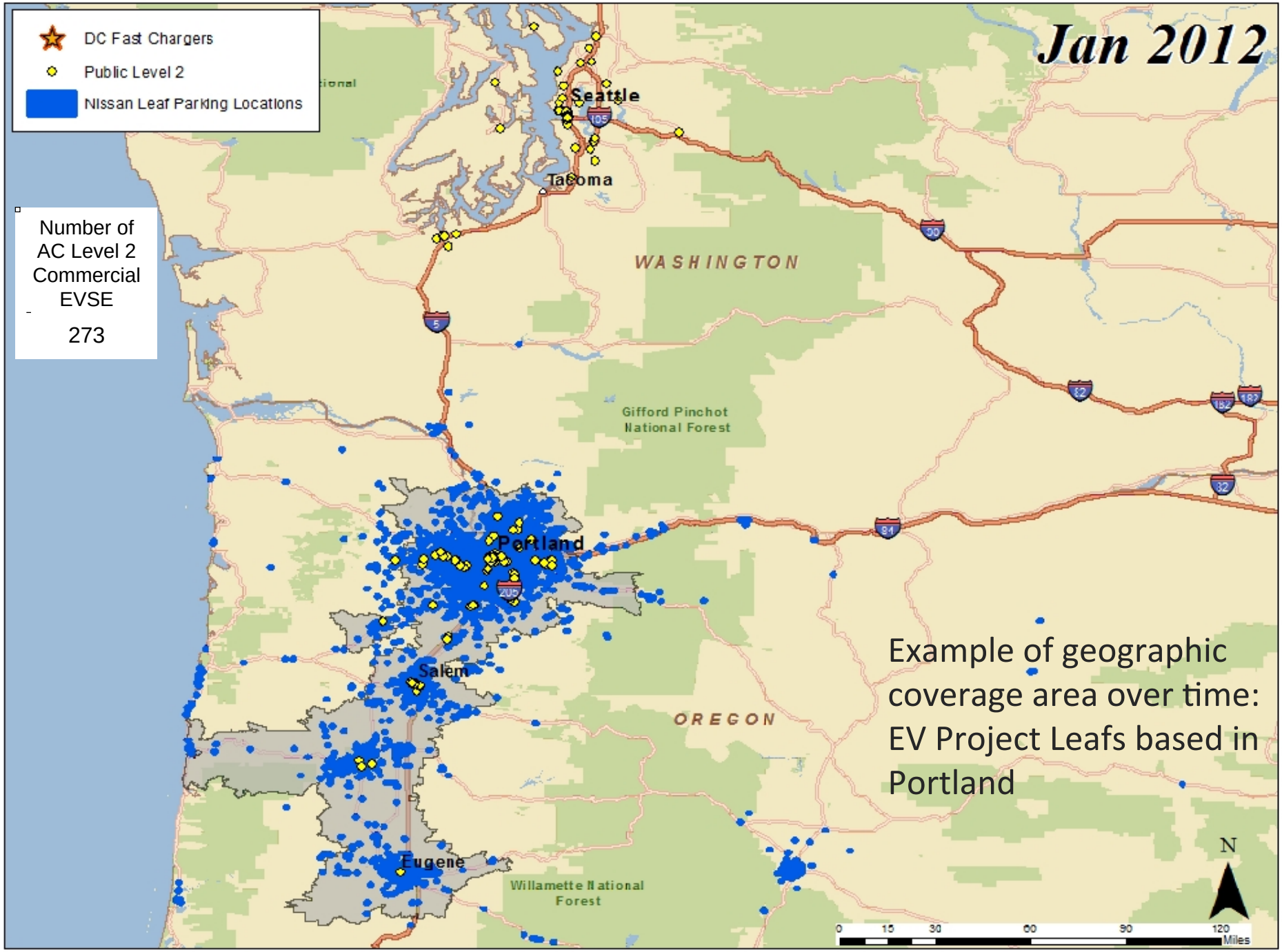
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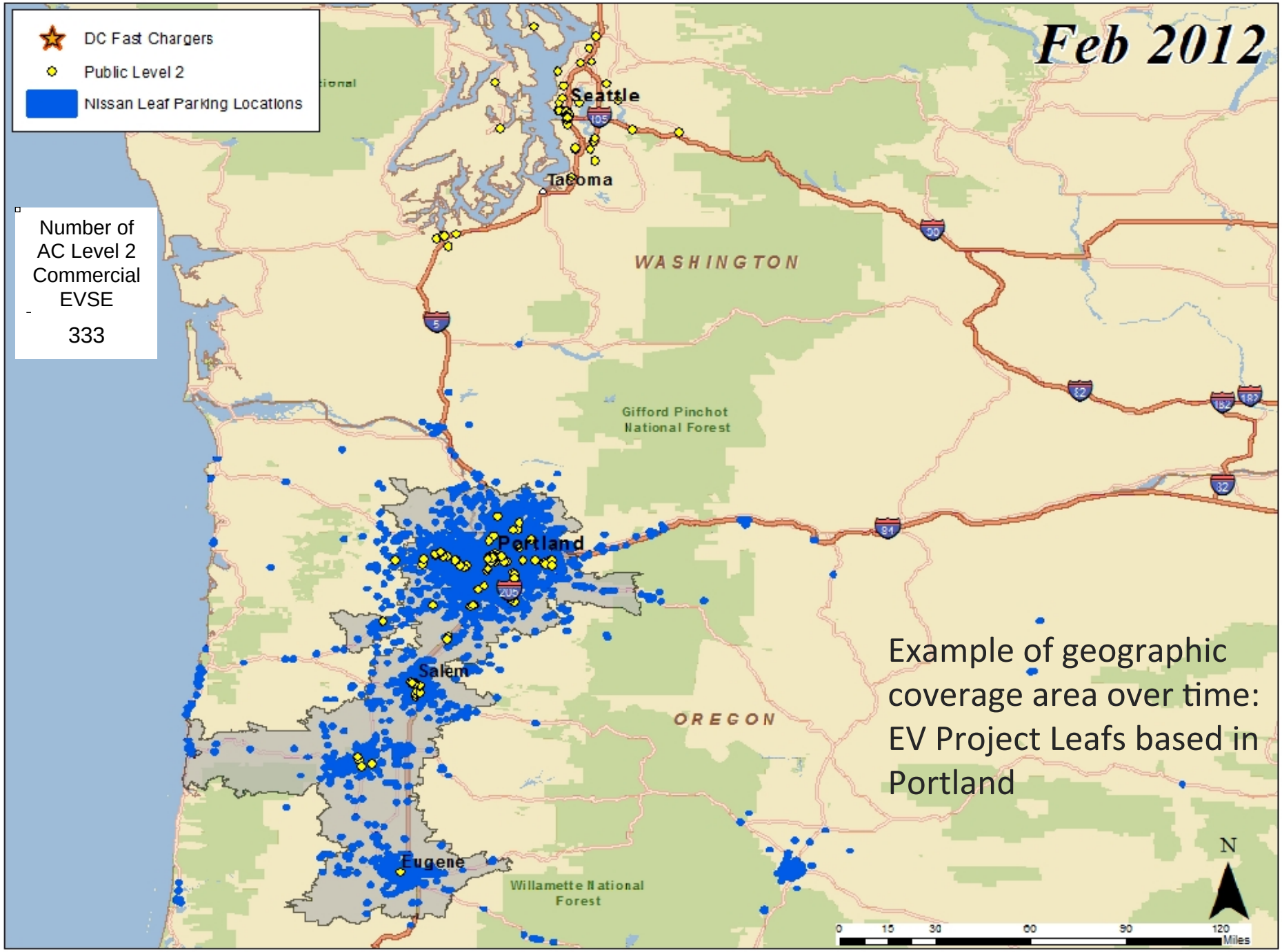
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Feb 2012
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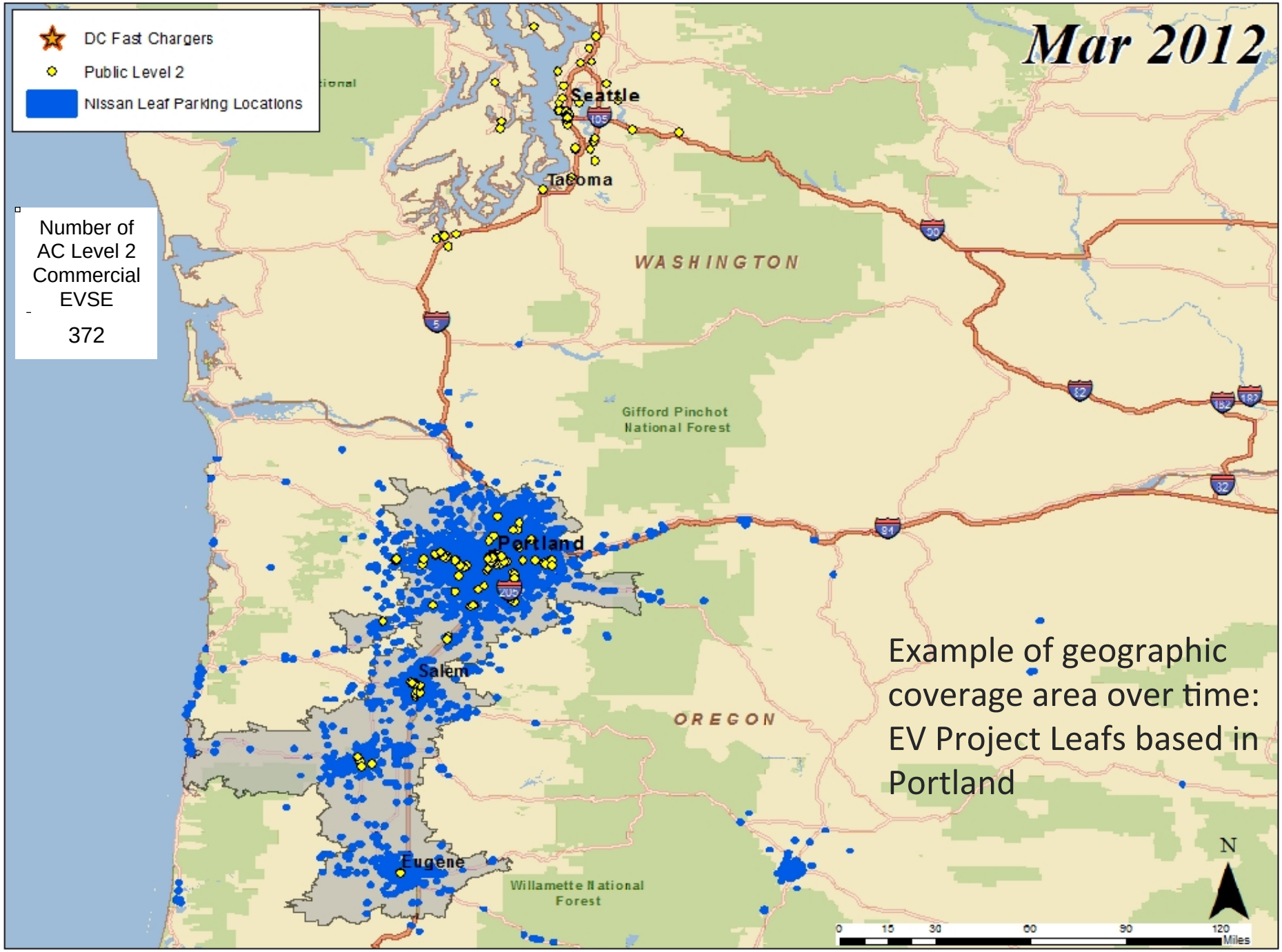
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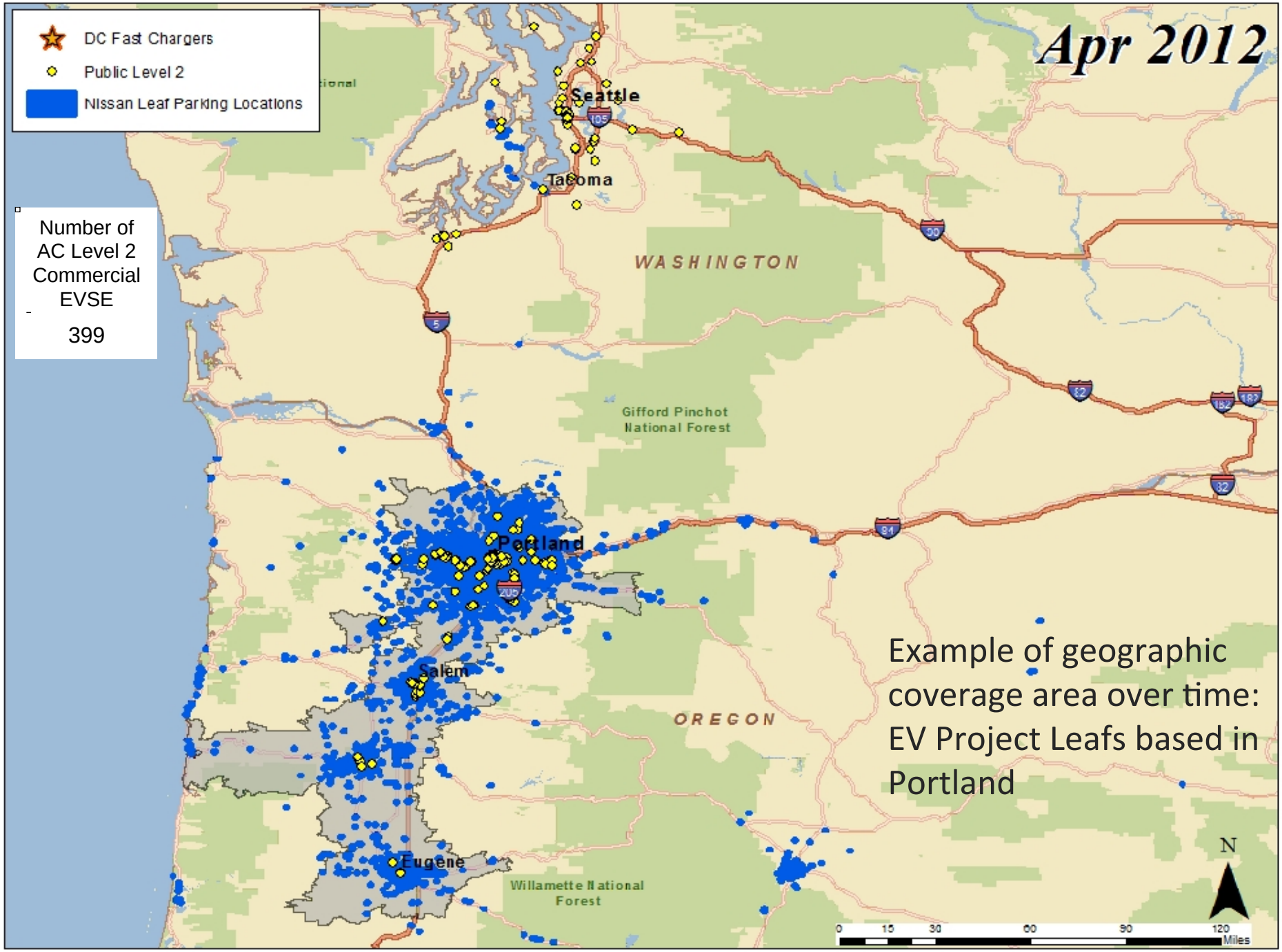
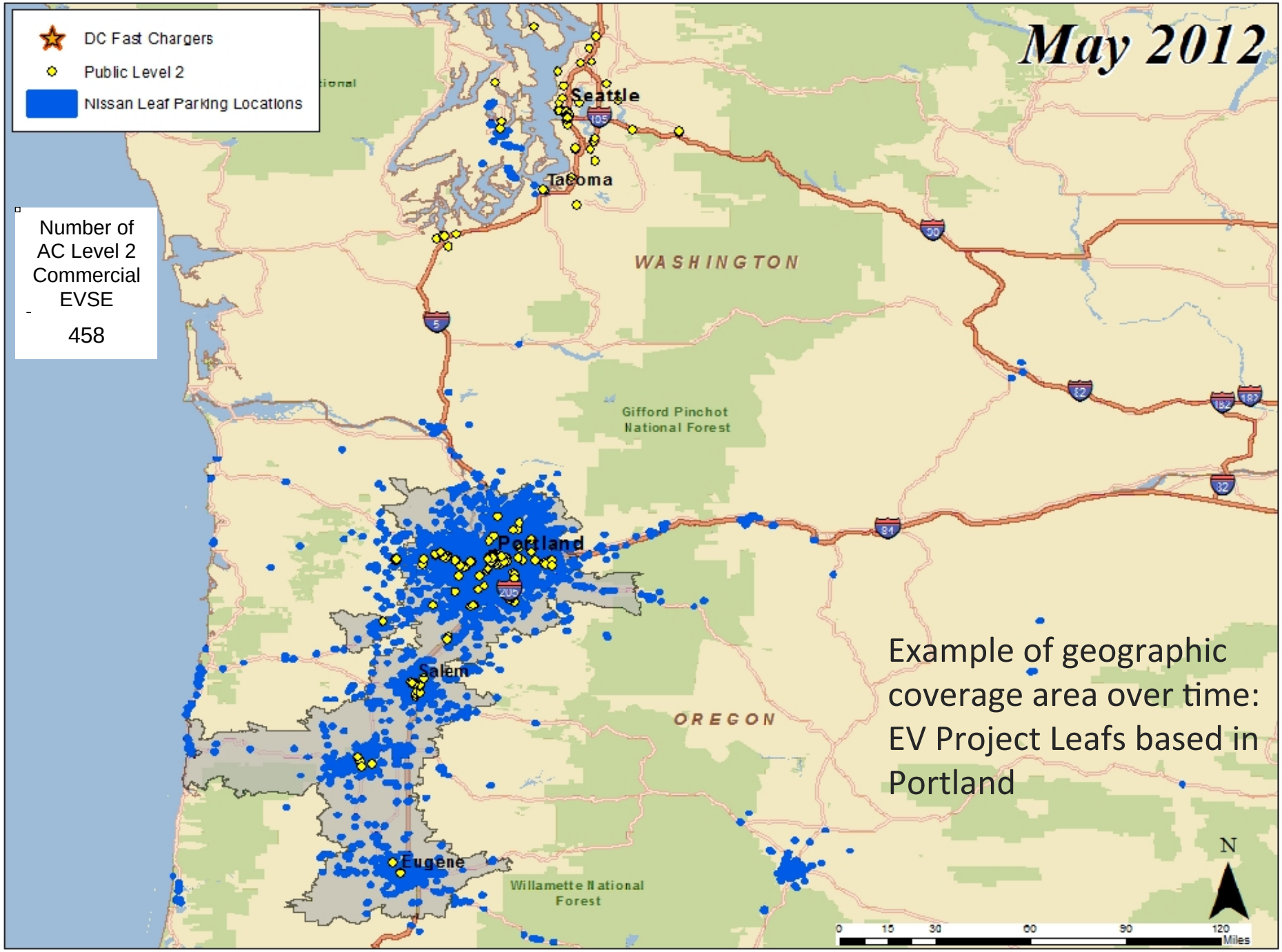
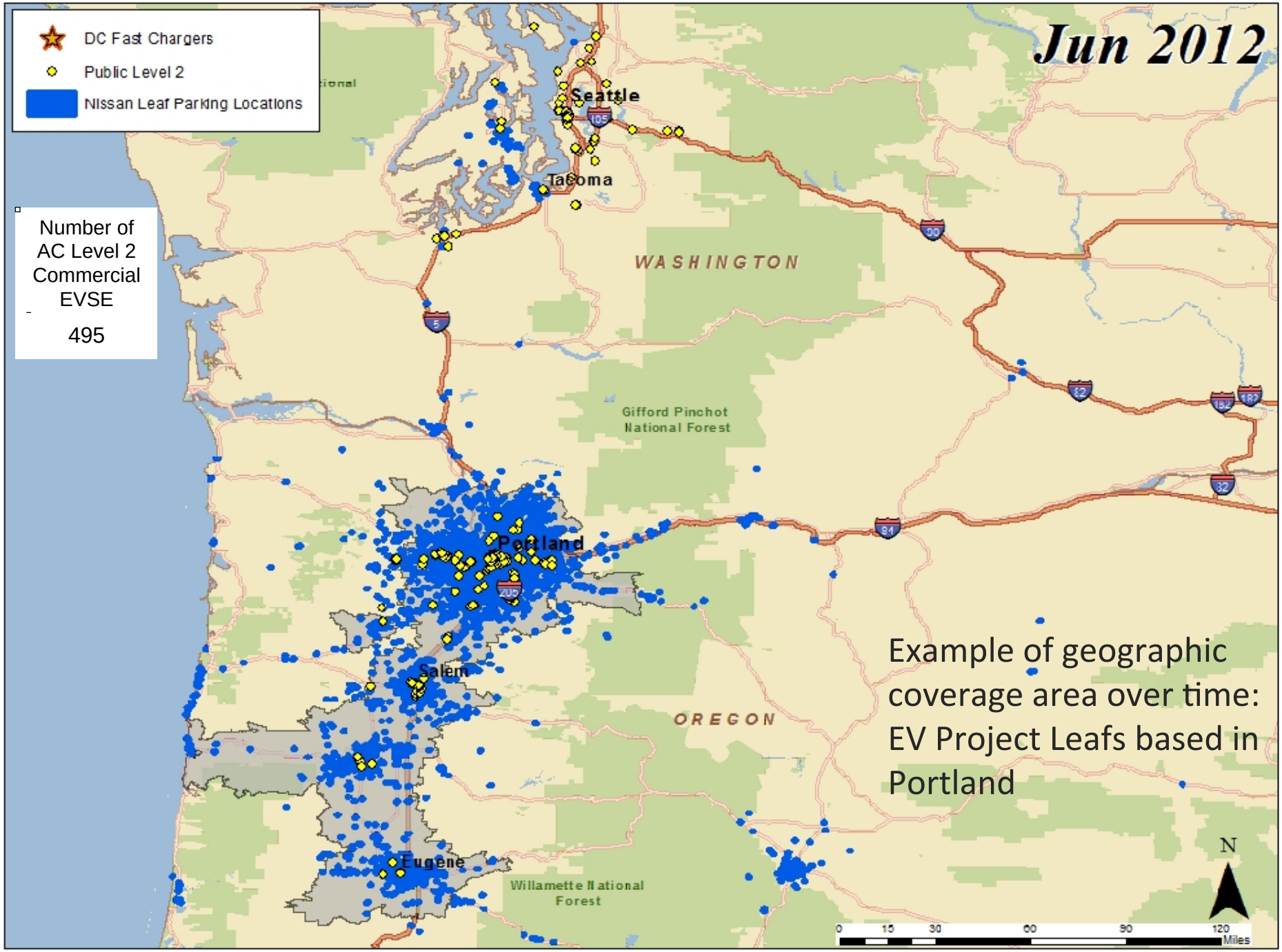
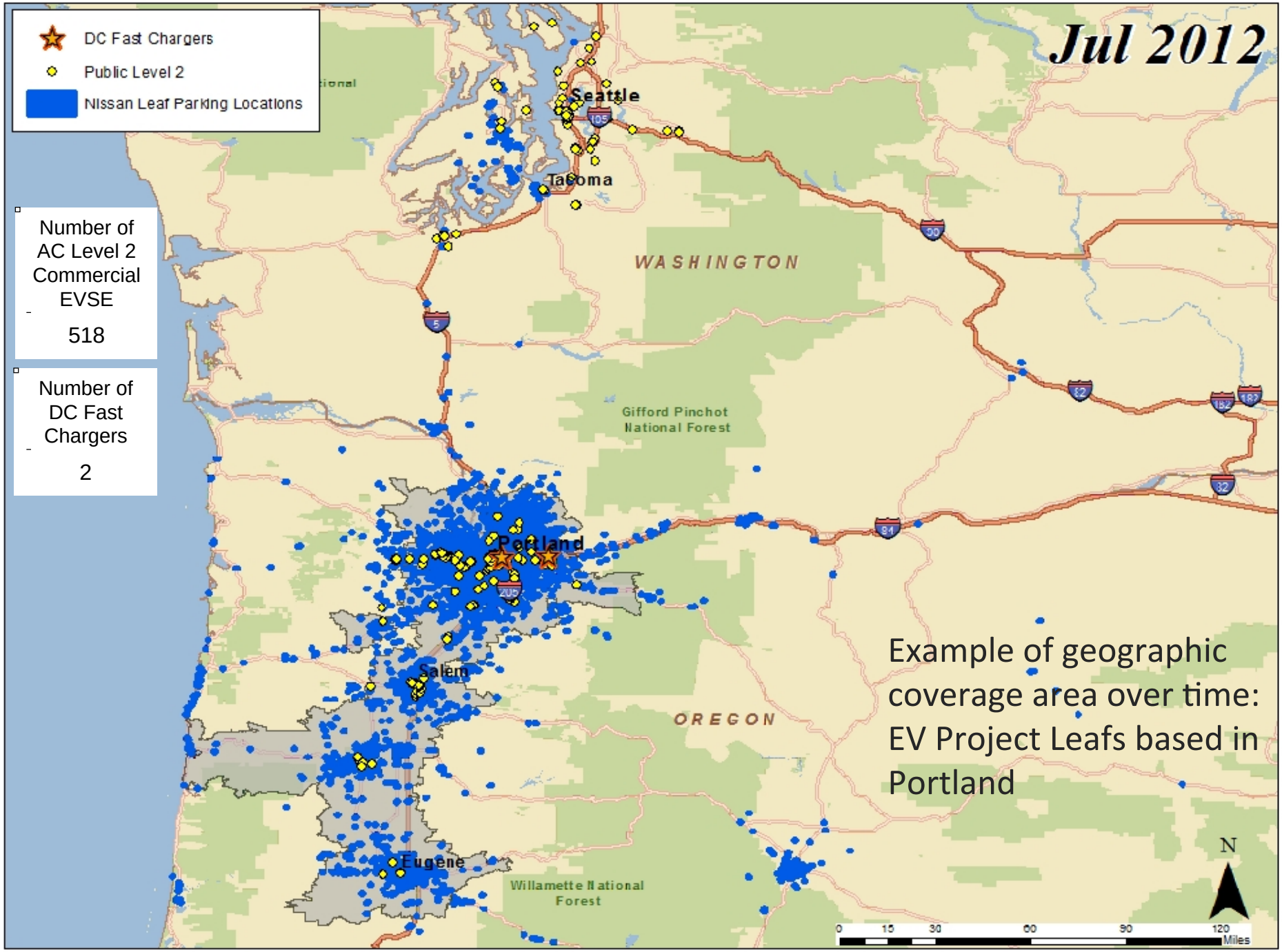
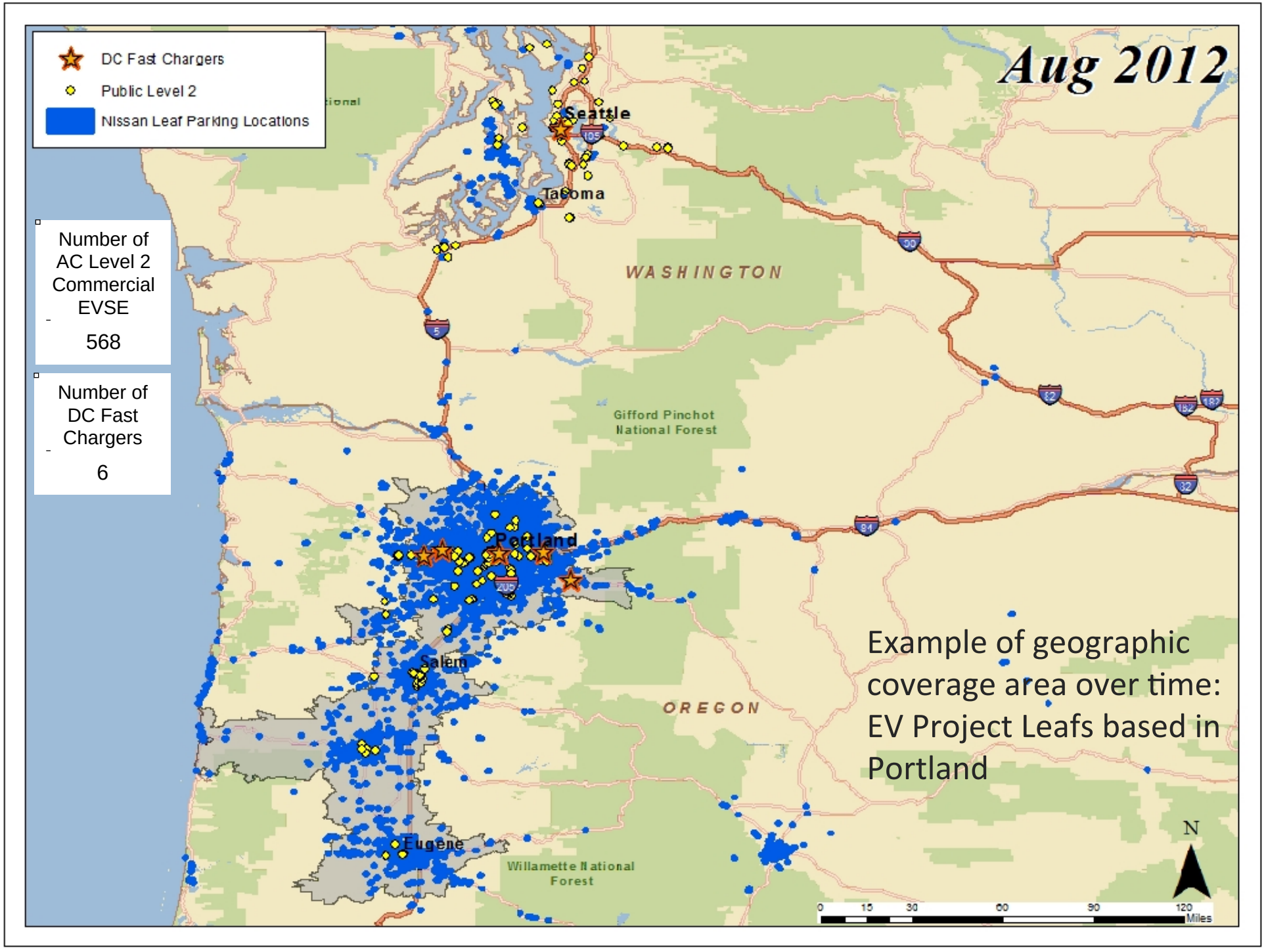
0 15 30 60 90 120
Miles

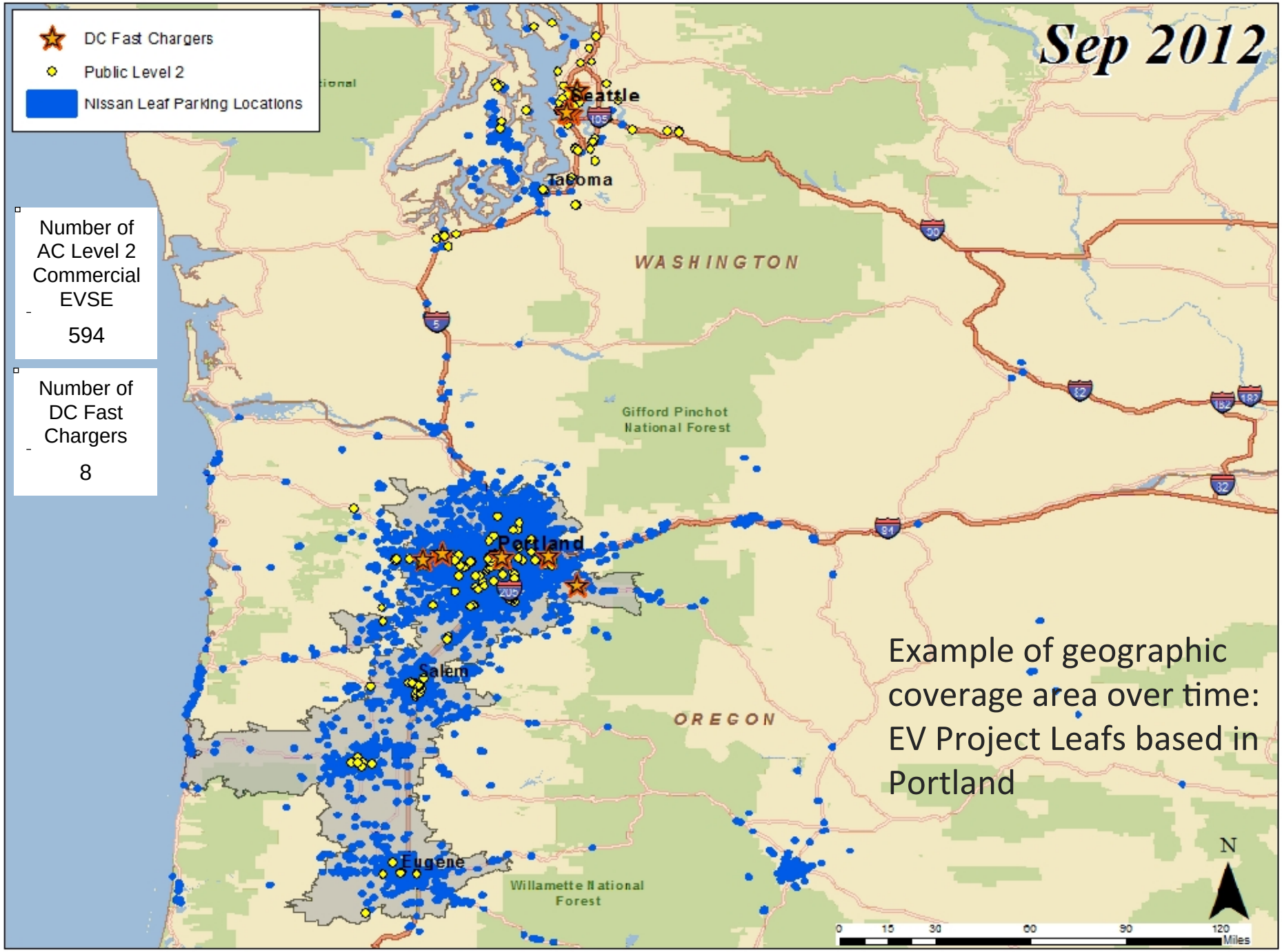

DC Fast Chargers
Public Level 2
Nissan Leaf Parking Locations
Apr 2012
Number of AC Level 2 Commercial EVSE
399
Seattle
Tacoma
WASHINGTON
Gifford Pinchot National Forest
Portland
Salem
OREGON
Eugene
Willamette National Forest
Example of geographic coverage area over time: EV Project Leafs based in Portland
N
0 15 30 60 90 120
Miles

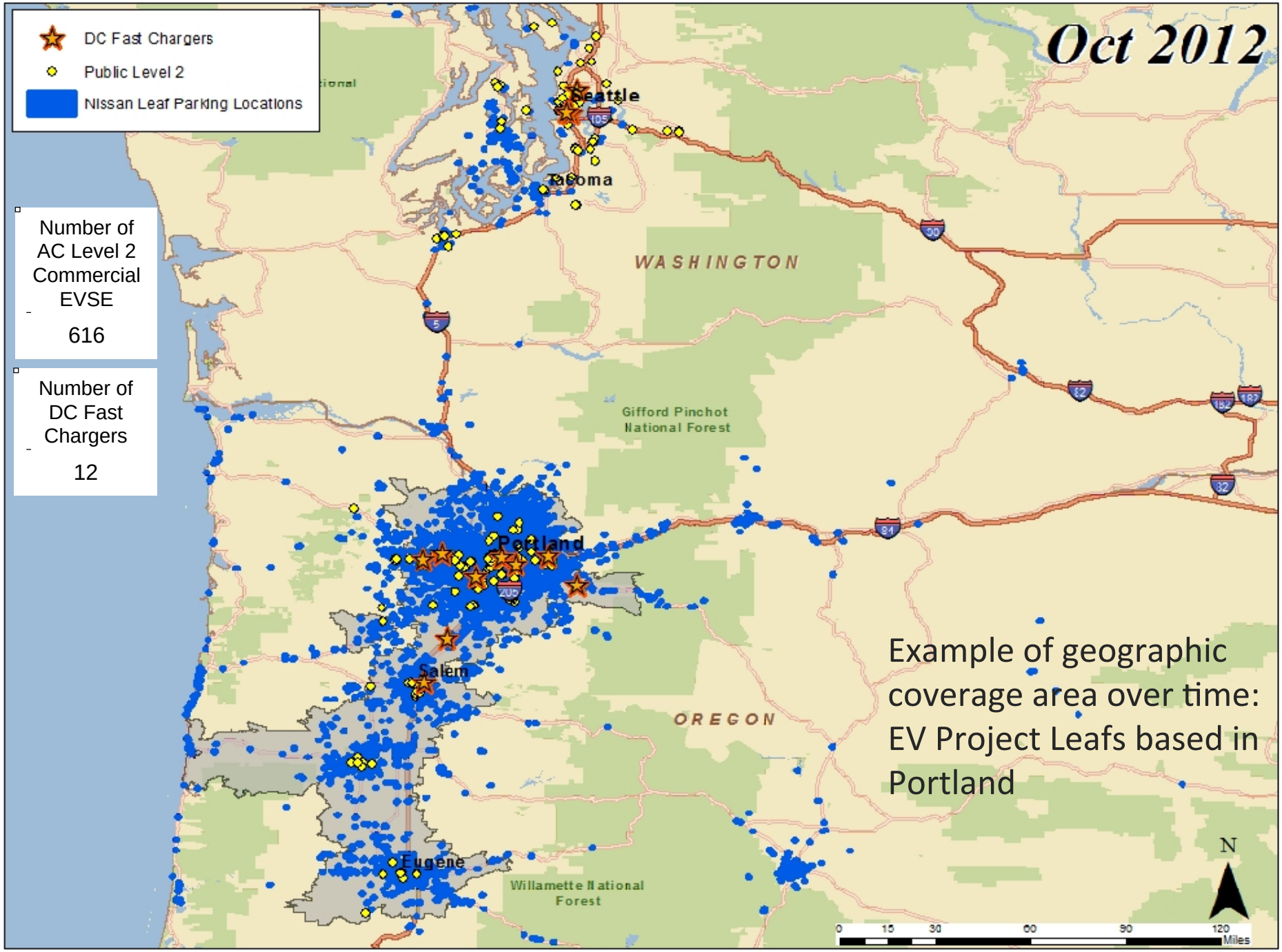

DC Fast Chargers
Public Level 2
Nissan Leaf Parking Locations
May 2012
Number of AC Level 2 Commercial EVSE
458
Seattle
Tacoma
WASHINGTON
Gifford Pinchot National Forest
Portland
Salem
OREGON
Eugene
Willamette National Forest
Example of geographic coverage area over time: EV Project Leafs based in Portland
N
0 15 30 60 90 120
Miles

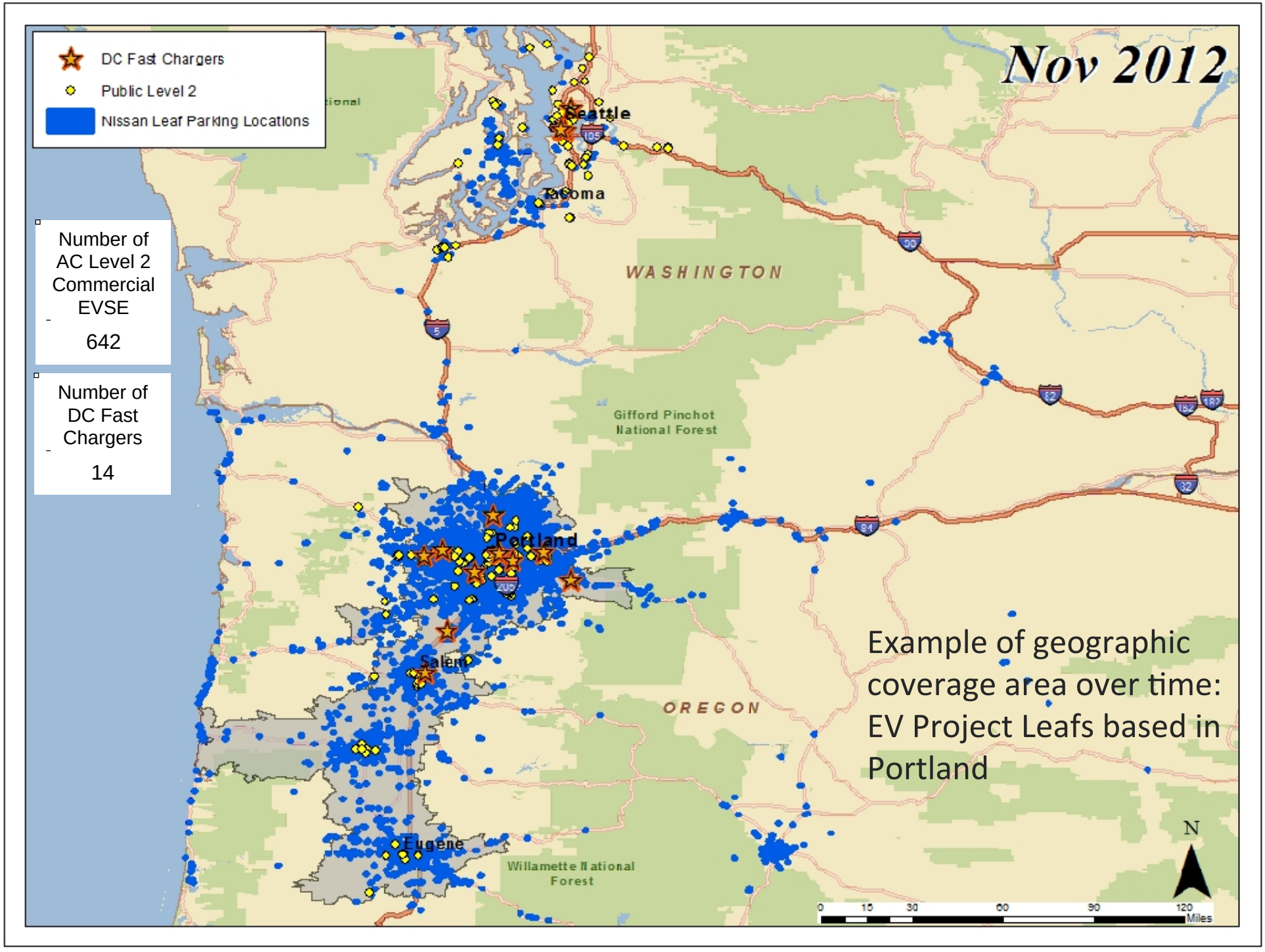

DC Fast Chargers
Public Level 2
Nissan Leaf Parking Locations
Jun 2012
Number of AC Level 2 Commercial EVSE
495
Seattle
Tacoma
WASHINGTON
Gifford Pinchot National Forest
Portland
Salem
OREGON
Eugene
Willamette National Forest
Example of geographic coverage area over time: EV Project Leafs based in Portland
N
0 15 30 60 90 120
Miles

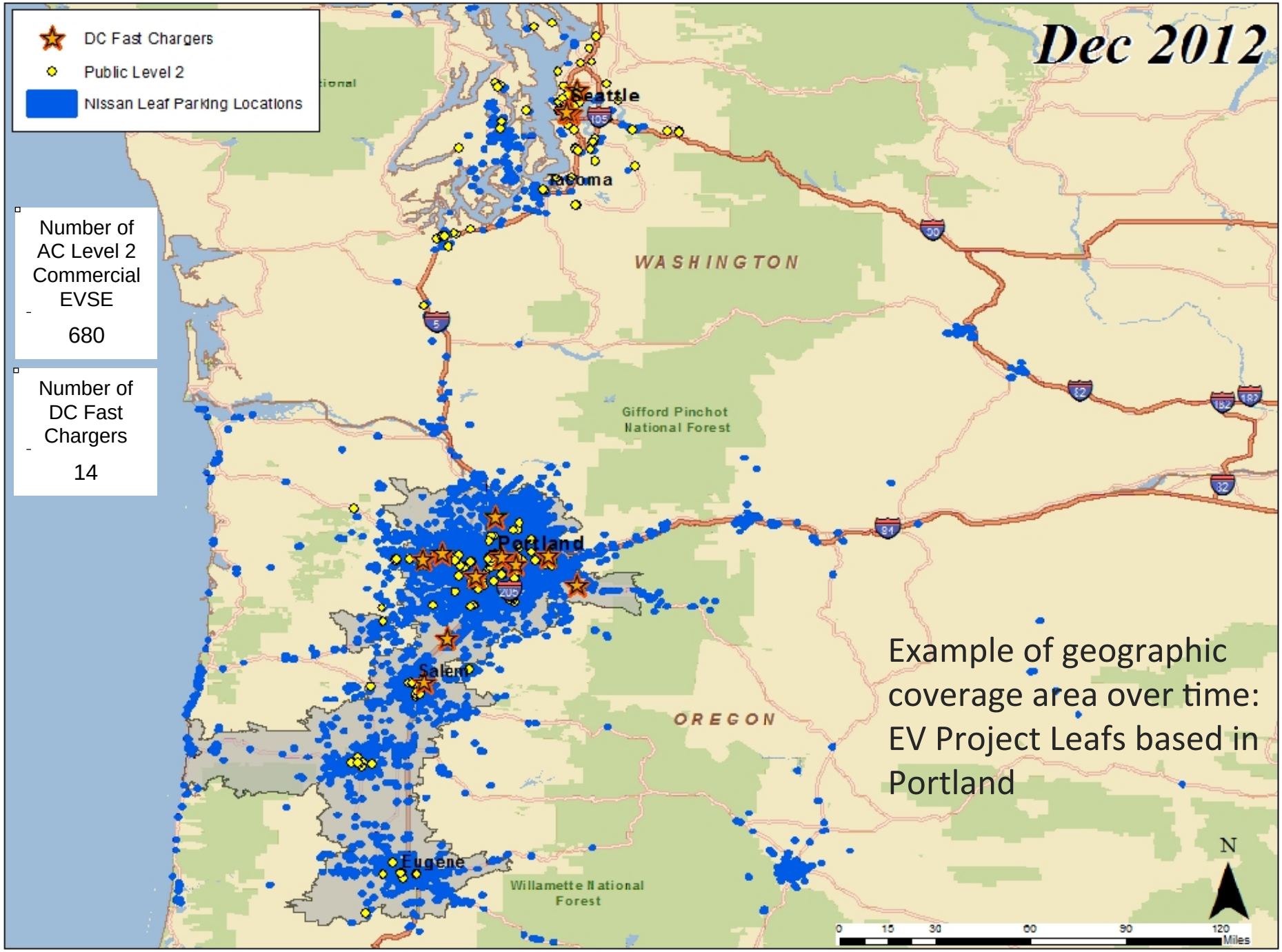

DC Fast Chargers
Public Level 2
Nissan Leaf Parking Locations
Jul 2012
Number of AC Level 2 Commercial EVSE
518
Number of DC Fast Chargers
2
Seattle
Tacoma
WASHINGTON
Gifford Pinchot National Forest
Portland
Salem
OREGON
Eugene
Willamette National Forest
Example of geographic coverage area over time: EV Project Leafs based in Portland
N
0 15 30 60 90 120
Miles

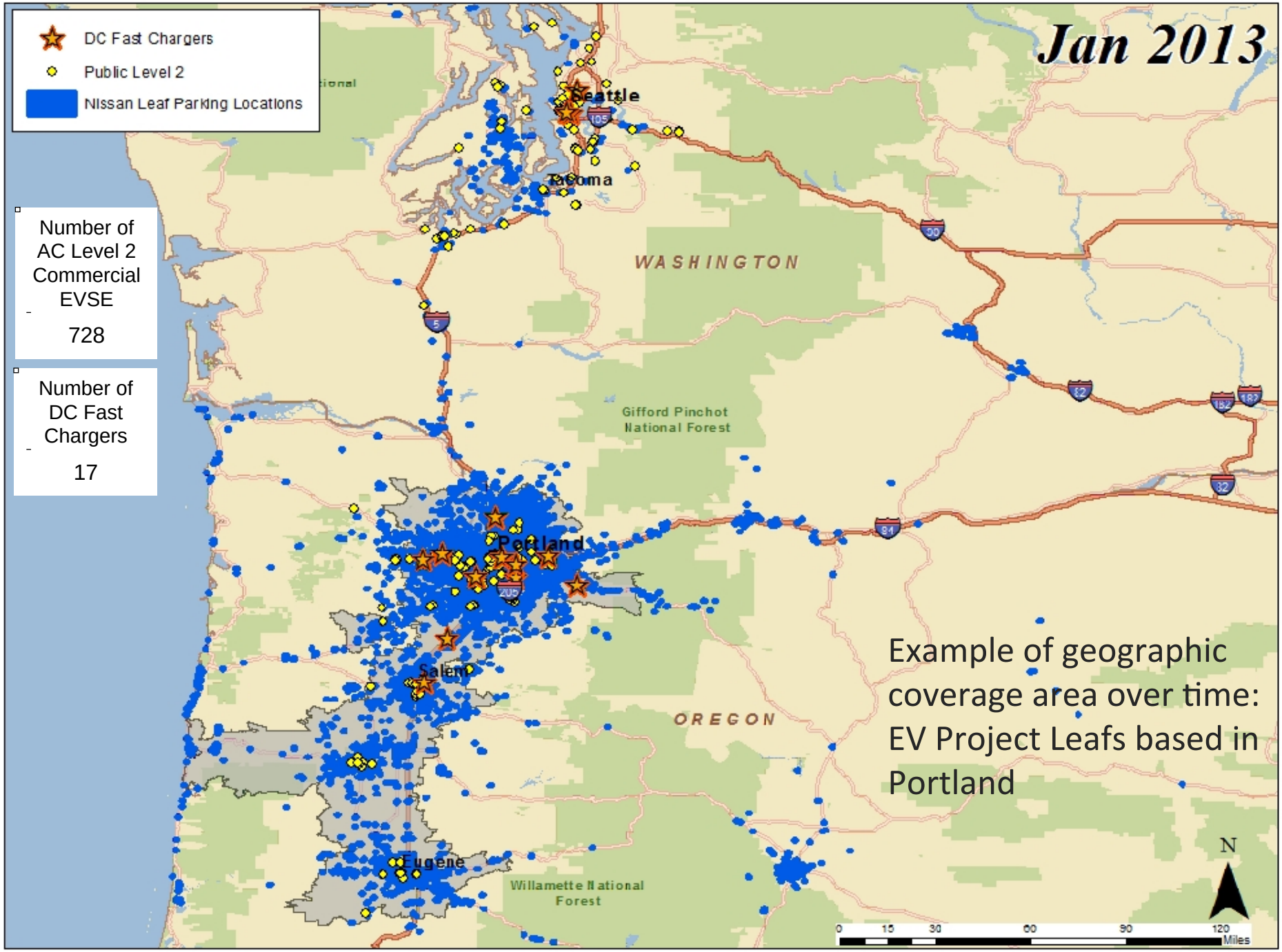

DC Fast Chargers
Public Level 2
Nissan Leaf Parking Locations
Aug 2012
Number of AC Level 2 Commercial EVSE
568
Number of DC Fast Chargers
6
Seattle
Tacoma
WASHINGTON
Gifford Pinchot National Forest
Portland
Salem
OREGON
Eugene
Willamette National Forest
Example of geographic coverage area over time: EV Project Leafs based in Portland
N
0 15 30 60 90 120
Miles

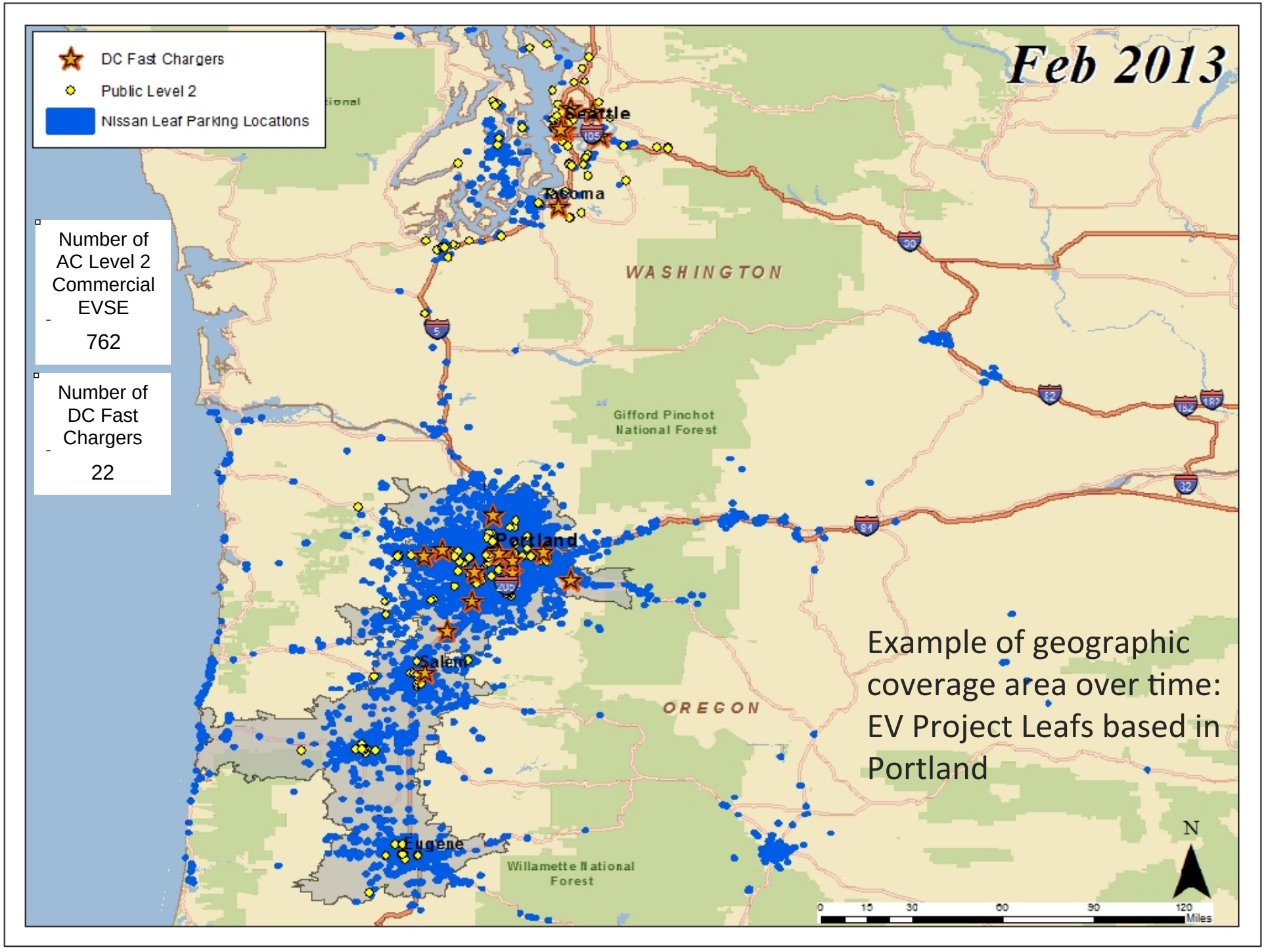

DC Fast Chargers
Public Level 2
Nissan Leaf Parking Locations
Sep 2012
Number of AC Level 2 Commercial EVSE
594
Number of DC Fast Chargers
8
Seattle
Tacoma
WASHINGTON
Gifford Pinchot National Forest
Portland
Salem
OREGON
Eugene
Willamette National Forest
Example of geographic coverage area over time: EV Project Leafs based in Portland
N
0 15 30 60 90 120
Miles

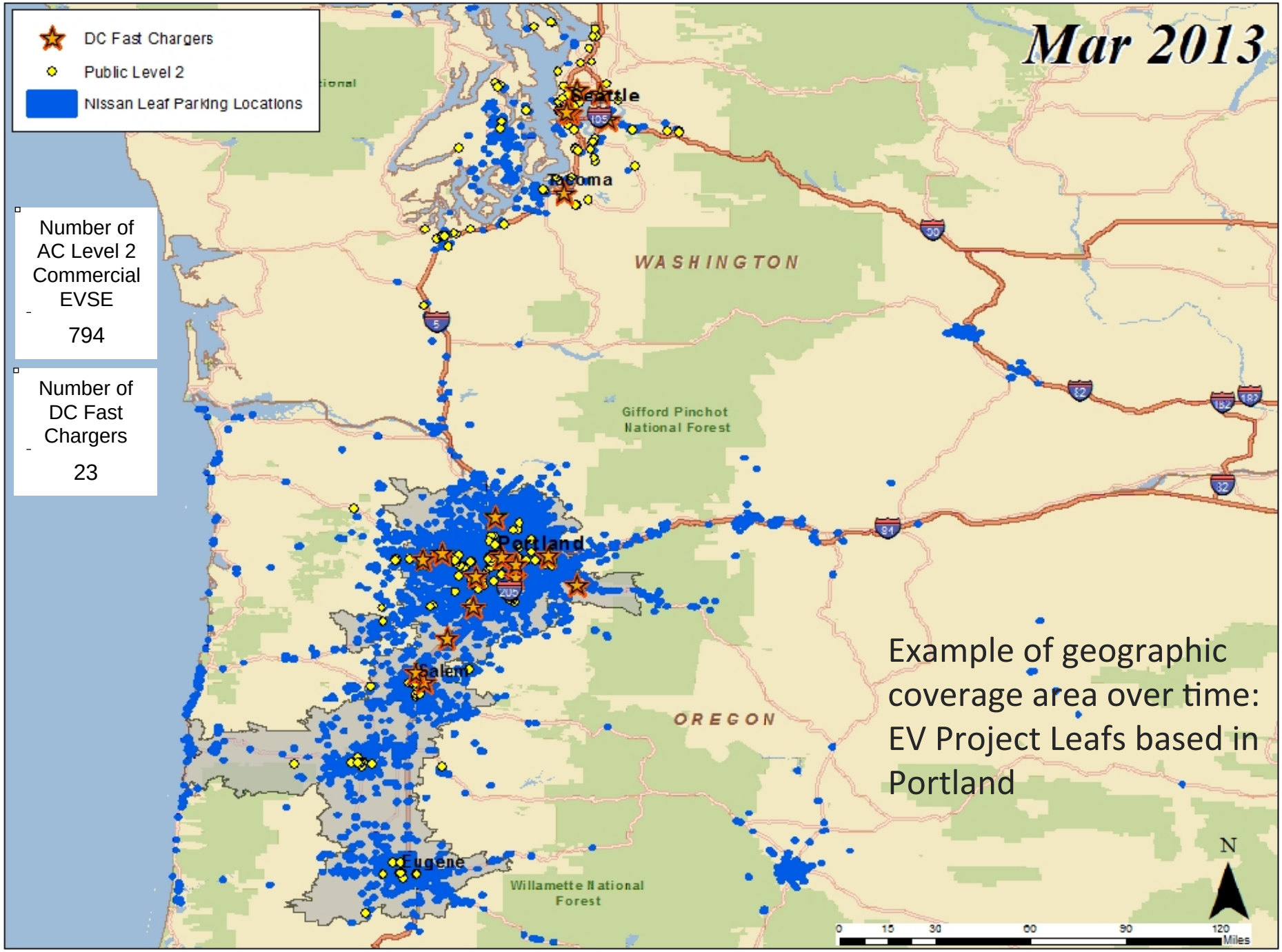

DC Fast Chargers
Public Level 2
Nissan Leaf Parking Locations
Oct 2012
Number of AC Level 2 Commercial EVSE
616
Number of DC Fast Chargers
12
Seattle
Tacoma
WASHINGTON
Gifford Pinchot National Forest
Portland
Salem
OREGON
Eugene
Willamette National Forest
Example of geographic coverage area over time: EV Project Leafs based in Portland
N
0 15 30 60 90 120
Miles

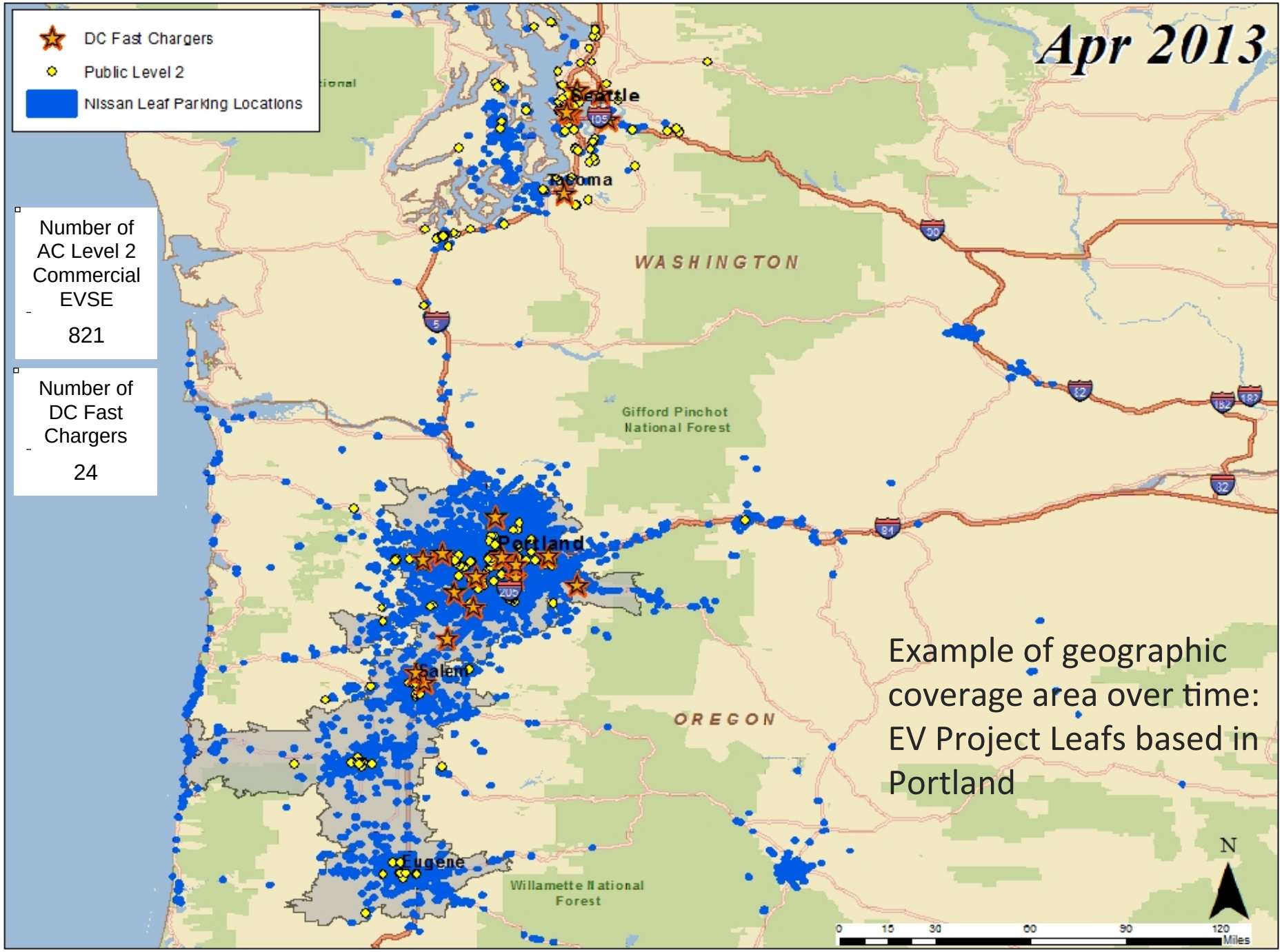

DC Fast Chargers
Public Level 2
Nissan Leaf Parking Locations
Nov 2012
Number of AC Level 2 Commercial EVSE
642
Number of DC Fast Chargers
14
Seattle
Tacoma
WASHINGTON
Gifford Pinchot National Forest
Portland
Salem
OREGON
Eugene
Willamette National Forest
Example of geographic coverage area over time: EV Project Leafs based in Portland
N
0 15 30 60 90 120
Miles

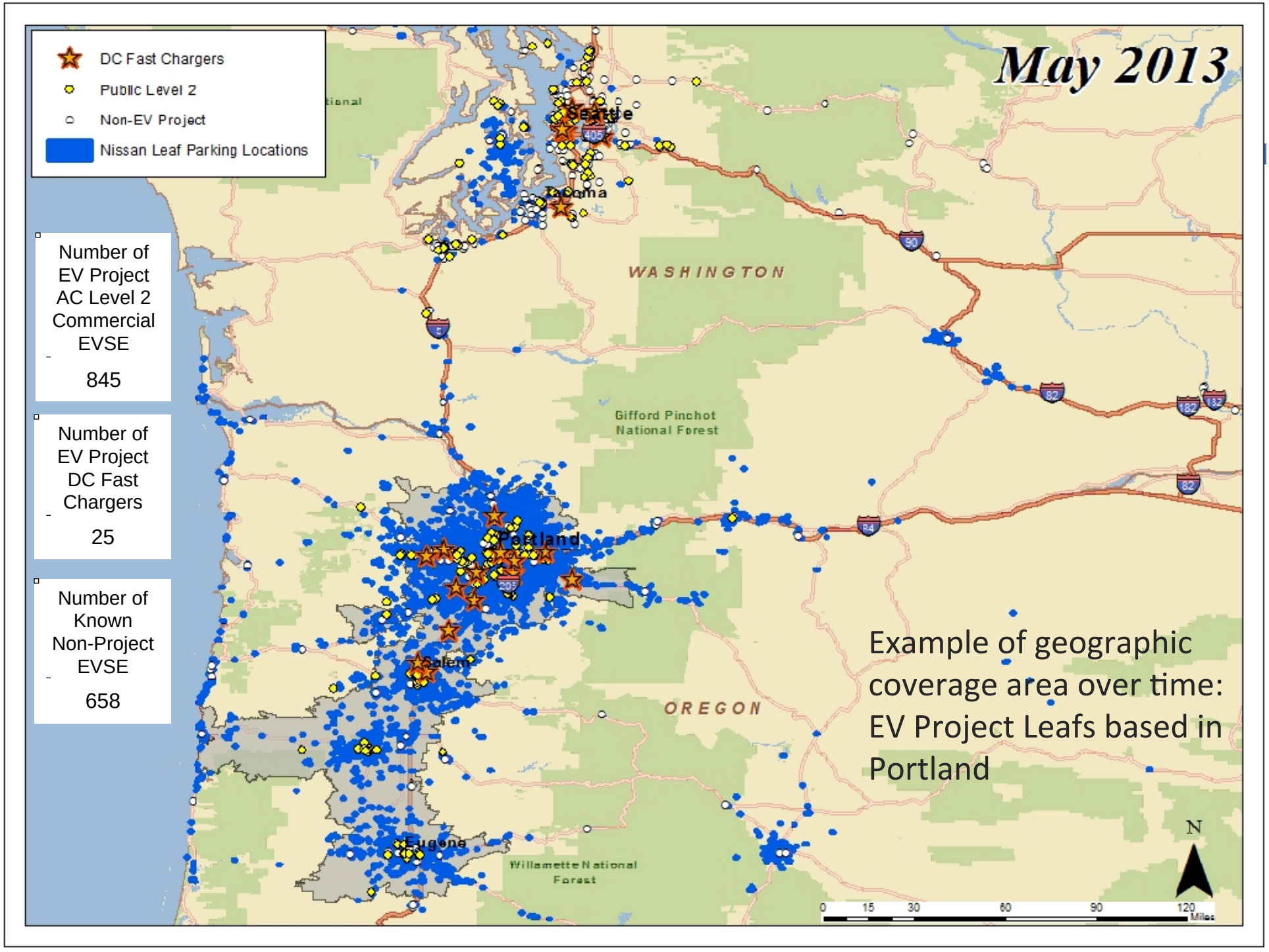

DC Fast Chargers
Public Level 2
Nissan Leaf Parking Locations
Dec 2012
Number of AC Level 2 Commercial EVSE
680
Number of DC Fast Chargers
14
Seattle
Tacoma
WASHINGTON
Gifford Pinchot National Forest
Portland
Salem
OREGON
Eugene
Willamette National Forest
Example of geographic coverage area over time: EV Project Leafs based in Portland
N
0 15 30 60 90 120
Miles


DC Fast Chargers
Public Level 2
Nissan Leaf Parking Locations
Jan 2013
Number of AC Level 2 Commercial EVSE
728
Number of DC Fast Chargers
17
Seattle
Tacoma
WASHINGTON
Gifford Pinchot National Forest
Portland
Salem
OREGON
Eugene
Willamette National Forest
Example of geographic coverage area over time: EV Project Leafs based in Portland
N
0 15 30 60 90 120
Miles


DC Fast Chargers
Public Level 2
Nissan Leaf Parking Locations
Feb 2013
Number of AC Level 2 Commercial EVSE
762
Number of DC Fast Chargers
22
Seattle
Tacoma
WASHINGTON
Gifford Pinchot National Forest
Portland
Salem
OREGON
Eugene
Willamette National Forest
Example of geographic coverage area over time: EV Project Leafs based in Portland
N
0 15 30 60 90 120
Miles


DC Fast Chargers
Public Level 2
Nissan Leaf Parking Locations
Mar 2013
Number of AC Level 2 Commercial EVSE
794
Number of DC Fast Chargers
23
Seattle
Tacoma
WASHINGTON
Gifford Pinchot National Forest
Portland
Salem
OREGON
Eugene
Willamette National Forest
Example of geographic coverage area over time: EV Project Leafs based in Portland
N
0 15 30 60 90 120
Miles


DC Fast Chargers
Public Level 2
Nissan Leaf Parking Locations
Apr 2013
Number of AC Level 2 Commercial EVSE
821
Number of DC Fast Chargers
24
Seattle
Tacoma
WASHINGTON
Gifford Pinchot National Forest
Portland
Salem
OREGON
Eugene
Willamette National Forest
Example of geographic coverage area over time: EV Project Leafs based in Portland
N
0 15 30 60 90 120
Miles

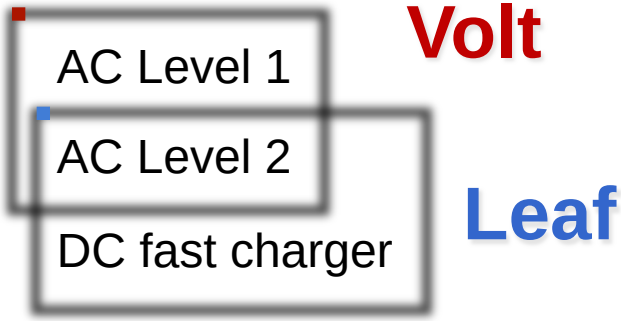

DC Fast Chargers
Public Level 2
Non-EV Project
Nissan Leaf Parking Locations
May 2013
Number of EV Project AC Level 2 Commercial EVSE
845
Number of EV Project DC Fast Chargers
25
Number of Known Non-Project EVSE
658
Seattle
Tacoma
WASHINGTON
Gifford Pinchot National Forest
Portland
Salem
OREGON
Eugene
Willamette National Forest
Example of geographic coverage area over time: EV Project Leafs based in Portland
N
0 15 30 60 90 120
Miles

Vehicle Utilization

How does driver behavior differ between those who frequently charge away from home and those who do not?

- Uses
  - Vehicle Owners
  - EVSPs
  - Utilities
  - Vehicle OEMs
  - Government
- Methodology
  - Group vehicles by charging behavior
  - Analyze travel behavior
- Dissemination
  - Report

- Analyze charging behavior by frequency and location:



Vehicle Utilization

Do EV drivers with access to workplace charging use their EVs differently?

- Uses
  - US DOE - EV Everywhere Workplace Challenge
  - Charging Site Hosts, EVSPs
  - Vehicle Owners
- Methodology
  - Survey participants to determine who has access to workplace charging
  - Analyze charging and driving behavior of survey respondents
- Dissemination
  - Report

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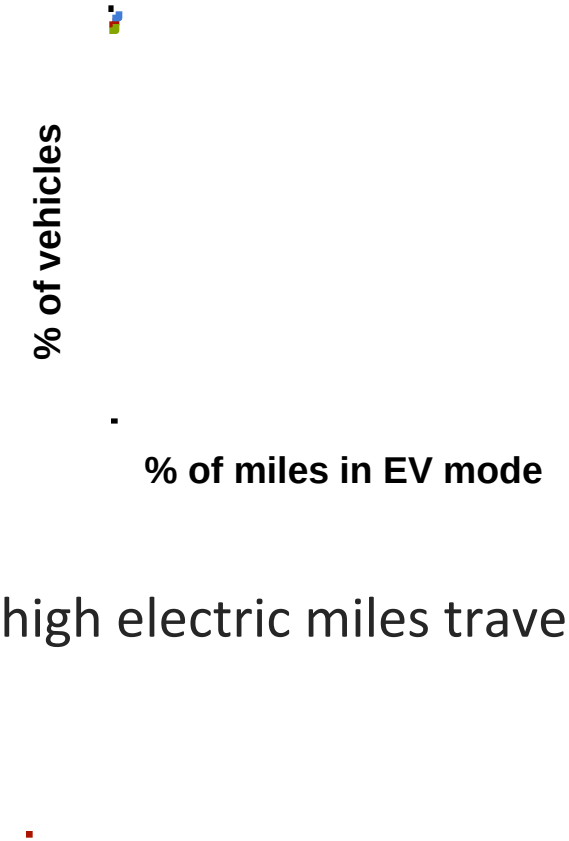
Vehicle Utilization

How does Volt utilization differ for drivers who frequently charge and those who do not?

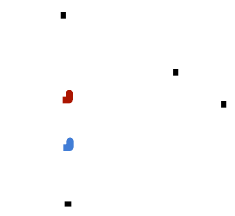
- Uses
  - Vehicle Owners
  - Vehicle OEMs
  - EVSP
- Methodology
  - Determine the distribution of electric miles traveled
  - Characterize the charging and driving behavior which resulted in high electric miles traveled
- Dissemination
  - Report



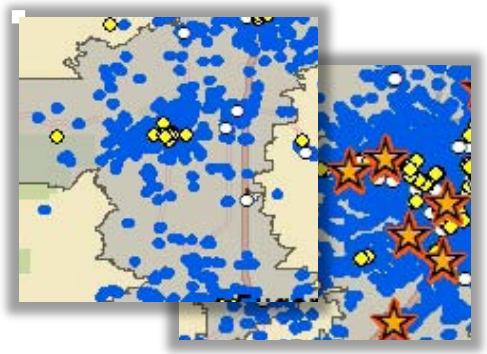
Vehicle Utilization

What differences are there in Leaf vehicle usage between areas with DCFC and areas without?

- Uses
  - EVSPs
  - Vehicle OEMs
  - Government
- Methodology
  - Group vehicles by areas with and without DCFCs or before and after installation
  - Perform statistical and geographic comparisons of travel behavior (regardless of DCFC usage)
- Dissemination
  - Report



Distance between charging events or other metrics



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Vehicle Utilization

How do drivers decide between their PEV and their ICE vehicle?

- Uses
  - Vehicle Owners
  - Vehicle OEMs
  - Government
- Methodology
  - Survey of EV Project participants
- Dissemination
  - Report

Vehicle Utilization

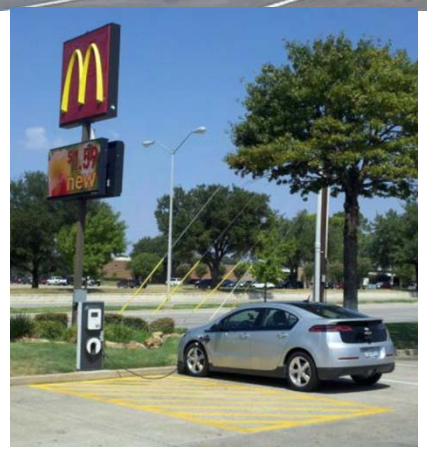
How often have Leaf drivers made trips beyond their vehicles' single-charge range, and how have drivers used public infrastructure to accomplish those trips?

- Uses
  - Government – corridor transportation planning
  - Vehicle OEMs
  - EVSPs
- Methodology
  - Analyze usage data to determine how many/how often Leafs fall into the following categories:
    - Never drove beyond the vehicle's single-charge range before returning home to charge
    - Extended range using level 2 public charging (local or corridor?)
    - Extended range using a DC fast charge (local or corridor?)
    - Extended range with multiple DC fast charges (local or corridor?)
- Dissemination
  - Report

Charger Utilization

Charger Utilization

- **What are the best venues/locations for publicly accessible infrastructure?**
  - Uses
    - Government
    - Vehicle Operators
    - Vehicle OEMs
    - EVSPs
  - Methodology
    - Define Metrics and classifications
    - Analyze charger data for 3 different periods
      - Start-to-current (May 2013)
      - Since fees introduced (Aug 2012 – Aug 2013)
      - Last 6 months of 2013
  - Dissemination
    - Reports



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Charger Venues

Asset Program

Fleet	Publicly Accessible
Workplace	Residential

Venue Type

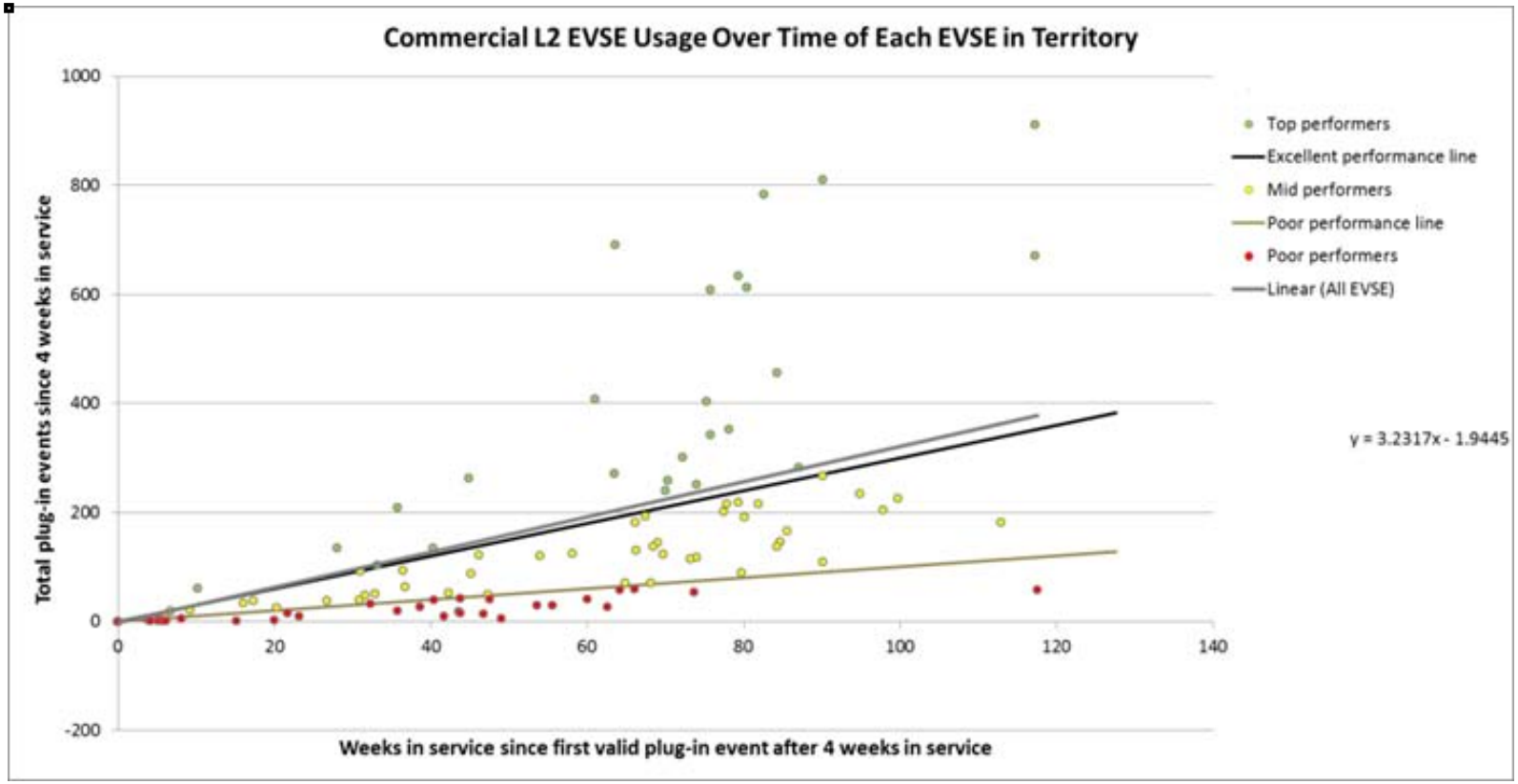
Arts/Entertainment	Healthcare/Medical	Multi-Family	Restaurant
Auto Dealer	Hotel	Not-for-Profit	Retail/Big Box/National
Business Office	Transportation Hub	Parking Lot/Garage	Retail/Small Bus/Local
Educational Svcs	Mall	Parks and Recreation	Image
Govt/Public Admin	Military Installation	Professional/Tech	Utilities

Environment

Urban	Transportation Corridor
Suburban	Industrial Campus

Charger Venues

- Metrics vs. Motivation
- Individual EVSE vs. EVSE Site



Charger Utilization

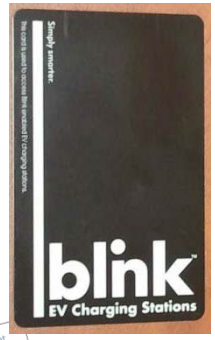
- **How does the presence of EVSE in retail locations influence customer behavior?**
  - Uses
    - Government
    - Vehicle Operators
    - Charging Site Hosts
    - EVSPs
  - Methodology
    - Identify and gather data from retail accounts
    - Analyze venue charger and vehicle data
  - Dissemination
    - Case Study Reports

Charger Utilization

- **What is utilization of DCFC in travel corridors, in urban, and in suburban environments?**
  - Uses
    - Government
    - Vehicle Operators
    - Charging Site Hosts
    - EVSPs
  - Methodology
    - Analysis of dwell time, SOC and trip distance at BOC, trip distance to next charge, outing distance within which corridor charge occurred
    - Distance from home of user
  - Dissemination
    - Reports

Charger Utilization

- **What business models are currently in use for public infrastructure?**
  - Uses
    - Government
    - Vehicle Operators
    - Charging Site Hosts
    - EVSPs
  - Methodology
    - Explore current models from perspective of EVSP, Charging Site Host and PEV driver
    - Is there correlation to driver behavior and EVSE utilization?
  - Dissemination
    - Reports

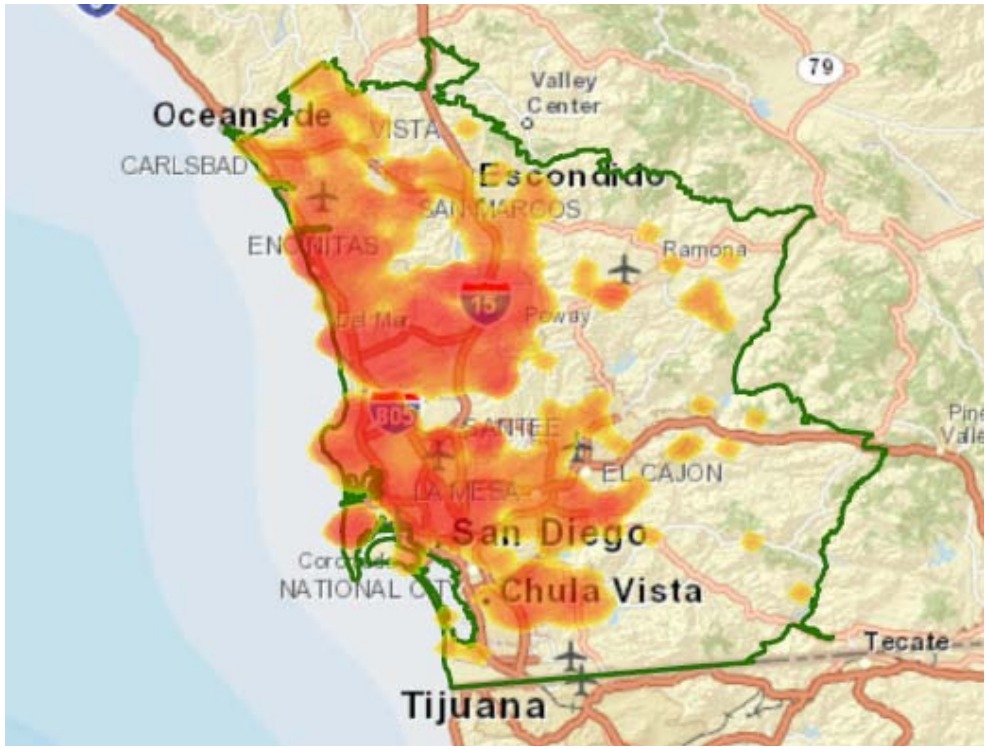


Charger Utilization

- **Implementing workplace charging**
  - Uses
    - EV Everywhere – Workplace Challenge
    - Charging Site Hosts
    - Vehicle Owners
    - EVSPs
  - Methodology
    - Segment EV Project participant base by those who do/do not have workplace charging availability – Analyze vehicle data
    - Survey EVP Participants
    - Interview Workplace Participants
    - Validate survey responses against driving behavior
  - Dissemination
    - Reports

Charger Utilization

- **How does use of publicly accessible EVSE infrastructure relate to projections/driver desires/deployment plans?**
  - Uses
    - Government
    - Transportation Planners



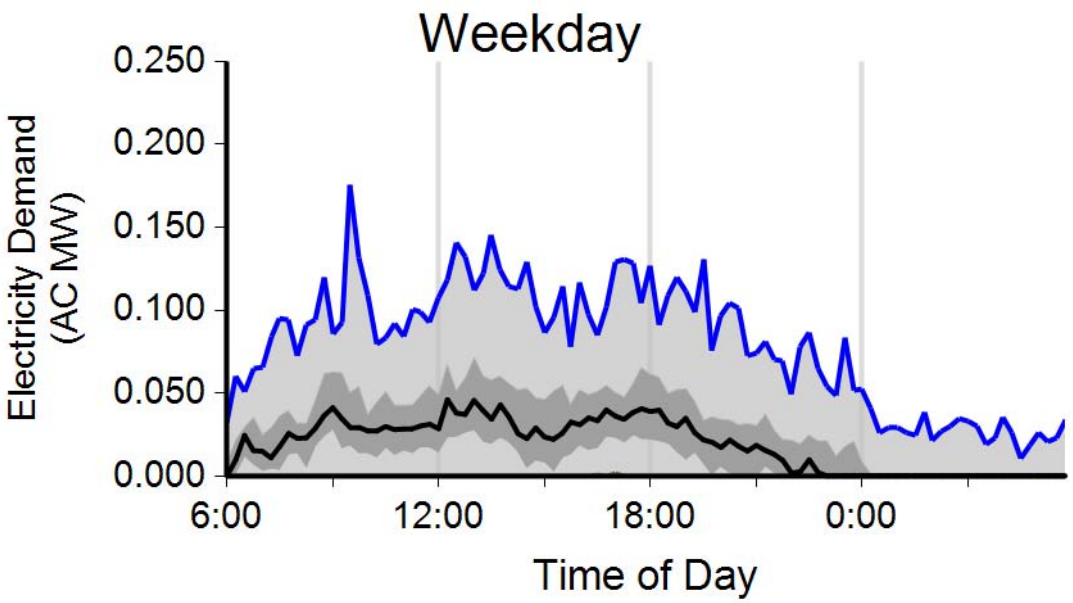
Charger Use Projections

- **How does use of publicly accessible EVSE infrastructure relate to projections/driver desires/deployment plans?**
  - Methodology
    - EVP Micro-Climate Planning Process – prior to EVs
    - EV driver survey by UC Davis – while infrastructure was being deployed
    - EVSE Deployment vs. Plan and vs. Driver Survey
    - Actual vehicle trip end point vs. EVSE Deployed and vs Driver Survey
    - EVSE Utilization
    - GIS mapping comparisons
    - UC Davis Report
  - Dissemination
    - Case Study for San Diego

Charger Utilization

- **What is the cost impact of utility demand charges on the host?**
  - Uses
    - Charging Site Hosts
    - Government
    - EVSPs
    - Utilities

DCFC Demand San Francisco Quarter 1, 2013



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Charger Utilization

- **What is the cost impact of utility demand charges on the host?**
  - Methodology
    - Select specific DCFC or multiple Level 2 AC charge events and apply electric utility rate structures
    - Compare across utility service territories
    - Identify potential and in-use mitigation strategies
  - Dissemination
    - Reports

Lessons Learned

Lessons Learned

- **What is the breakdown in Residential installation costs? (compare by region, total cost, permit fees)**
  - Uses
    - Government
    - Vehicle owners
    - EVSPs
  - Methodology
    - Evaluate data collected in deployment phase of EV Project
    - Identify significant cost drivers
  - Dissemination
    - Report
    - Case studies

Lessons Learned

- **What is the breakdown in Non-Residential installation costs? (compare by region, total cost, environment, permit fees)**
  - Uses
    - Government
    - Charger hosts
    - EVSPs
  - Methodology
    - Evaluate data collected in deployment phase of EV Project
    - Identify significant cost drivers
  - Dissemination
    - Report
    - Case studies

Lessons Learned

- **What is the breakdown in DC Fast Charger installation costs? (compare by region, total cost, environment, permit fees)**
  - Uses
    - Government
    - Charger hosts
    - Electric utilities
    - EVSPs
  - Methodology
    - Evaluate data collected in deployment phase of EV Project
    - Identify significant cost drivers
  - Dissemination
    - Report
    - Case studies

Lessons Learned

- **What were the challenges in conducting EV Micro-Climate planning?**
  - Uses
    - Government
    - Charger hosts
    - Electric utilities
    - EVSPs
  - Methodology
    - Analysis of plan, location information, and utilization of deployed infrastructure
    - Subjective analysis of plan and planning process and the effectiveness between regions
  - Dissemination
    - Report

Lessons Learned

- **What were workplace installation challenges?**
  - Uses
    - Government
    - Vehicle owners
    - Charger hosts
    - Electric utilities
    - EVSPs
  - Methodology
    - Workplace host interviews
    - Evaluate installation costs compared to other commercial in the region
  - Dissemination
    - Report
    - Case studies

Lessons Learned

- **What impact did access control, authentication and Blink payment have on charger utilization?**
  - Uses
    - Government
    - Vehicle owners
    - Charger hosts
    - EVSPs
  - Methodology
    - Evaluate charge patterns and changes over time
  - Dissemination
    - Report

Lessons Learned

- **How do EV owners respond to time-of-use rates while charging EV Project vehicles?**
  - Uses
    - Government
    - Electric utilities
  - Methodology
    - Evaluate use patterns in markets with and without TOU rates
    - Survey EVP participants
  - Dissemination
    - Report
    - Case studies

Lessons Learned

- **What has been EV Project experience with advertising and other revenue generating opportunities?**
  - Uses
    - Government
    - Charger hosts
    - EVSPs
  - Methodology
    - Evaluate charge unit use patterns associated with advertising campaigns (before & after, frequency & dwell time)
    - Survey charging site hosts
  - Dissemination
    - Report
    - Case studies

Lessons Learned

- **What was experience with sub-meters embedded in EVSE?**
  - Uses
    - Government
    - Vehicle owners
    - Charger hosts
    - Electric utilities
    - Vehicle OEMs
    - EVSPs
  - Methodology
    - ECOtality EV Project team interview
    - Dissemination
    - Report

Lessons Learned

- **What benefits has networked charging provided to the PEV driver, to the charging site host, and to the electric utility?**
  - Uses
    - Government
    - Vehicle owners
    - Charger hosts
    - Electric utilities
    - EVSPs
  - Methodology
    - ECOtality EV Project team interviews & research
  - Dissemination
    - Report
    - Case studies

Lessons Learned

- **What is the impact of Car2Go EV car sharing program on the use of public infrastructure?, … What is the impact on the grid?**
  - Uses
    - Government
    - Charger hosts
    - Electric utilities
  - Methodology
    - Evaluation of Car2Go charging patterns (location, duration, frequency) over time
    - Compare to SDG&E grid information
  - Dissemination
    - Case studies

Lessons Learned

- **What would EV Project do differently had we known what we know today?**
  - Uses
    - Government
  - Methodology
    - ECOtality staff interviews
    - INL staff interviews
    - Participant interviews
    - Charging Site host interviews
  - Dissemination
    - Report

Best Practices Observed

- Residential Permitting Process
- Commercial Permitting Process
- DCFC Installation Planning, Permitting & Installation
- Commercial site characteristics
- Effective Way-finding options
- Management of workplace units by businesses and EV drivers
- Other revenue streams
- Attracting EV Drivers
- Advertising
- Installations at Multi-Dwelling Units

Wrap Up

- **Thanks**
  - Vehicle Technologies Office of the US Department of Energy
  - EV Project Leaf and Volt Driver Participants
  - EV Project Charging Site Hosts
  - EV Project Partners
- **If We haven't Addressed Your Needs**
  - SSCHEY@ECOTALITY.COM
- **What Happens After The EV Project**
  - Data
  - Analyses

This material is based upon work supported by the Department of Energy under Award Number DE-EE0002194.

www.theevproject.com