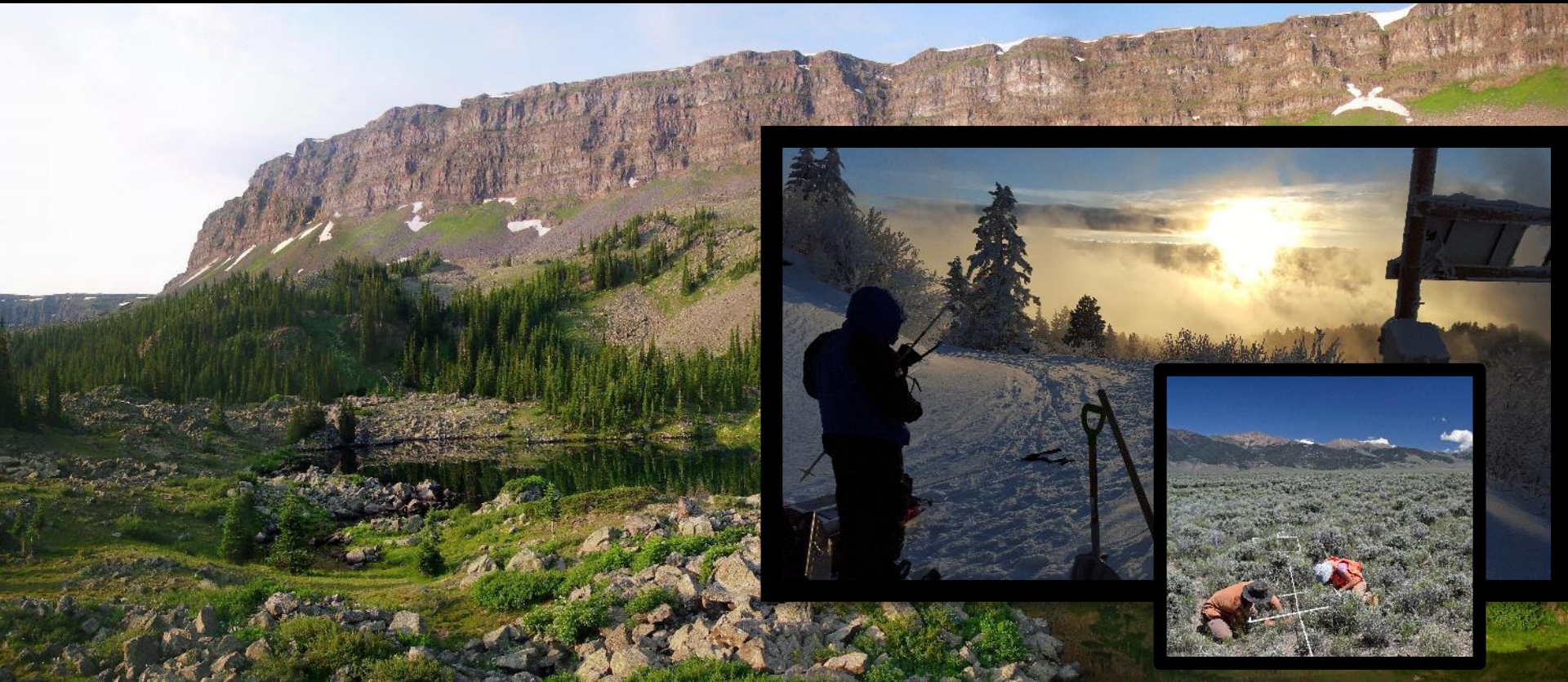




United States Department of Agriculture

Aseguramiento de calidad y control de calidad para los datos del inventario nacional forestal

Sara Goeking y Rachel Simons



Forest Service 5 March 2021
Rocky Mountain Research Station

Aseguramiento de calidad y control de calidad para los datos del inventario nacional forestal (NFI)

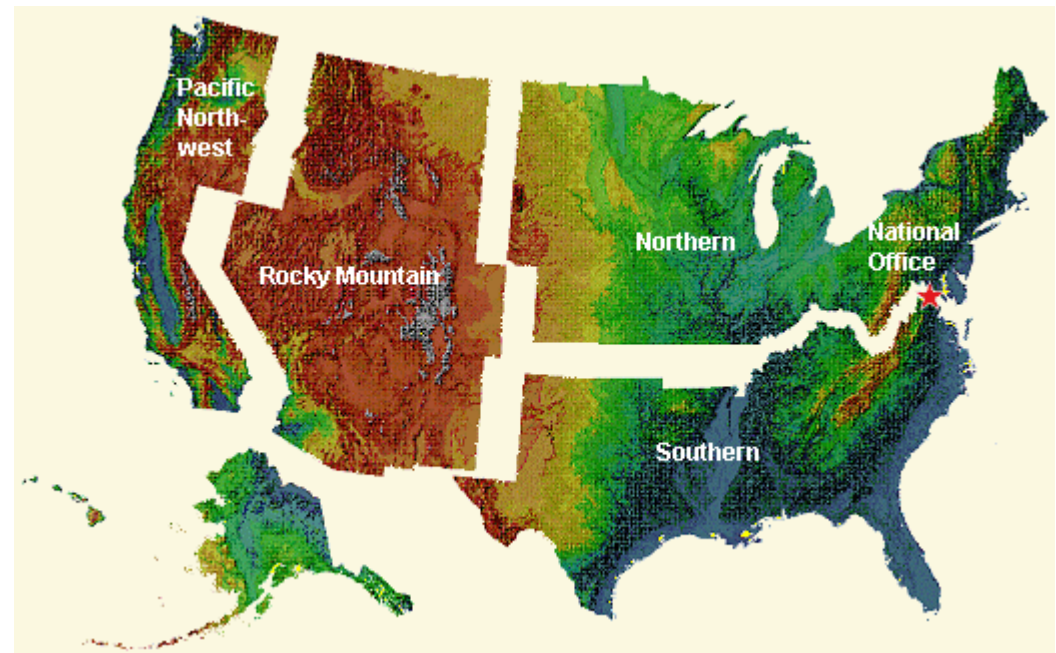


Agenda del taller:

- **Experiencias en aseguramiento de calidad en los Estados Unidos**
- Uso de equipo portátil electrónico para registrar datos
- Ayuda con técnicas de muestreo: equipos y herramientas
- Integración y propósito de bases de datos
- Procesos para generar reportes y publicaciones
- Estrategias para distribuir la información y los resultados del inventario nacional forestal

Estructura organizacional y supervisión

- El inventario nacional forestal lo realizan 4 unidades regionales
- Cada unidad regional es parte de una Estación de Investigación del Servicio Forestal de los EE.UU.



Estructura organizacional y supervisión

- Organización regional



Objetivos del aseguramiento de calidad



Aseguramiento de calidad: Actividades que mejoran y aseguran la calidad de los datos del NFI; incluye tanto control de calidad como evaluación de la calidad:

- **Control de calidad (QC):**
 - Actividades operativas que mejoran la calidad de los datos
 - Sucede en cada etapa en el inventario (levantamiento de datos, análisis y reporte)
- **Evaluación de la calidad:**
 - Análisis cuantitativo post-hoc de la repetitibilidad de los datos

Actividades del aseguramiento de la calidad



- **Control de calidad**
 - Antes de salir a campo: Entrenamiento y documentación sobre los protocolos de campo (manual de campo)
 - En campo: Capacitación continua y verificación de los datos de campo (verificación en caliente y en frío)
 - Después del trabajo de campo: Verificación de los datos compilados en las bases de datos, verificación de los resultados de los reportes
- **Evaluación de la calidad**
 - En campo: Verificación ciega (medición de una parcela que la midió recientemente otro equipo de brigadistas)
 - Después del trabajo de campo: Los analistas comparan los dos conjuntos de mediciones

Objetivos del aseguramiento de calidad



¿Qué tan bueno es suficientemente bueno? ¿Qué es un error?

- Define una meta del nivel de precisión para cada variable, o un Objetivo de la calidad de medición (MQO)
 - Tolerancia
 - Estándar de cumplimiento
- Ejemplo: Diámetro del árbol
 - Tolerancia: +/- 0.1 cm
 - Estándar de cumplimiento: 95% del tiempo
- Ejemplo: Especies de árboles
 - Tolerancia: Sin error
 - Estándar de cumplimiento: 99% del tiempo

Capacitación de brigadistas sobre los protocolos de muestreo



Tipos de capacitación:

- Entrenamiento al inicio de la temporada de campo
 - Todos asisten, incluyendo los brigadistas con experiencia/expertos
 - Cada año o cada dos años
- Entrenamiento en la práctica
 - Retroalimentación sobre cuáles mediciones no están cumpliendo con los objetivos de medición (verificaciones en caliente y en frío)
 - Al contratar a una persona nueva, toman el entrenamiento en la práctica con mentor

Capacitación de brigadistas sobre los protocolos de muestreo



¿Cómo cuantificamos la efectividad de la capacitación?

- Parcelas de certificación
- Verificaciones en caliente y en frío
 - Verificación en caliente: La brigada de QC acompaña a los brigadistas de campo a la parcela y les da retroalimentación inmediata
 - Verificación en frío: La brigada de QC visita la parcela después de los brigadistas de campo y después la brigada de QC brinda retroalimentación.

Para brindar retroalimentación que mejore la calidad de los datos, los brigadistas de QC deben poder identificar *porqué* suceden los errores.

Uso de bases de datos para aseguramiento de calidad



- Control de calidad
 - **Antes de salir a campo:**
 - Verificación de datos iniciales
 - Ejemplos: Coordenadas correctas en el GPS, datos previos
 - **En campo:**
 - Verificación de los datos en tiempo real utilizando un equipo portátil para registrar datos (PDR) pre-programado
 - Verifica que los valores sean lógicos, razonables y estén completos
 - Compara los datos actuales con datos previos
 - **Después del trabajo de campo:**
 - Evaluación de verificación en frío (brigadistas regulares en comparación con brigada de QC)
 - Verifica que los valores sean lógicos, razonables y estén completos durante el levantamiento y análisis
- Evaluación de la calidad:
 - Dos conjuntos de mediciones por parcela (verificación ciega)
 - Calcular el índice de cumplimiento (el número de mediciones que están dentro del rango de tolerancia de la variable dividido entre el número total de mediciones para esa variable)

¿Preguntas?



- Contacto: Sara.Goeking@usda.gov
- ¡Habrá más información!
- Experiencias en aseguramiento de calidad en los Estados Unidos
- Uso de equipo portátil electrónico para registrar datos
- Ayuda con técnicas de muestreo: equipos y herramientas
- Integración y propósito de bases de datos
- Procesos para generar reportes y publicaciones
- Estrategias para distribuir la información y los resultados del inventario nacional forestal



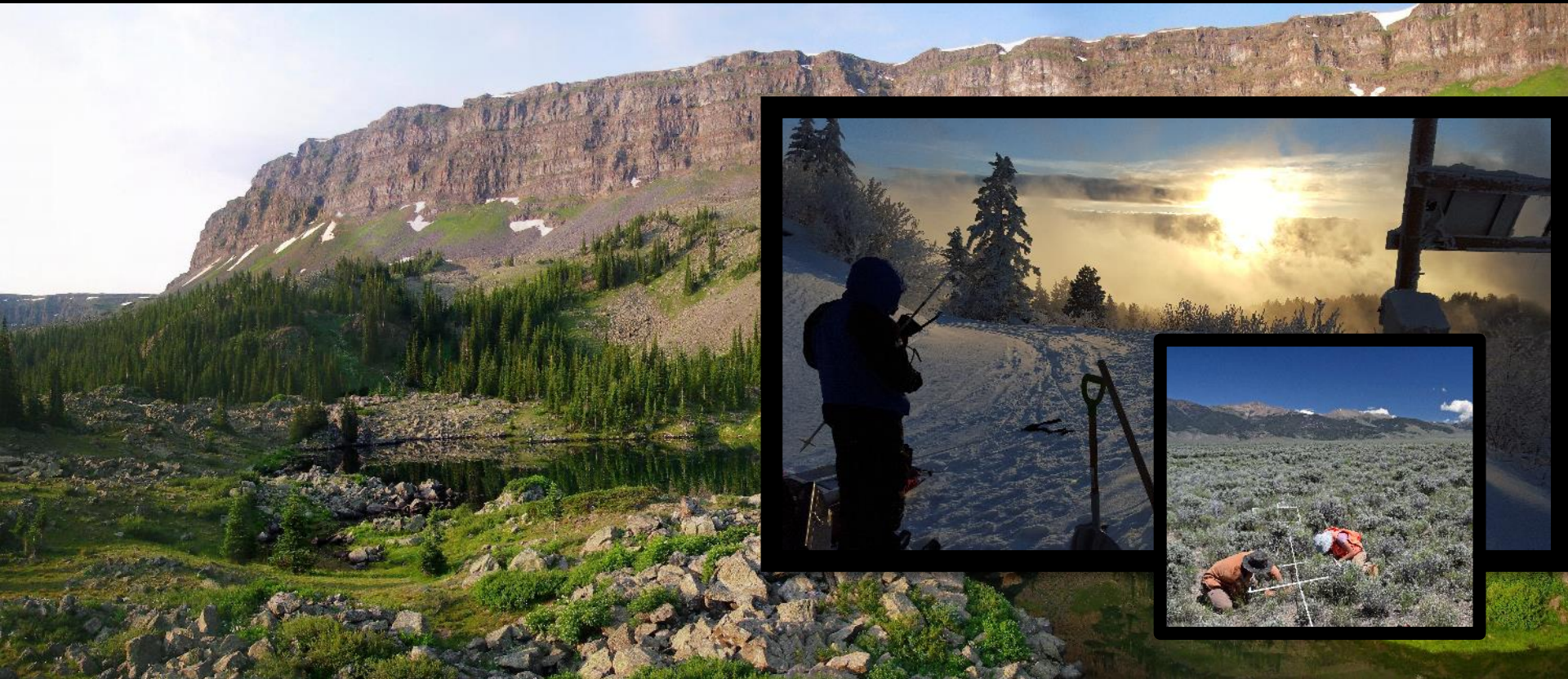
United States Department of Agriculture

Use of portable electronic data recorders

Quality control during and after data collection

Tom Weber

USDA Forest Service Rocky Mountain Research Station



Forest Service 3/5/2021
Rocky Mountain Research Station

During Data Collection – PDR warnings

2. [Seedling] [W] - subplot 1 - record 1
Seedling count 78 seems high.

5. [Tree] [W] - subplot 2 - record 3
Length to Diameter difference < 1 foot, requiring abnormality.
Exp: Measured below a second fork. See individual tree note.

5. [Tree] [W] - subplot 2 - record 2
Pole size trees with Tree Class 3 should have some kind of Damage Causal Agent present. Ok if caused by form defect.
Exp: This tree does not have a straight section of merchantable timber. The majority of its entire length is heavily crooked.

8. [Tree] [W] - subplot 2 - record 5
Info: Make sure the core is collected for Subplot 2 Tree number 5
Exp: Collected.

9. [P2vegSubplotSpecies] [C] - subplot 1 - record 15
FEOV is unusual for this state. Recheck

After data collection – individual plots

- Multiple levels of quality checks
 - Field crews, field supervisors, office editor

1. [Tree] [W] - subplot 1 - record 18
Questionable Diameter/Total Length (unusually tall) for species 113. Diameter 9.2 Length 52
Exp: This was a tall, thin Limber Pine.
4. [Tree] [W] - subplot 2 - record 1
Questionable Diameter growth. Measurements indicate a growth rate of 0.299 inches/year, expected upper limit is 0.20 inches/year.
Exp: Measurement accurate. This is a great site for growth; right next to Pole Creek, a year-round water source and good soils.
8. [Tree] [W] - subplot 4 - record 11
The current diameter (12.6 inches) is less than the previous diameter (13.0 inches), for species 108 Pinus contorta / lodgepole pine PICO.
Exp: The diameter was measured accurately at the same length to diameter.

After data collection – dataset as a whole



- Tools
 - Plotting of diameter to height relationships
 - Boundary Mapping tool
- SQL Queries
 - Extreme diameter growth, shrinkage
- GIS processes

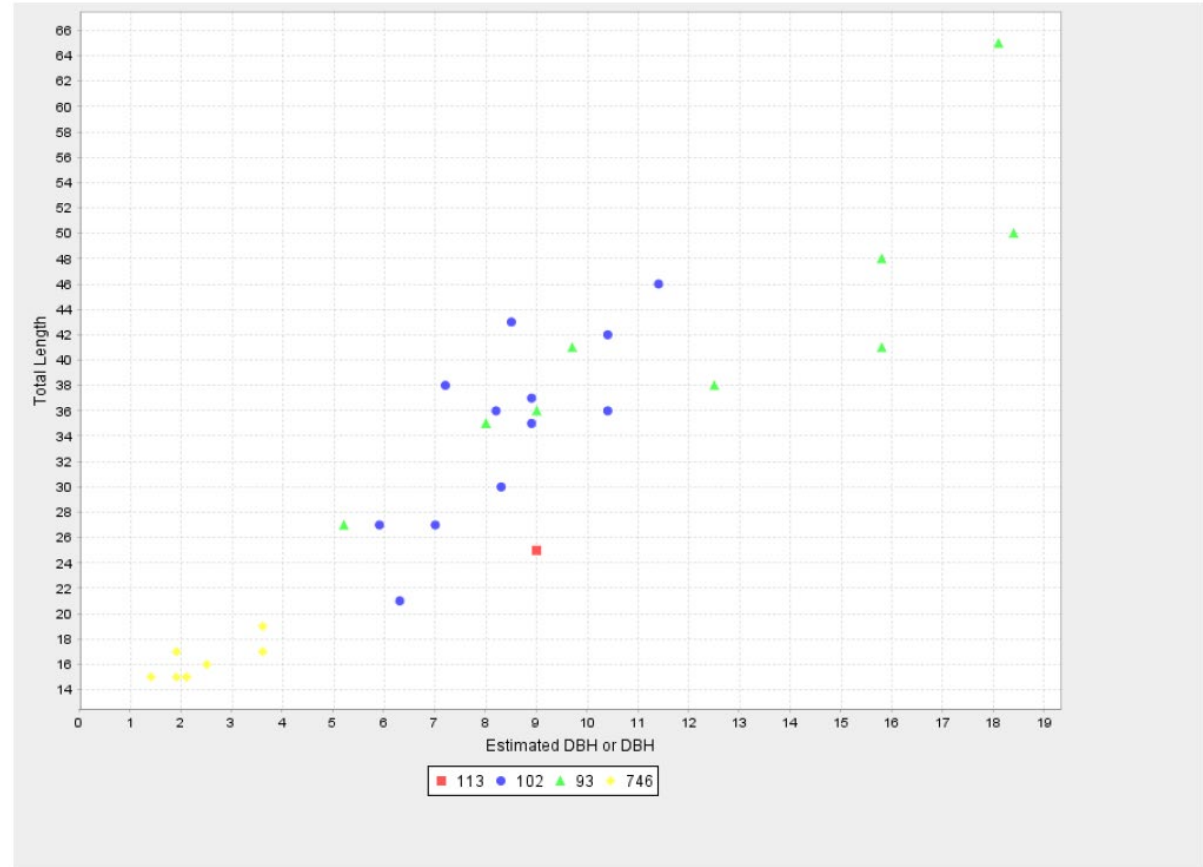
After data collection - Tools

- Diameter to height

Filename:CO.119.03005.03.08.P3.800.STD

Mon Jun 08 16:44:06 MDT 2020

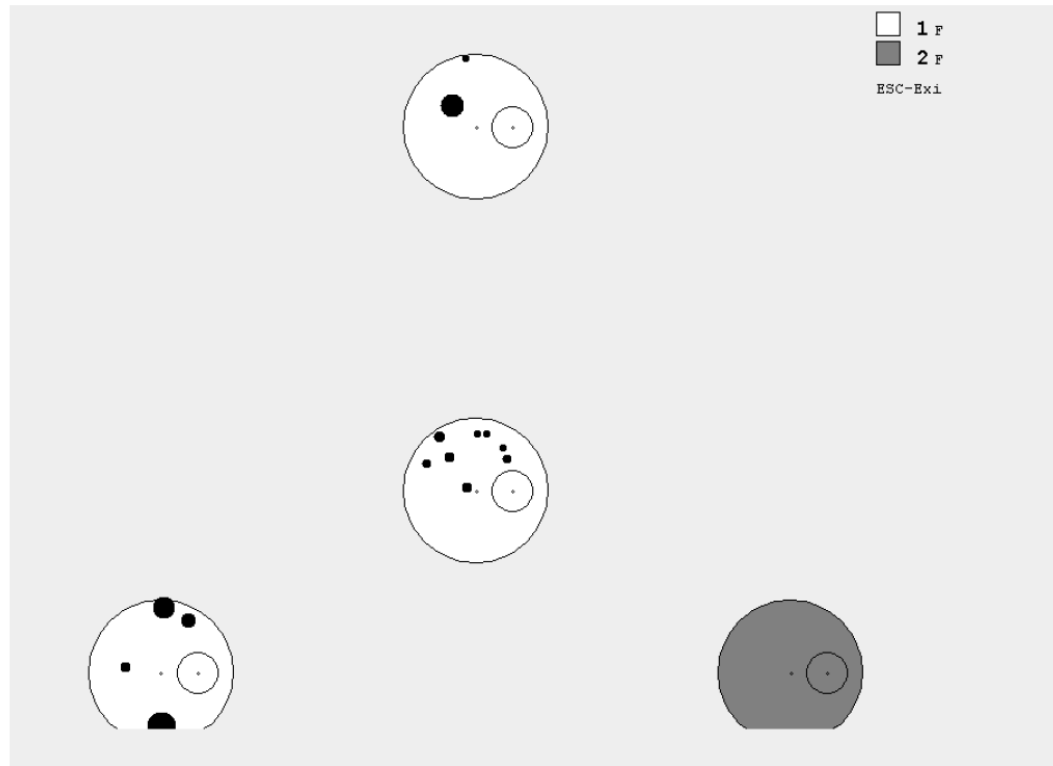
Page 12 of 12



After data collection - Tools

- Boundary Mapping tool

Filename:ID.049.03097.03.06.P2.800.STD Wed May 06 14:22:25 MDT 2020 Page 9 of 10

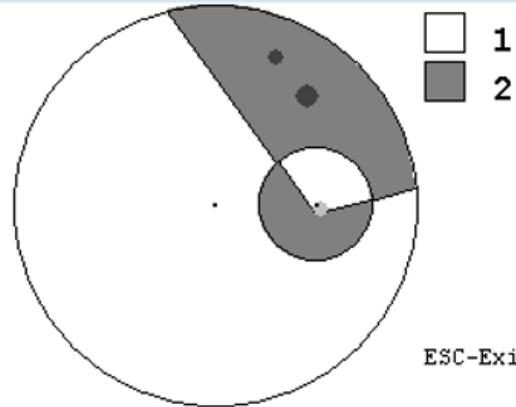


After data collection - Tools

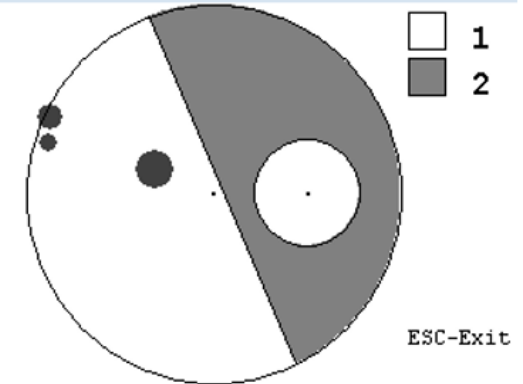


- Boundary Mapping tool

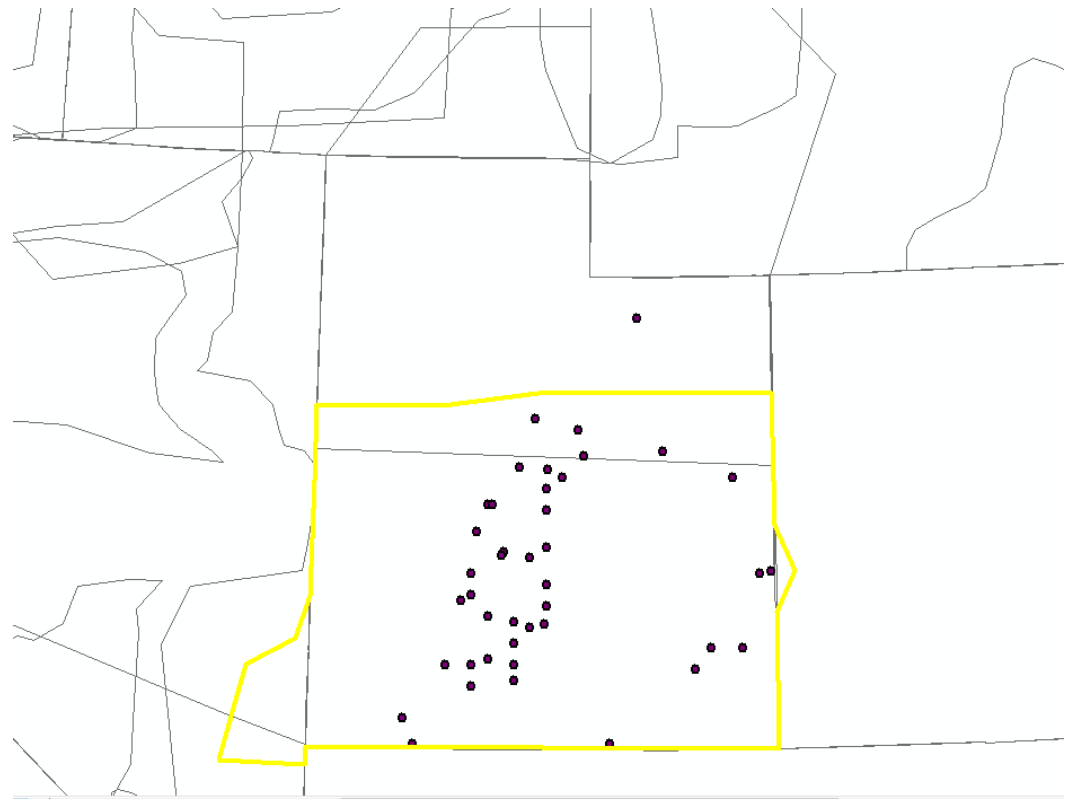
Boundary Diagram for Subplot 1



Boundary Diagram for Subplot 1



After data collection - GIS



After data collection – SQL queries

Extreme diameter growths

SQL Output Statistics

```
select statedcd, countycd, plot, invyr, subp, tree, statuscd, spcd, dia, prevdia, dia-prevdia as dia_chng, diacheck, t.htdmp, notes
from FS_MIDAS.WORK_TREE t
where statedcd in &statedcd
and invyr in &invyr
and statuscd = 1
and prevdia is not null and dia is not null
and diacheck <> 2
order by dia-prevdia desc;
```

	STATECD	COUNTYCD	PLOT	INVYR	SUBP	TREE	STATUSCD	SPCD	DIA	PREVDIA	DIA_CHNG	DIACHECK	HTDMP	NOTES
1	16	35	39	2019	2	1	1	17	14.8	7.1	7.7	0	4.5	
2	16	35	39	2019	4	11	1	17	15.7	8.8	6.9	0	4.5	
3	16	55	3	2019	3	3	1	17	13.8	7.6	6.2	0	4.5	Flagging on lower branches about 15%
4	16	49	3	2019	2	3	1	93	15.9	9.8	6.1	0	4.5	
5	16	55	3	2019	3	2	1	17	15.0	9.0	6	0	4.5	
6	16	49	3021	2019	3	3	1	17	20.0	14.1	5.9	0	4.5	
8	16	17	110	2019	2	5	1	73	14.6	8.9	5.7	0	4.5	
7	16	35	229	2019	4	9	1	122	10.7	5.0	5.7	0	4.5	
9	16	35	229	2019	4	7	1	122	13.0	7.6	5.4	0	4.5	
10	16	3	11	2019	2	2	1	17	14.7	9.4	5.3	0	4.5	Growing extremely well. Old nail completely

After data collection – SQL queries



Extreme diameter growths

SPCD	AVG_DIA	DIA_90	DIA_95	MAXGROWTH	TREES
69	0.28385975367501	1.1	1.6	21.9	10068
65	0.179291839983567	0.9	1.3	21	38946
756	0.372262773722628	1.5	2.25	17.2	411
63	0.494374686087393	1.3	1.7	15.7	3982
814	0.229326892109501	0.6	0.7	14.9	15525
202	0.73326996729194	1.7	2.2	11.5	35771
133	0.318890900115188	0.8	1.1	11	12154
122	0.757618608935974	1.7	2.1	10.4	21710
15	0.78186889818689	1.6	2.1	10.2	3585
106	0.297985871035623	0.8	1.1	10	26612
475	0.124585253456221	0.8	1.1	9.9	4340
113	0.389267139479905	1	1.3	9.1	2115



Questions?

Quality Assurance & Quality Control of National Forest Inventory (NFI) data



Workshop agenda:

- Experiences in quality assurance in the United States
- Use of portable electronic data recorders
- **Assistance with sampling techniques: teams and tools**
- Integration and purposes of databases
- Processes for generating reports and publications
- Strategies for the distribution of information and results from the NFI

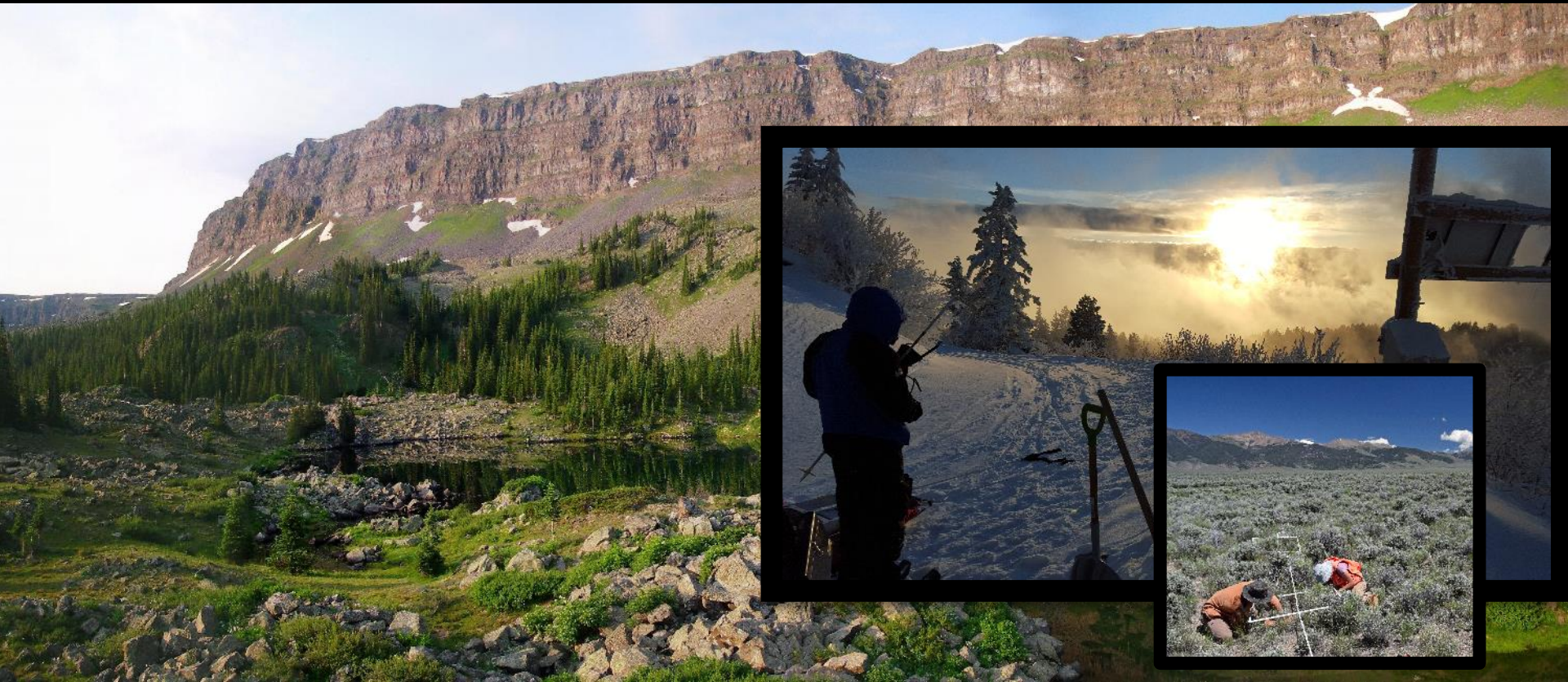


United States Department of Agriculture

Quality assurance sampling techniques: teams and tools

Rachel Simons and Sara Goeking

USDA Forest Service Rocky Mountain Research Station



Forest Service Date: 3/1/2021
Rocky Mountain Research Station

Selection criteria for hot checks, cold checks and blind checks



What we strive for (the ideal):

- blind check = 3% all plots
- cold check = 5% all plots
- hot check = 2% all plots



**A check on 10%
of all plots**

Random plot selection

Regular crews doing the plots **know** that 10% will be checked randomly.

Quality control (QC) and quality assessment (QA) crews will have a backup plot in case unforeseen circumstances occur.

Blind and cold checks are never done on the same plot (preserve integrity of blind check)

Blind checks are always done by peers (regular crews), not “expert” quality control crews.

Selection criteria for hot checks, cold checks and blind checks



What happens in real life:

- Not all QA/QC plots are selected randomly. Examples:
 - If a plot is “**suspicious**”, it’s often selected for cold check. (example: a species not expected in that area)
 - If crews work locations are far apart, plots for blind checks may be selected to be near each other to prevent crews from traveling excessive distances.
 - **Unforeseen circumstances:** A checked plot that is not randomly selected is better than NO checked plot at all.
- Some regions **pick plots ahead of time** to ensure random plot selection.

Selection criteria for hot checks, cold checks and blind checks



What happens in real life:

Blind and cold checks are SOMETIMES and VERY CAREFULLY done on the same plot.

How?

- To ensure the integrity of the **blind check** is preserved, the blind check must be *entirely finished first* by the QC crew, without looking at the regular (previous) crew's data.
- Then the QC crew looks at the regular crew's data, and completes the plot again as a **cold check**.

Do you see any issues with this?

(hint: expert crew v. regular crew)

When bridging between the ideal and the real, we pick our compromises to get our best (not perfect) outcome.

QA/QC principles: balance between quality and productivity.

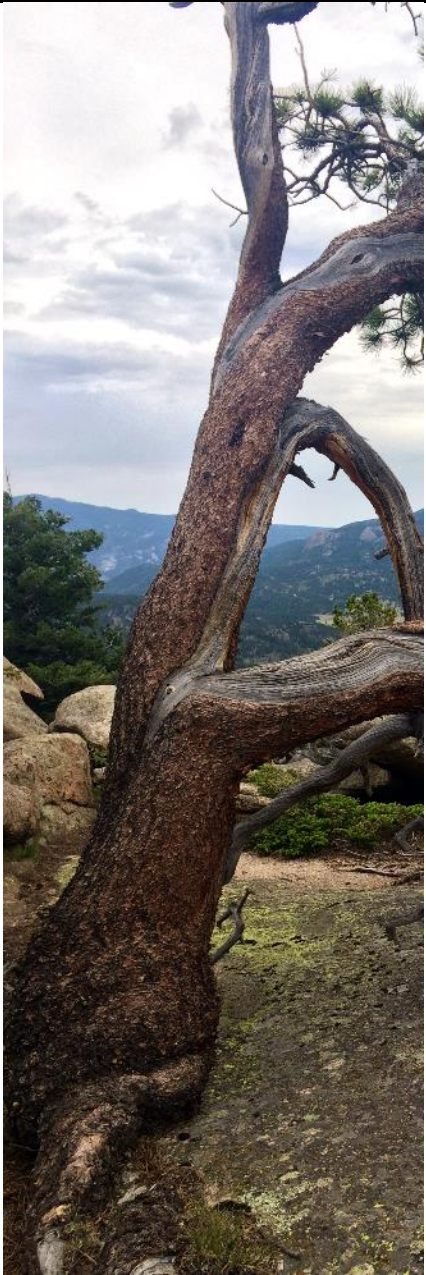
Do we want one perfect gold-plated spoon, or just spoons?



When the tolerance for a diameter is ± 0.1 inch, with a compliance rate of 95% the time, there is little benefit to having a perfect diameter 100% of the time.

The time we might spend perfecting the data may be better spent collecting *more data*.

QA never-ending cycle: assessment, correction and prevention

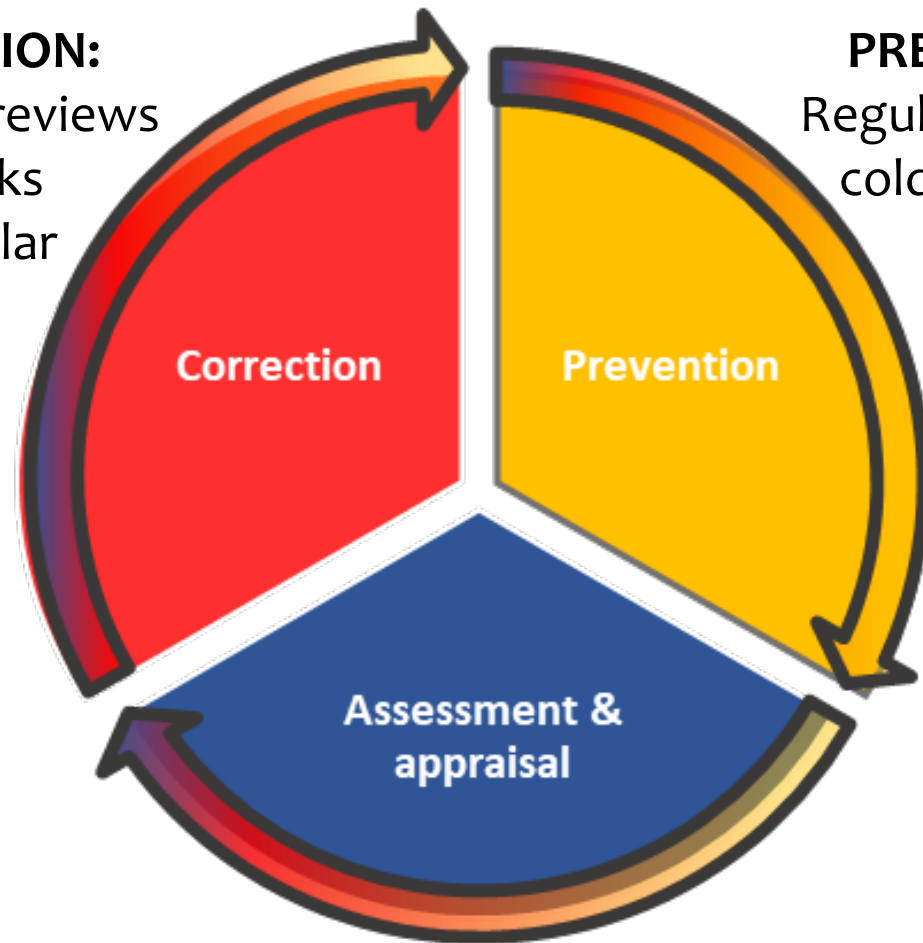


CORRECTION:

QC crew reviews
cold checks
with regular
crews

Training

protocol
revision



PREVENTION:

Regular hot and
cold checks to
provide
consistent
feedback

ASSESSMENT AND APPRAISAL: Blind check data analysis.
QC crews provide feedback annually to make trainings for
common errors

Cold check scoring – general tips



- **Make use of photographs** and video to record discrepancies.
- **Your feelings** about a crew shouldn't enter into the cold check scoring process.
- **Allow for regular crews to respectfully question QC crews.** Some data items require making subjective assessments, and it's difficult to require a data collector to exercise the exact same discretion as the inspector.
- QC crews should use the same equipment, electronics, and tools as the initial production crews.
- **Simply marking something wrong doesn't fix the error.** Fix the error on that plot, then teach the regular crew what they got wrong. Doing this will fix that, and many more errors. (QA never ending cycle)



Cold check scoring sheet



What is a cold check scoring sheet?

A cold check scoring sheet holds all the items/measurements to be checked, along with tolerances.

Why do we use it?

- Scoring provides an objective measure to determine what is/is not acceptable work, preventing personal feelings about a crew from influencing assessment of work.
- When QC crews find items that do not meet tolerance, the scoring sheet becomes a teaching tool to show crews where they may need to improve.
- QC crews can track where errors occur across multiple score sheets, then correct errors in training for all regular field crews.

Evaluation of contract crews



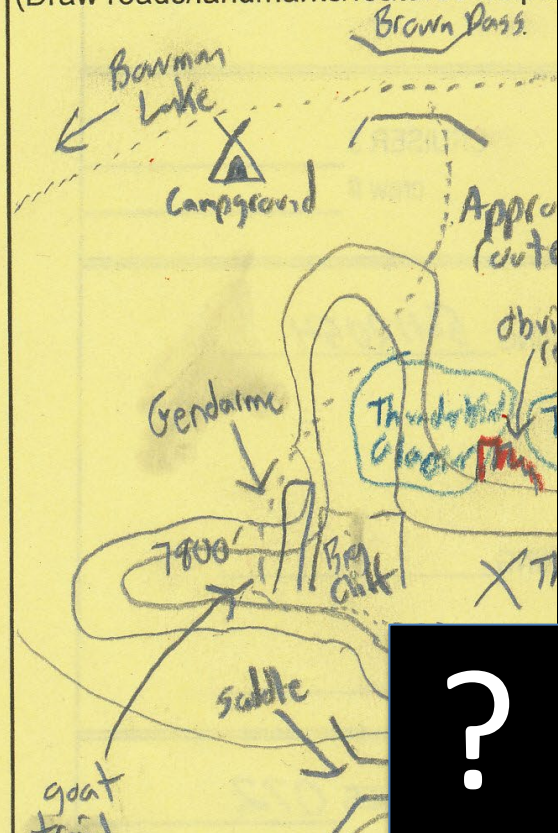
In USFS NFI, we check 10% of all our contractor's plots.

- Contractors turn in plots in batches of 10. the QC crew inspects 1 of these 10 plots.
- The contractor gets paid for the 10 plots *after* that one checked plot passes cold check inspection.
- If a plot does not pass inspection:
 - The QC crew tells the contractor the plot failed and gives them the option to re-work the 10 plots and make sure the other 9 plots don't have the same errors.
 - The contractor turns in the 9 plots again, and the QC crew inspects another plot. If it passes, the contractor gets paid in full.
- If a contractor fails the second time, they may be given another chance to correct and turn in the plots, but they will not be paid in full.

What happens if you can't find a plot?

FIELD LOCATION MAP

(Draw roads/landmarks/features helpful)



- Check GPS unit datum and coordinate system
 - (preventative measure: ensure all GPS units are consistently configured)
- Field-drawn maps that include geographic and manmade features may be helpful.
- Plot markers- are protocols adequate for marking plots?
 - Consider triangulating using three distances and azimuths.
- Look for anomalous trees (large, small, different species)
- Consider using metal detectors

What to do with a missing plot?



This is very, very rare. But if it does occur:

- QA crews will want to track these carefully.
- **Research** what happened.
- **Watch for trends** past or present.
- **Set plot aside** and alert other quality assurance crews if a problem may be a trend.
- Use a reconcile coding system for lost plots in all data fields. Examples:
 - **Plot Status** code= 3 (Nonsampled),
 - **Plot Nonsampled Reason** code= 6 (Lost Plot- Remeasurement plot not found)

Questions?



- Contact: rachel.simons@usda.gov
- More info to come!
 - Experiences in quality assurance in the United States
 - Use of portable electronic data recorders
 - Assistance with sampling techniques: teams and tools
 - **Integration and purposes of databases**
 - Processes for generating reports and publications
 - Strategies for the distribution of information and results from the NFI

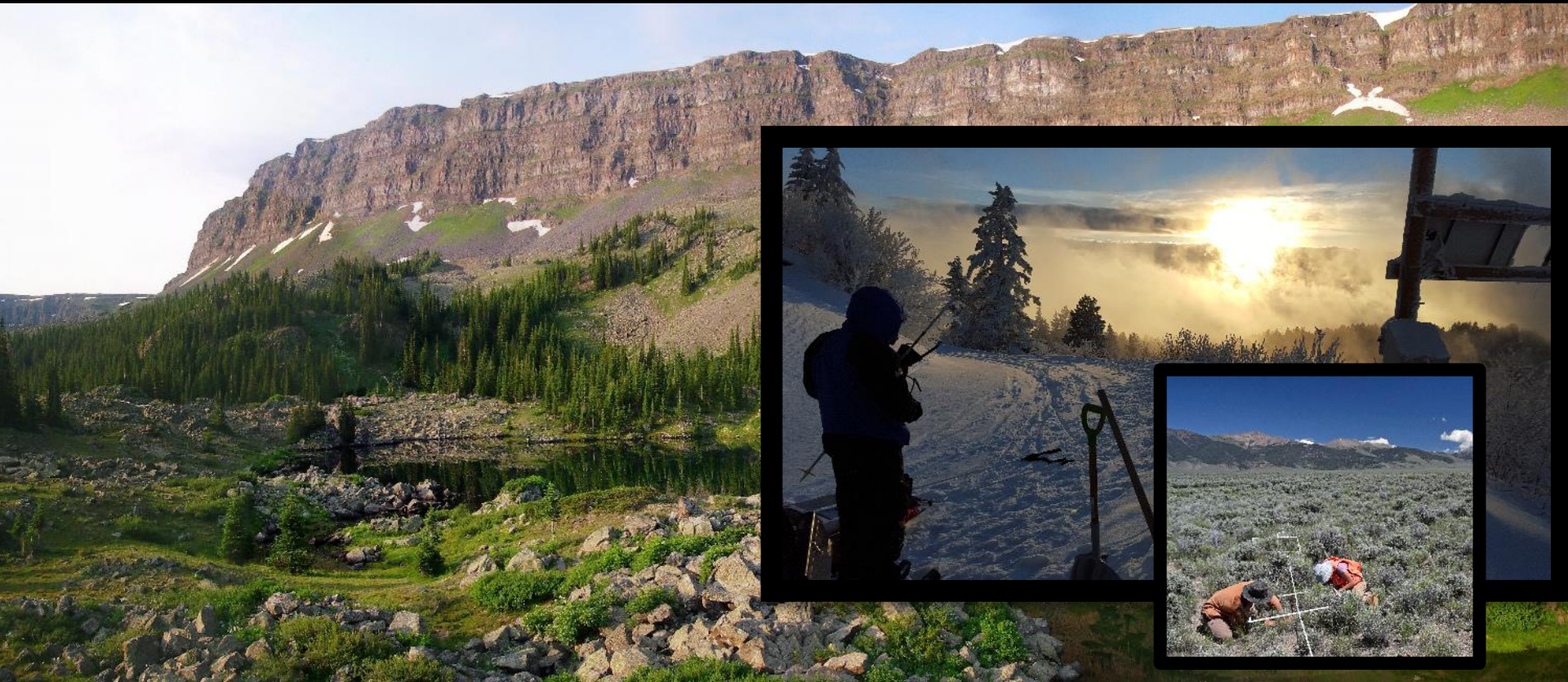


United States Department of Agriculture

Integration and purposes of databases

Erich Dodson

USDA Forest Service Rocky Mountain Research Station



Forest Service 3/5/2021
Rocky Mountain Research Station

Relational Database



FS_FIADB.SURVEY

Column	Type
CN	VARCHAR2(34)
INVYR	NUMBER(4)
P3_OZONE_IND	VARCHAR2(1)
STATECD	NUMBER(4)
STATEAB	VARCHAR2(2)
STATENM	VARCHAR2(40)
RSCD	NUMBER(2)

PLT_SRV

FS_FIADB.PLOT

Column	Type
CN	VARCHAR2(34)
SRV_CN	VARCHAR2(34)
CTY_CN	VARCHAR2(34)
PREV_PLT_CN	VARCHAR2(34)
INVYR	NUMBER(4)
STATECD	NUMBER(4)
UNITCD	NUMBER(2)
COUNTYCD	NUMBER(3)

TRE_PLT

FS_FIADB.TREE

Column	Type
CN	VARCHAR2(34)
PLT_CN	VARCHAR2(34)
PREV_TRE_CN	VARCHAR2(34)
INVYR	NUMBER(4)
STATECD	NUMBER(4)
UNITCD	NUMBER(2)
COUNTYCD	NUMBER(3)
PLOT	NUMBER(5)
SUBP	NUMBER(3)
TREE	NUMBER(3)

Database primary and unique keys



- Primary key: used to uniquely identify a record (plot, tree, etc.). We call it cn.
- Unique key: a combination of columns (e.g., statecd, countycd, plot, invyr) used to uniquely identify a record.

Key Type	Column(s) order
Primary	CN
Unique	STATECD, INVYR, UNITCD, COUNTYCD, PLOT

Processing steps



- Basic process:
- Field collection and review: RAW > WORK
- Compilation system: LOAD > computation tables
- Load to mimic public database for review
- Load to public database

Multiple copies of the data



- Keeps copies the data at various stages of processing, in case anything goes wrong
- Raw stores the field collected data exactly as it was at the time of collection.

Raw to Work



- Review, office, field supervisors, etc.
All edits done to raw data are saved in the work database copy.
- Work data are loaded to the compilation system

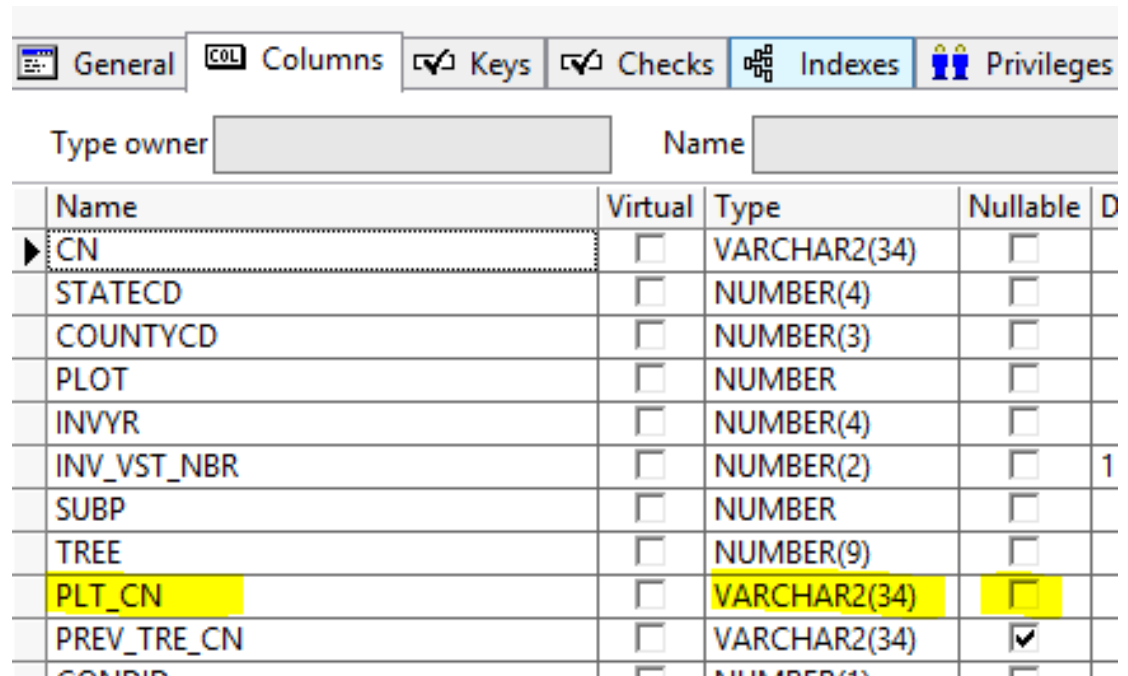
Loading to compilation



- Loading logic add to or check data:
- Example for vegetation species:
`DECODE(VEG_SPCD,NULL,DECODE(SPECIMEN_COLLECTED,0,VEG_FLDSPCD,VEG_SPCD),VEG_SPCD) as VEG_SPCD`

Compilation System

- Database constraints used to ensure data quality:



General Columns Keys Checks Indexes Privileges

Type owner: Name:

Name	Virtual	Type	Nullable	D
▶ CN	<input type="checkbox"/>	VARCHAR2(34)	<input type="checkbox"/>	
STATECD	<input type="checkbox"/>	NUMBER(4)	<input type="checkbox"/>	
COUNTYCD	<input type="checkbox"/>	NUMBER(3)	<input type="checkbox"/>	
PLOT	<input type="checkbox"/>	NUMBER	<input type="checkbox"/>	
INVYR	<input type="checkbox"/>	NUMBER(4)	<input type="checkbox"/>	
INV_VST_NBR	<input type="checkbox"/>	NUMBER(2)	<input type="checkbox"/>	1
SUBP	<input type="checkbox"/>	NUMBER	<input type="checkbox"/>	
TREE	<input type="checkbox"/>	NUMBER(9)	<input type="checkbox"/>	
PLT_CN	<input type="checkbox"/>	VARCHAR2(34)	<input type="checkbox"/>	
PREV_TRE_CN	<input type="checkbox"/>	VARCHAR2(34)	<input checked="" type="checkbox"/>	
CONDIS	<input type="checkbox"/>	NUMBER(4)	<input type="checkbox"/>	

Compilation system -- Triggers

- Triggers used to automatically update data correctly

```
CREATE OR REPLACE TRIGGER FS_NIMS_RMRS.TBIUR_CND_LOC_GRP
BEFORE INSERT OR UPDATE OF
  HABTYPCD1, STATECD, UNITCD, COUNTYCD, FORTYPCD, FLDTYPCD
ON NIMS_COND_TBL
FOR EACH ROW
BEGIN
  IF INSERTING OR UPDATING THEN
    :new.unitcd:=nims_populate_unitcd.populate_unitcd(:new.statecd, :new.countycd);
    :new.vol_loc_grp := nims_update_loc_grp.driver(:new.statecd,:new.countycd,:new.plot,:new
  END IF;
END TBIUR_CND_LOC_GRP;
```

Compilation system



- Computations, e.g., volume, biomass, carbon
- Stratification for population estimates (post-stratification)

U.S. NFI does this mostly internally in the database with PL/SQL packages, etc.

Review



- Publish to mimic public database, reviewed by experts, focusing on population estimates.

Then published to public database (FIADB) with data available to the public

The process is always getting updated



- Teams can (and do as needed) update packages, loading logic, triggers etc.
- Different team for field data collection, programming warnings and errors.

Questions?



- Contact: erich.k.dodson@usda.gov
- More info to come!
 - Experiences in quality assurance in the United States
 - Use of portable electronic data recorders
 - Assistance with sampling techniques: teams and tools
 - Integration and purposes of databases
 - **Processes for generating reports and publications**
 - Strategies for the distribution of information and results from the NFI

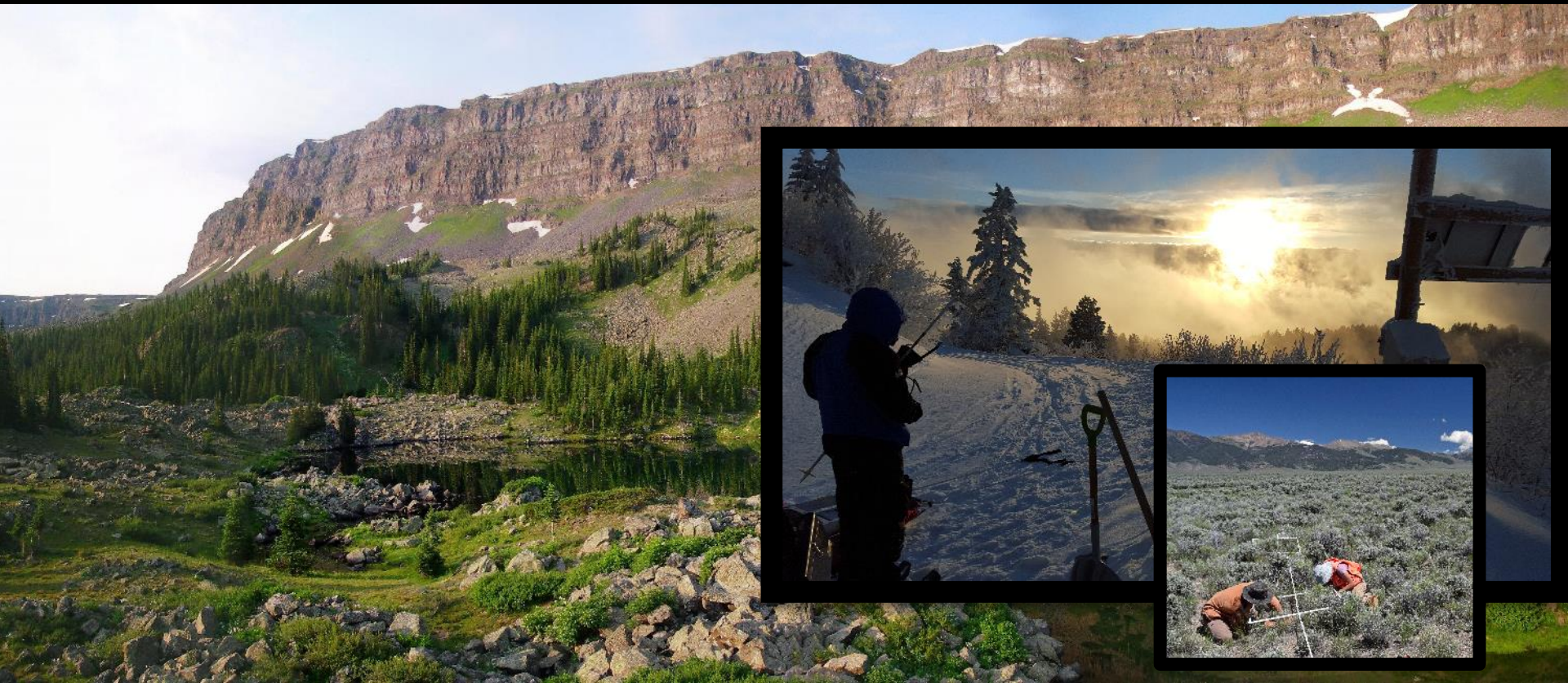


United States Department of Agriculture

Processes for generating reports and publications

Jennifer Bakken

USDA Forest Service Rocky Mountain Research Station



Forest Service 5 March 2021
Rocky Mountain Research Station

NFI – Reporting mandates



- Publish data to a publicly available database (annually)
- Provide national data summary reporting tools
- Publish State Forest Inventory Reports (every 5 years)

NFI – Reporting mandates

- Publish data to a publicly available database (annually)

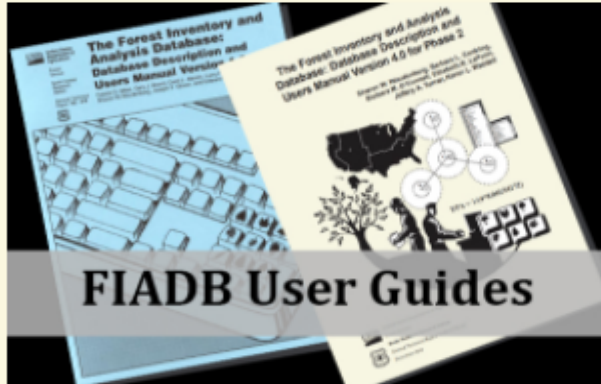


Photo: Covers of FIA P2 User Manuals

Forest Inventory and Analysis Database (FIADB) User Guides

The Forest Inventory and Analysis Database (FIADB) User Guides series includes multiple documents. These documents provide detailed information for the FIADB.

<https://www.fia.fs.fed.us/library/database-documentation/>

– Database Description and User Guide

- Describes the database tables and data elements
- Explain the structure and relation of tables

– Population Estimation User Guide

- How to obtain population estimates and sampling errors for standard attributes
 - Forest Area, Number of trees, Volume, Biomass, Carbon in trees, etc.

NFI – Reporting mandates

Structured
Query
Language

- [Population Estimation User Guide](#)
 - (SQL) Standard queries for each attribute
 - Able to produce standard tables and estimates for reporting
 - Tables and estimates can be easily compared from State to State or Region to Region

Example 4-1: Area of timberland, in acres, with sampling error (ATTRIBUTE_NBR 3).

Line	Script
1	<code>select eval_grp,</code>
2	<code>eval_grp_descr,</code>
3	<code>3 attribute_nbr,</code>
4	<code>'Area of timberland, in acres' attribute_descr,</code>
5	<code>coalesce(cast(grp_by_attrib as varchar(4000)), 'Not available') group_by_field,</code>
6	<code>'&filter' filter,</code>
7	<code>sum(estimate_by_estn_unit.estimate) estimate,</code>
8	<code>case</code>
9	<code>when sum(estimate_by_estn_unit.estimate) <> 0 then</code>

NFI – Reporting mandates


- Examples of attributes and estimates

Attribute description	Estimate	Non-Standard Error (%)	zero plots
Area of forest land, in acres	24,643,064	0.86	3849
Number of live trees (at least 1 inch d.b.h./d.r.c.), in trees, on forest land	6,367,326,420	2.02	3537
Number of standing dead trees (at least 5 inches d.b.h./d.r.c.), in trees, on forest land	368,384,204	2.99	2032
Aboveground biomass of live trees (at least 1 inch d.b.h./d.r.c.), in dry short tons, on forest land	310,050,404	1.81	3537
Net merchantable bole volume of live trees (at least 5 inches d.b.h./d.r.c.), in cubic feet, on forest land	17,161,366,945	1.83	3475
Average annual net growth of live trees (at least 5 inches d.b.h./d.r.c.), in cubic feet, on forest land	3,384,897	517.56	3515
Average annual mortality of trees (at least 5 inches d.b.h./d.r.c.), in cubic feet, on forest land	238,426,702	7.32	1430
Number of live seedlings (less than 1 inch d.b.h./d.r.c.), in seedlings, on forest land	18,897,959,685	3.51	2493
Net merchantable bole volume of standing dead trees (at least 5 inches d.b.h./d.r.c.), in cubic feet, on forest land	2,364,746,951	5.17	2012
Aboveground biomass of standing dead trees (at least 5 inches d.b.h./d.r.c.), in dry short tons, on forest land	35,745,274	5.29	2032




NFI – Reporting mandates

- National data summary reporting tools



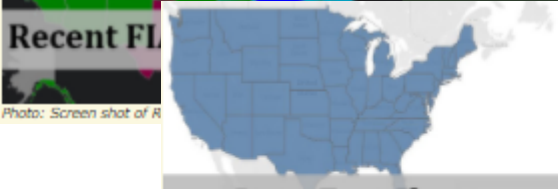
DATIM

The **Design and Analysis Toolkit for Inventory and Monitoring (DATIM)** provides four modules: an analysis tool for inventory and monitoring (ATIM) used for creating tables; a spatial intersection tool (SIT); a design tool for inventory and monitoring plans (DTIM); and a data compilation system (DCS) to add **FVS** attributes to DATIM datasets.



Recent FIA Data by State

The **Recent FIA Data by State** allows visitors to view a map of the most recent dataset collected for each state.



Recent FIA

State Fact Sheets

The **State Fact Sheets** tool allows visitors to view **FIA** state fact sheets via an interactive experience. Click on the desired state on the map to produce a real-time fact sheet of that state based on current **FIA** data.



State

EVALIDator

EVALIDator allows users to produce a large variety of population estimates and their sampling errors based on the current **FIADB**.



EVALIDator

FIA Data Mart

The **FIA Data Mart** allows visitors to download raw data files, standard tables, SQLite databases, and a desktop **EVALIDator** reporting tool. Data Mart also provides access to the **FIA** State reports, **FIADB** most recent load history, API **EVALIDator**, and **FIADB** User Guides.

FIA Data Mart

Photo by Sjana Schanning, US Forest Service, Northern Research Station

Example: Availability of data summaries

<https://www.fia.fs.fed.us/tools-data/>

Some tools (EVALIDator, DATIM, and Batch Reports) allow users to run their own queries

- Users define *what* (the attribute of interest), *when* (years), and *where*
- Output includes an estimate and a standard error

Table 1.3: Timberland Acres by Stand Size

Stand-size class	Acres of Timberland	Sample Error
Total	10,448,134	1.73
Large diameter	6,150,386	2.62
Medium diameter	2,641,723	4.33
Small diameter	1,328,004	6.15
Nonstocked	328,020	12.17

NFI – Reporting mandates

- Publish State Forest Inventory Reports (every 5 years)



Quality control and verification of new data (annual data review)

- Comparison of annual data estimates
 - Helps identify change from year to year

State Evaluation Tables:

Table 1a. Area of forest land by ownership class, in acres for Colorado.

Group-by Field	2018			2019			Percent Change
	Estimate	Sampling Error (percent)	Non-zero Plots	Estimate	Sampling Error (percent)	Non-zero Plots	
11. National Forests	11,200,766	1.56	1916	11,185,460	1.56	1918	-0.137
12. National Grasslands	25,788	47.52	5	25,868	47.55	5	0.311
21. National Park Service	377,587	12.25	63	376,001	12.26	63	-0.420
22. Bureau of Land Management	5,042,861	2.83	869	5,045,235	2.83	871	0.047
24. Departments of Defense/Energy	109,662	23.63	18	113,591	23.48	18	3.582
25. Other federal	12,773	72.03	2	12,642	71.97	2	-1.029
31. State	616,537	9.64	115	622,583	9.61	116	0.981
32. Local (County, Municipal, etc.)	149,970	19.19	28	182,959	17.08	35	21.997
46. Undifferentiated private	5,402,396	2.79	981	5,355,792	2.80	975	-0.863
Total	22,938,341	0.75	3953	22,920,131	0.75	3954	-0.079



Questions?



- Contact: Jennifer.L.Bakken@usda.gov
- More info to come!
 - Experiences in quality assurance in the United States
 - Use of portable electronic data recorders
 - Assistance with sampling techniques: teams and tools
 - Integration and purposes of databases
 - Processes for generating reports and publications
 - Strategies for the distribution of information and results from the NFI

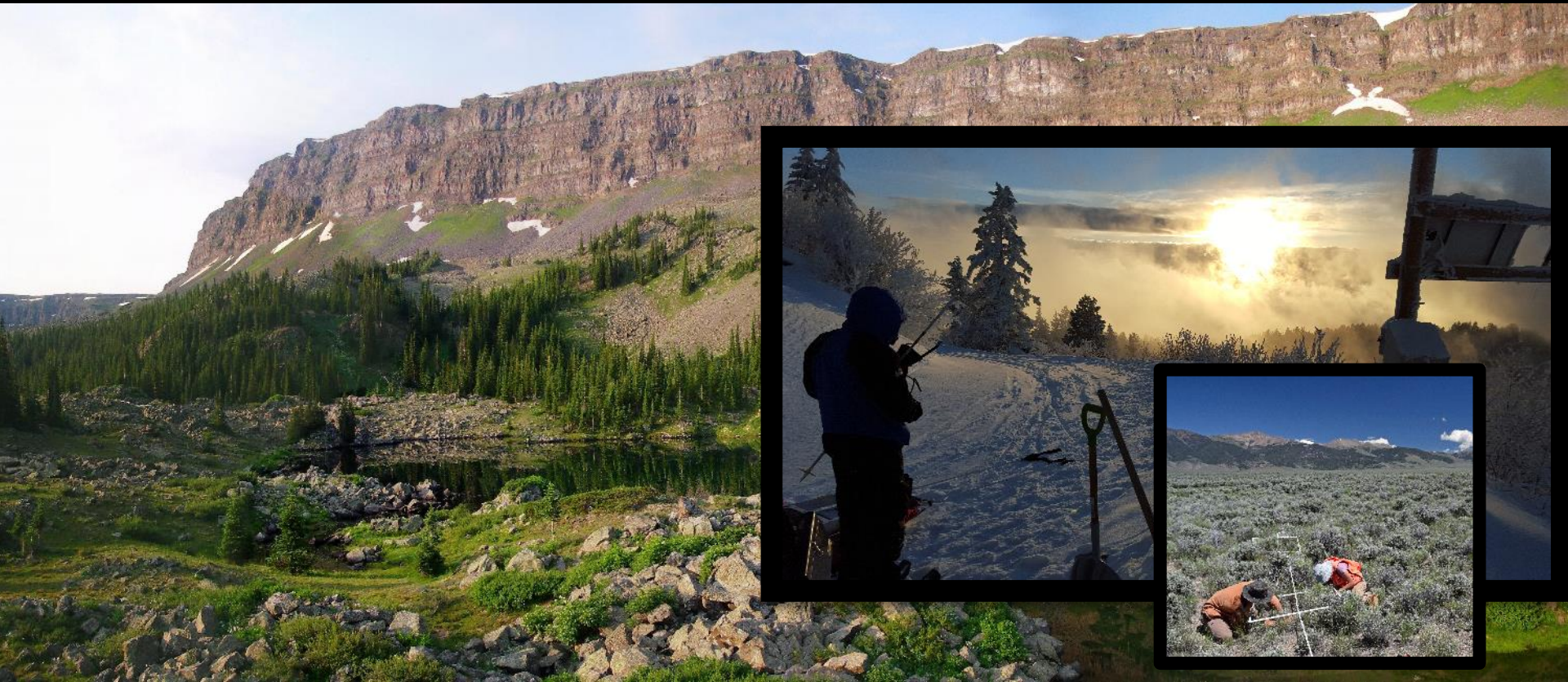


United States Department of Agriculture

Strategies for distribution of information from the NFI

Sara Goeking

USDA Forest Service, Rocky Mountain Research Station










Forest Service 5 March 2021
Rocky Mountain Research Station

NFI Products: Basic data

- <https://apps.fs.usda.gov/fia/datamart/datamart.html>



 FIA DataMart FIADB_1.8.0.03 Last updated February 2, 2021		
FIA DataMart files		
File type	Description	Level of difficulty
 PDF	Portable Document Format files of FIA State reports	Low
 HTML	HTML Format - Most recent FIA data by State	Low
 XLS	Microsoft® Excel 2013 workbooks containing many reports for the most recent State inventories. Workbooks also includes VBA Macros that issue POST and/or GET API commands to generate EVALIDator reports based on parameters passed in INPUTS worksheet.	Medium
 SQLITE	SQLite3 State databases. SQLite home page . The SQLite State databases contain FIADB data and FVS-ready data (see Field note: A new conversion of Forest Inventory and Analysis data for use in the Forest Vegetation Simulator for information about FVS-ready data).	High
 CSV	Forest Inventory and Analysis Database (FIADB) comma-delimited files in FIADB version 1.8.0.02 format.	High
 API	Application Programming Interface for EVALIDator web-application	High

NFI Products: Data reports or summaries

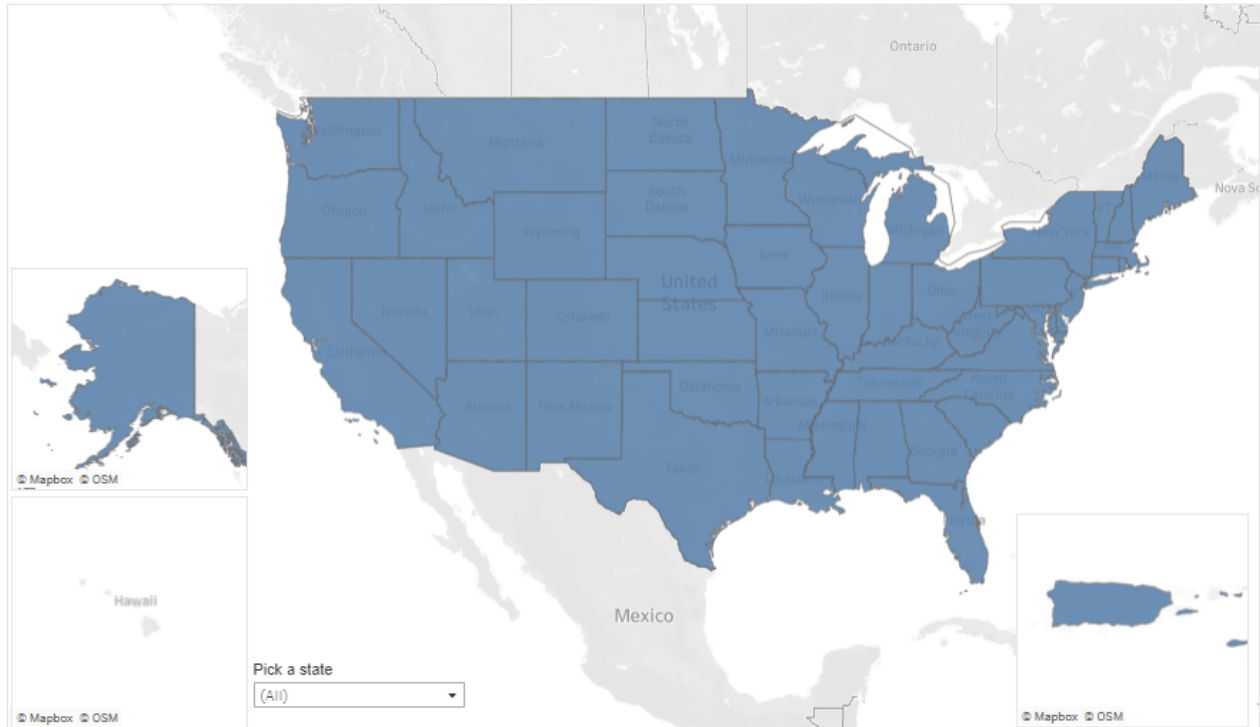
<https://www.fia.fs.fed.us/tools-data> (click on State Fact Sheets)

Forest Inventory & Analysis One-Click Factsheet

The USDA Forest Service Forest Inventory & Analysis program supplies annual updates that provide a brief overview of forest resources in each state based on an inventory conducted by the FIA program in cooperation with each State forestry agency.

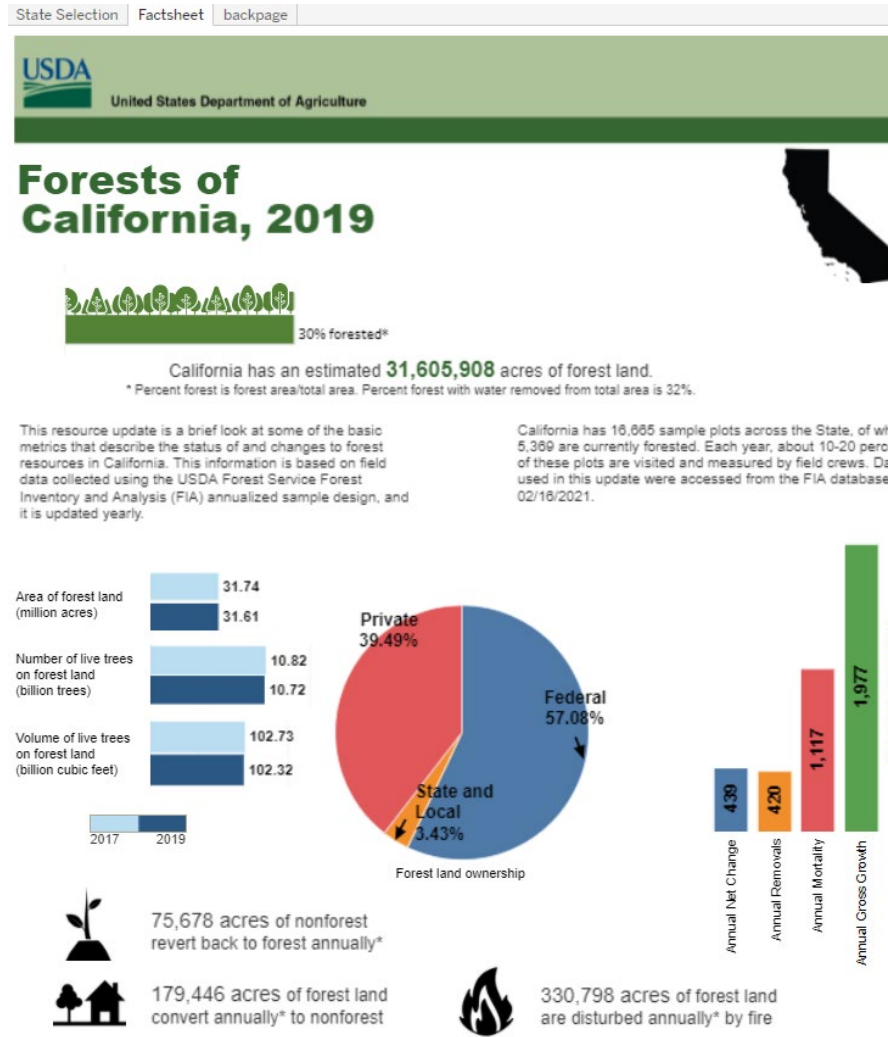


Hover over each state to see the State and Report Year. Pick a state of interest and the Factsheet will be generated for you. Use the back button to navigate back to the map to choose another state. Use the download button to obtain your own copy of the factsheet that interests you. NOTE - a drop-down state selector is available in the bottom left-hand corner. Once a state is selected using the drop-down menu, you must click the Factsheet and/or Backpage tab. Currently, not all factsheets are complete as some change estimates are unavailable in many western states. Check back often as we will be completing all states very soon.



NFI Products: Data reports or summaries

<https://www.fia.fs.fed.us/tools-data> (click on State Fact Sheets)



Distribution of data, reports, and publications



- Basic data:
 - Publicly available online
- Data summaries or reports:
 - Develop online tools to create user-defined data summaries and tabular reports
- Official reports:
 - Available at no charge
- Peer-reviewed publications:
 - Reach technical and academic audiences

Identify and involve stakeholders early and often



- Prior to publishing reports:
 - What should our reports include?
 - Has anything changed in the data that our users should be aware of?
- Prior to changing our protocols
 - If we change something, how will it affect their ability to use our data?
 - Is there anything we are not measuring or reporting that would make our data more useful?

Meet with existing stakeholders and partners



- User group meetings
 - Include stakeholders and partners
 - Inform but also listen to feedback
 - Provide multiple methods for communication
- NFI-sponsored research conferences
 - “FIA Stakeholder Science Meeting” held every two years for research related to our NFI
- Other scientific conferences

Identify potential *new* stakeholders and partners



- Make your data publicly available, and publicize it, as much as possible
- Build teaching tools so new stakeholders and partners can use the publicly available data
- Identify the resource needs of new stakeholder groups

Develop new products

- Develop flexible analysis tools and reports to meet stakeholder needs
 - Examples: Managers of large areas such as National Forests or National Parks may have specific resource management questions
 - Allow user-defined queries in publicly available tools
 - Look for opportunities to partner with other entities who can do more work or offer special skills or resources
- Develop new platforms to engage diverse users
 - Examples: Online multimedia dashboards, story maps



Collaborate with partners to increase capacity



- University partners may have complementary expertise and funding
- Involvement with local or regional community organizations may improve the ability to access plots in some regions

Develop new resource applications of NFI data



- Can you more fully use existing data?
 - Examples: Non-timber forest products, assessments of species-of-interest, climatic niches of seedlings versus mature trees by species
- Do you collect any information that you do not currently use? Can it become useful?
- Can NFI information be combined with other datasets?
 - Example: Mexico's NFI data and GEDI (Global Ecosystem Dynamics Investigation – space-based lidar)

Examples: Applications of NFI data



- Sustainability of forest products sector
- Use of NFI data for National Forest Planning mandates
- Calibration and/or validation of other spatially-explicit datasets and remote sensing products
- Provide a spatially representative, landscape-level perspective on several resource issues:
 - Geographic extent, severity, and frequency of disturbances
 - Species of interest
 - Habitat for any wildlife species whose habitat is defined by vegetation structure or composition

Questions?



Contacts:

- Sara.Goeking@usda.gov
- Thomas.Weber@usda.gov
- Rachel.Simons@usda.gov
- Erich.K.Dodson@usda.gov
- Jennifer.L.Bakken@usda.gov