Updating the NHD for USFS Lands: A Collaborative Approach

Solving Problems with Collaboration
ESRI User Conference
Tuesday, July 9, 2019
SDCC: Room 29C

Joel Osuna
Project Manager
Center for Geospatial Science and Technology
California State University, Northridge

Veronica Lopez
GIS Analyst
USDA Forest Service
Southwestern Region

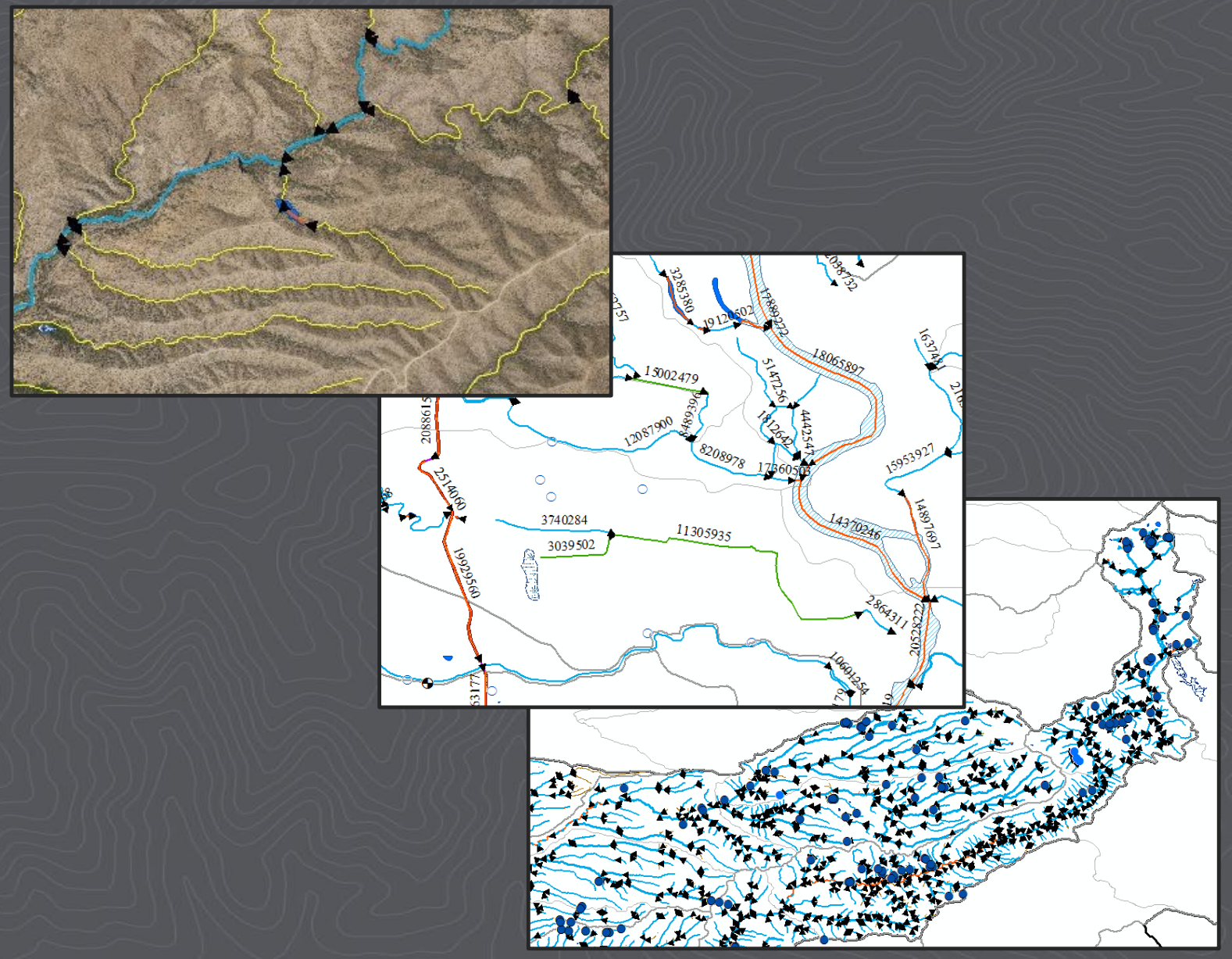
Presentation Overview

- NHD and Its Importance
- USFS Region 3 and NHD
- Building Collaboration
- Scope and Work Specifics
- Results and Outcomes
- Benefits
- Q&A

NHD and Its Importance

NHD: About the Data

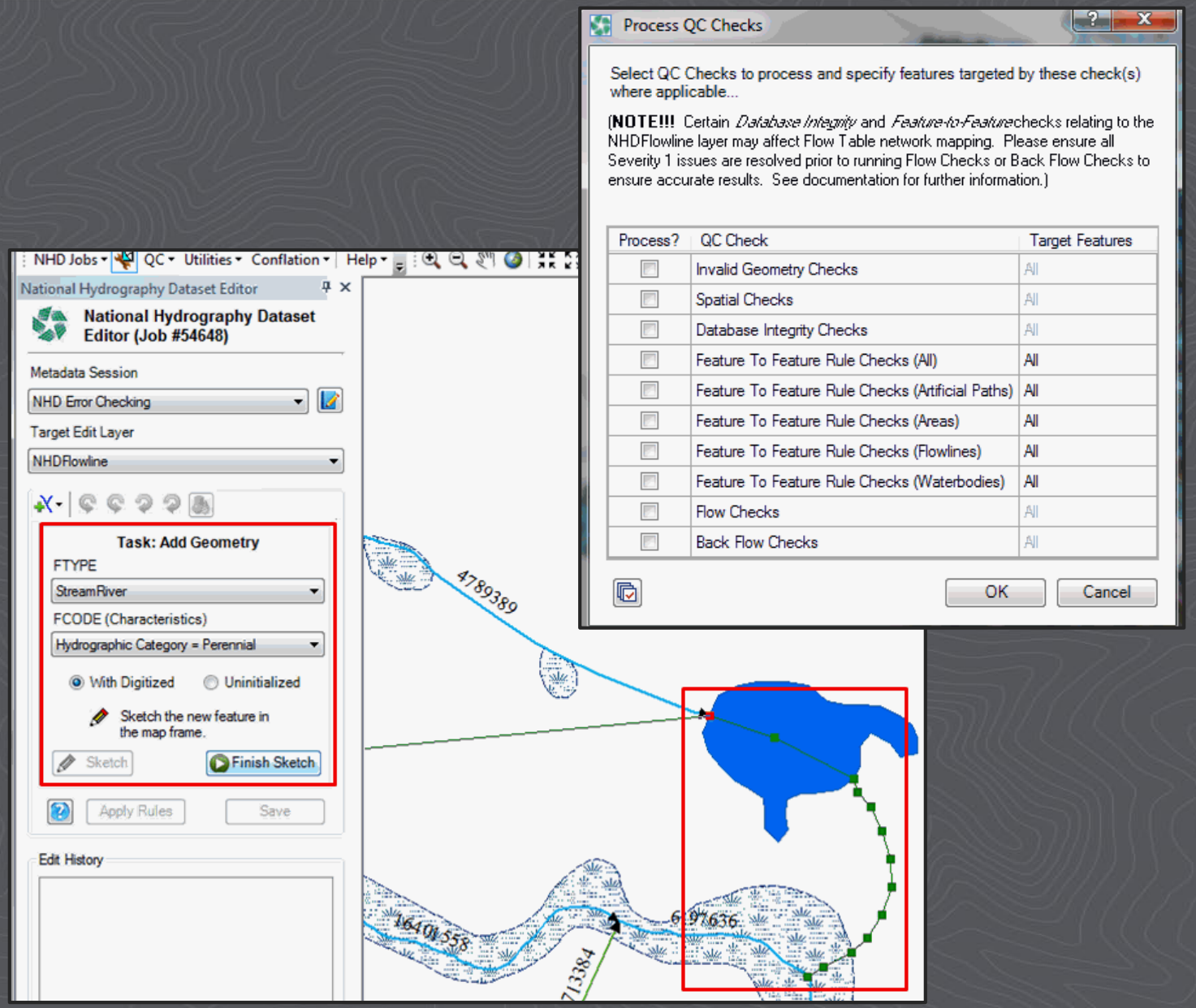
- Nation-Wide GIS Dataset
- 1:24,000 Scale
- Surface Water/Hydrography
  - Polygons
  - Lines
  - Points
- Contains a robust set of attributes
  - FTypes/FCodes
  - GNIS Names/ID
  - ReachCodes



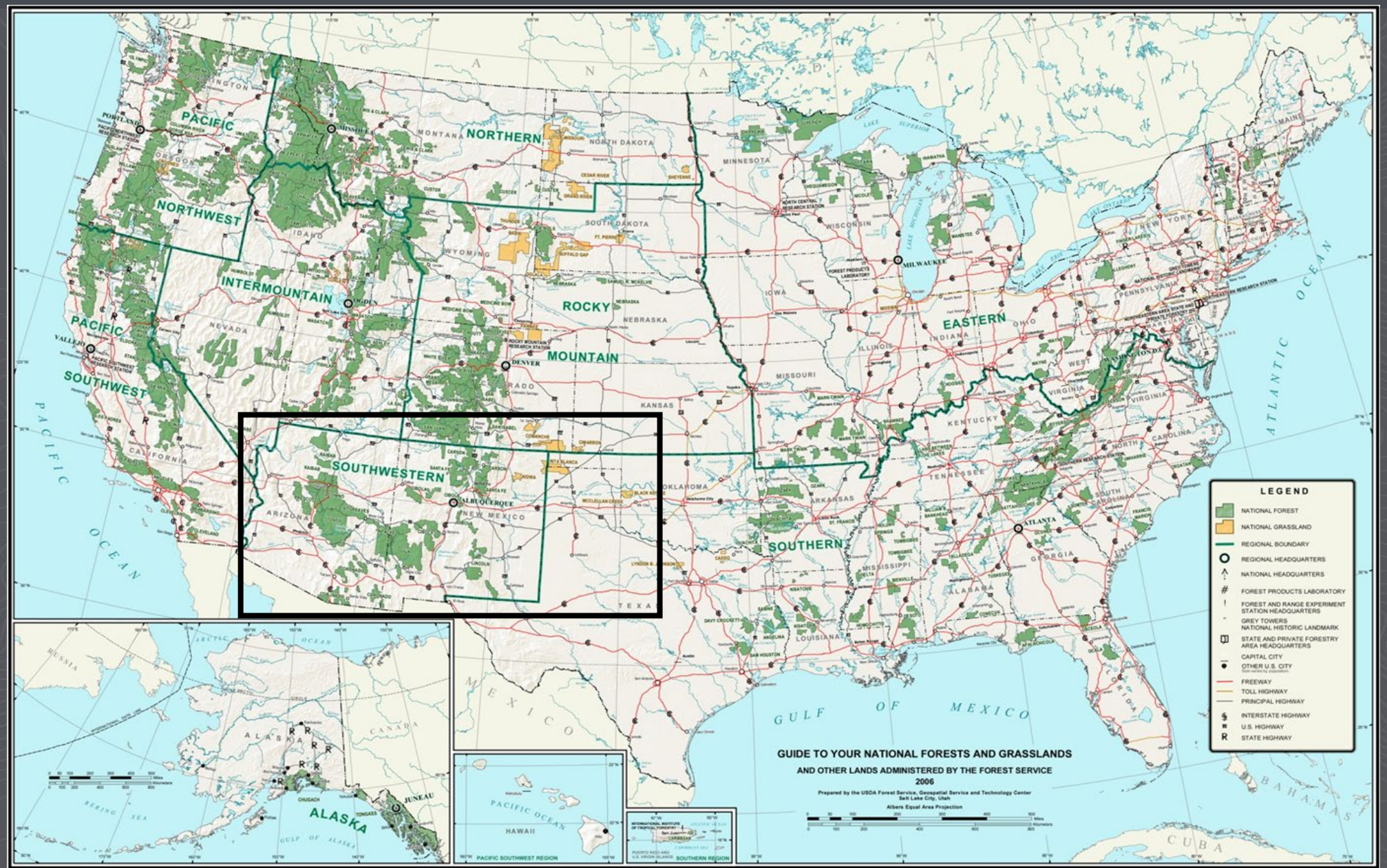
NHD and Its Importance

NHD: Stewardship

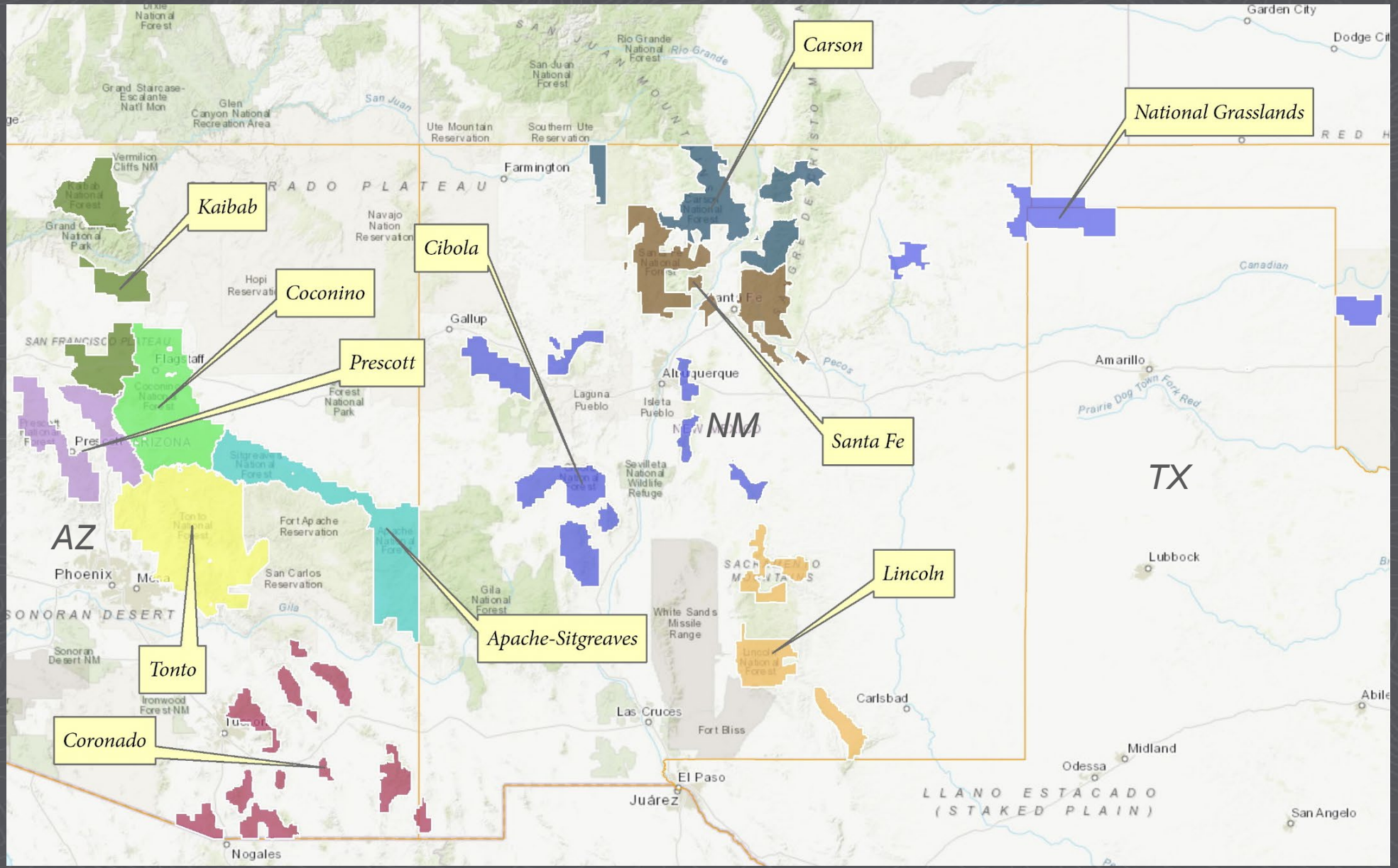
- Housed by USGS
- Stewardship system for updates
- Custom Edit Tools in ArcGIS:
  - Data Management
  - Structure
  - Control
  - Robust QA/QC
  - Data Check-in/Check Out-out



USFS Region 3 and NHD



USFS Region 3 and NHD



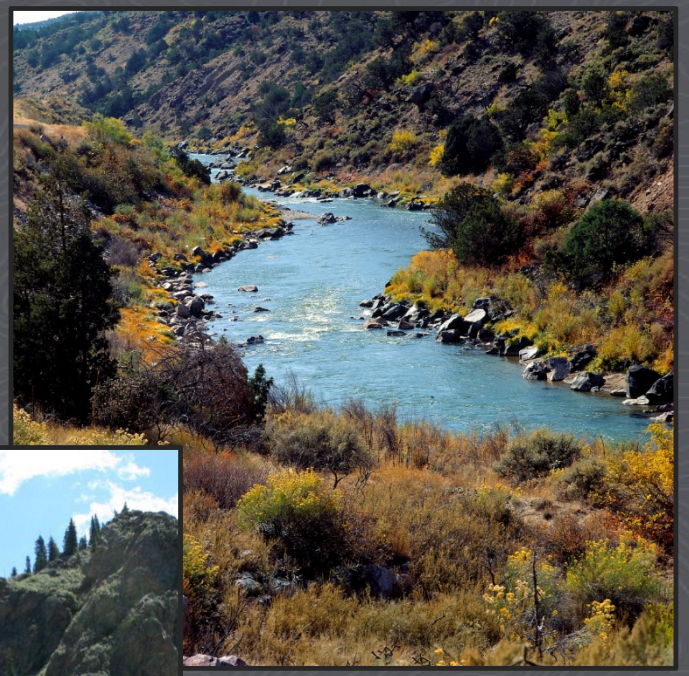
USFS Region 3 and NHD

Uses/Need for Updated NHD

- Forest Service applications and maps
  - Aquatic Surveys
  - Water Improvement Tracking
  - Fire Retardant Avoidance Maps

- Planning, Implementation, and Reporting

Essential to use an accurate dataset



USFS Region 3 and NHD

What are the Forest needs for NHD?

- Regional Assessment
  - Completed in Fiscal Year 2015
- Important updates to the Forests
  - Stream type attribute (perennial, intermittent, ephemeral)
  - Provisional names (non-GNIS names)
  - Complete stream flowlines [too costly]
- Three year commitment for NHD updates

TABLE 1: FOREST CHALLENGES COMPARISON

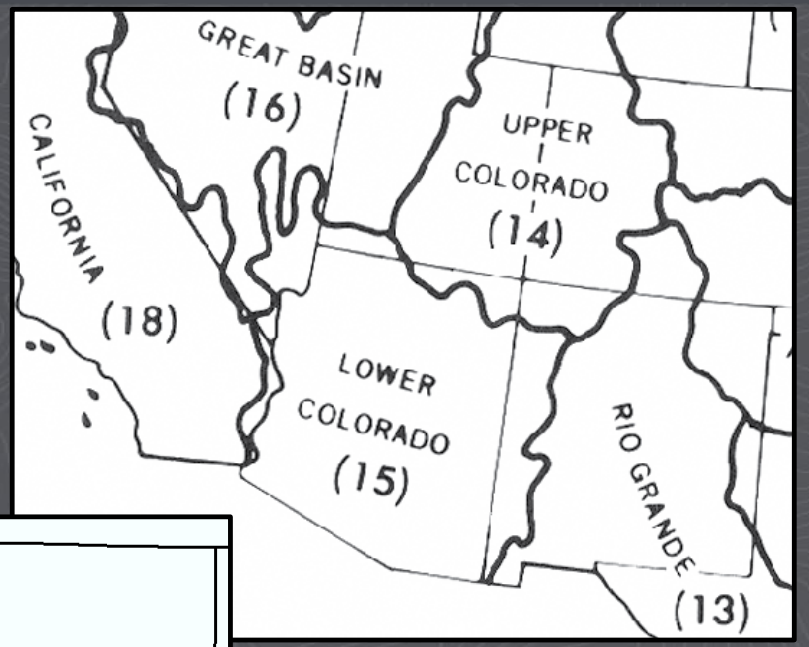
NHD ISSUE	CORONADO	GILA	CARSON	SANTA FE	PRESCOTT	KAIBAB	COCONINO	TONTO	APACHE-SITGREAVES	CIBOLA	LINCOLN	TOTAL RANK
1. Stream Type Attributes (Perennial/Intermittent/Ephemeral)	■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■	■■	29
2. Completeness Standard	■■■	■■	■■■	■■■	■■	■■■	■■■	■■	■	■	■	24
3. Names (GNIS)	■■	■■	■■■	■■	■■	■■	■■■	■■	■■	■■	■■	24
4. Hydrology Point Data (Springs/Tanks)	■■	■	■■	■■	■■	■■	■■■	■■	■	■■	■■	21
5. Water Rights & Uses Database	■	■	■■	■■	■	■■	■■	■■	■■■	■■	■■■	21
6. Consistency Standard	■■■	■■	■■■	■■■	■	■■	■■	■	■■	■	■	21
7. Flowline Geometry	■■■	■■	■■	■■	■	■	■	■■	■■■	■■■	■	21
8. Borderline/Peripheral Watersheds	■■■	■■	■■	■■	■	■■	■■	■■	■	■	■■	20
9. Wetlands						■	■■■	■	■■	■	■	9
10 Acequias/Diversions			■	■■					■	■	■	6

Key:
■■■ – Major Priority
■■ – Moderate Priority
■ – Low Priority
<blank> – Not identified as a priority.

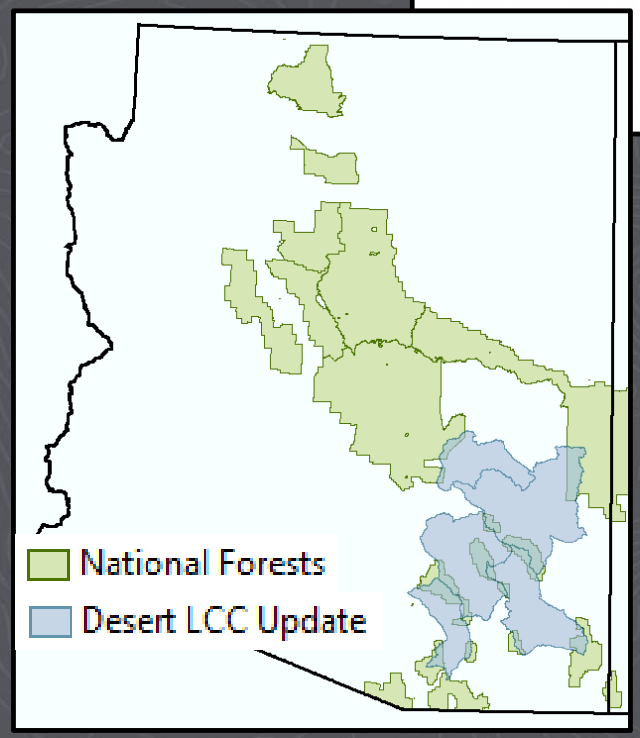
Building Collaboration

Prior NHD Work

- USGS updated stream attributes in arid regions
  - Changed intermittent to ephemeral
  - Completed region 15 (AZ) in 2016
  - Completed region 13 (NM) in 2017



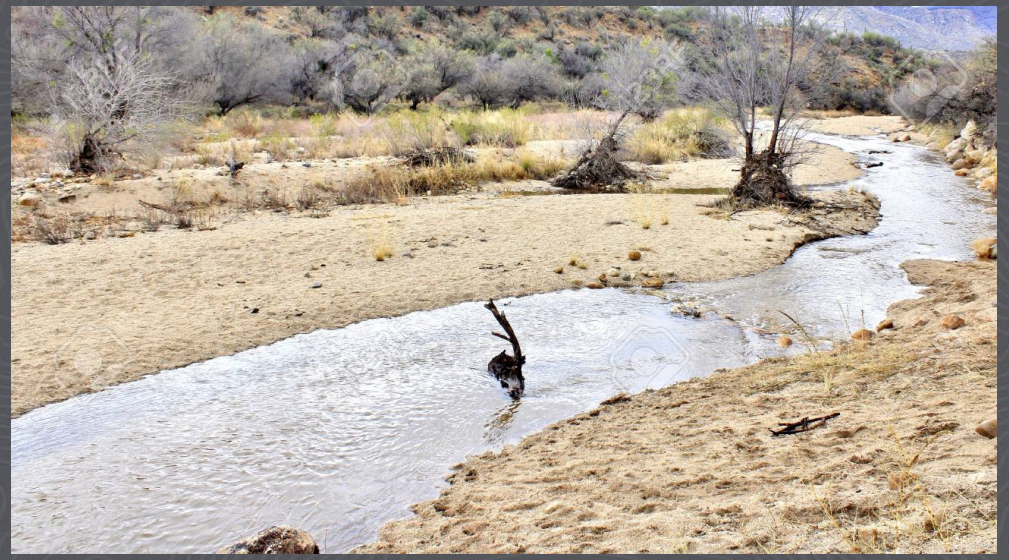
- CGST updated watersheds adjacent to the Coronado NF for the Desert LCC
  - Comprehensive updates
  - Updated all land outside of FS lands



Building Collaboration

USFS-CGST Connection

- CGST
  - Completed updates for Desert LCC
  - Showed comprehensive updates were feasible
  - Business rules in place



- Mutual Interest Agreement
  - FS additions to business rules
  - Data review by Forest specialists
  - Provide local data and resource photography

Scope and Work Specifics

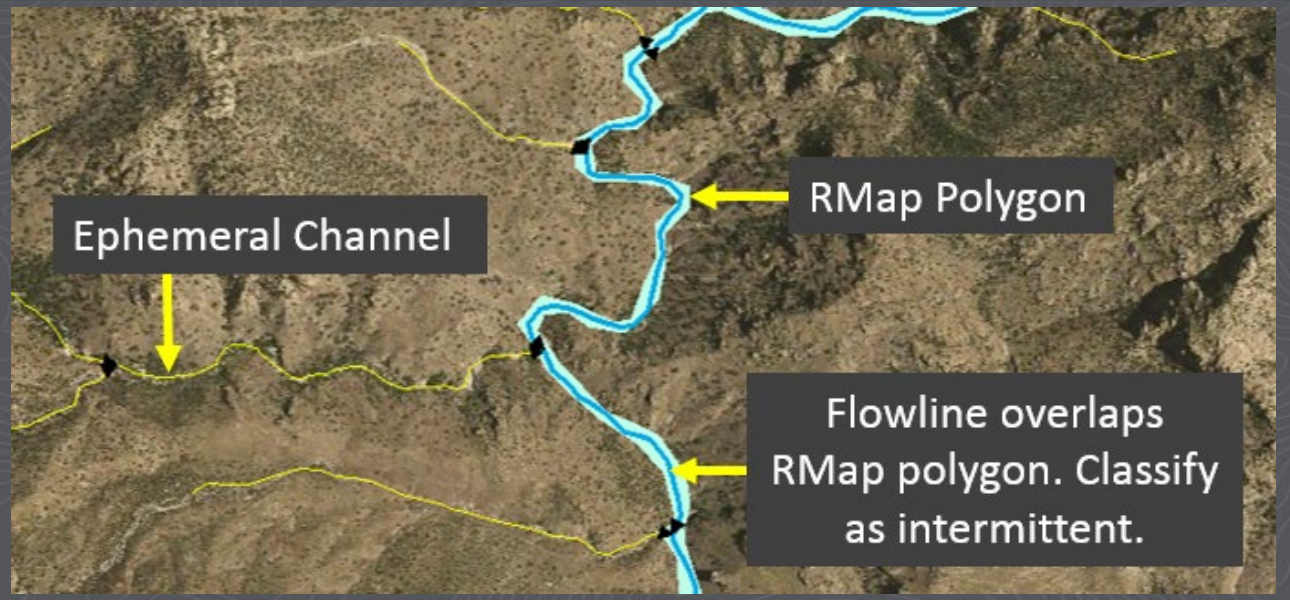
NHD Standards

- Scale
  - Accuracy Scale: 1:24,000
  - Editing Scale: 1:12,000 – 1:10,000
- Business Rules
  - Consistency
  - Developed new rules
- NHD Workflow
  - Editing
  - QC

Scope and Work Specifics

USFS Specific Requirements

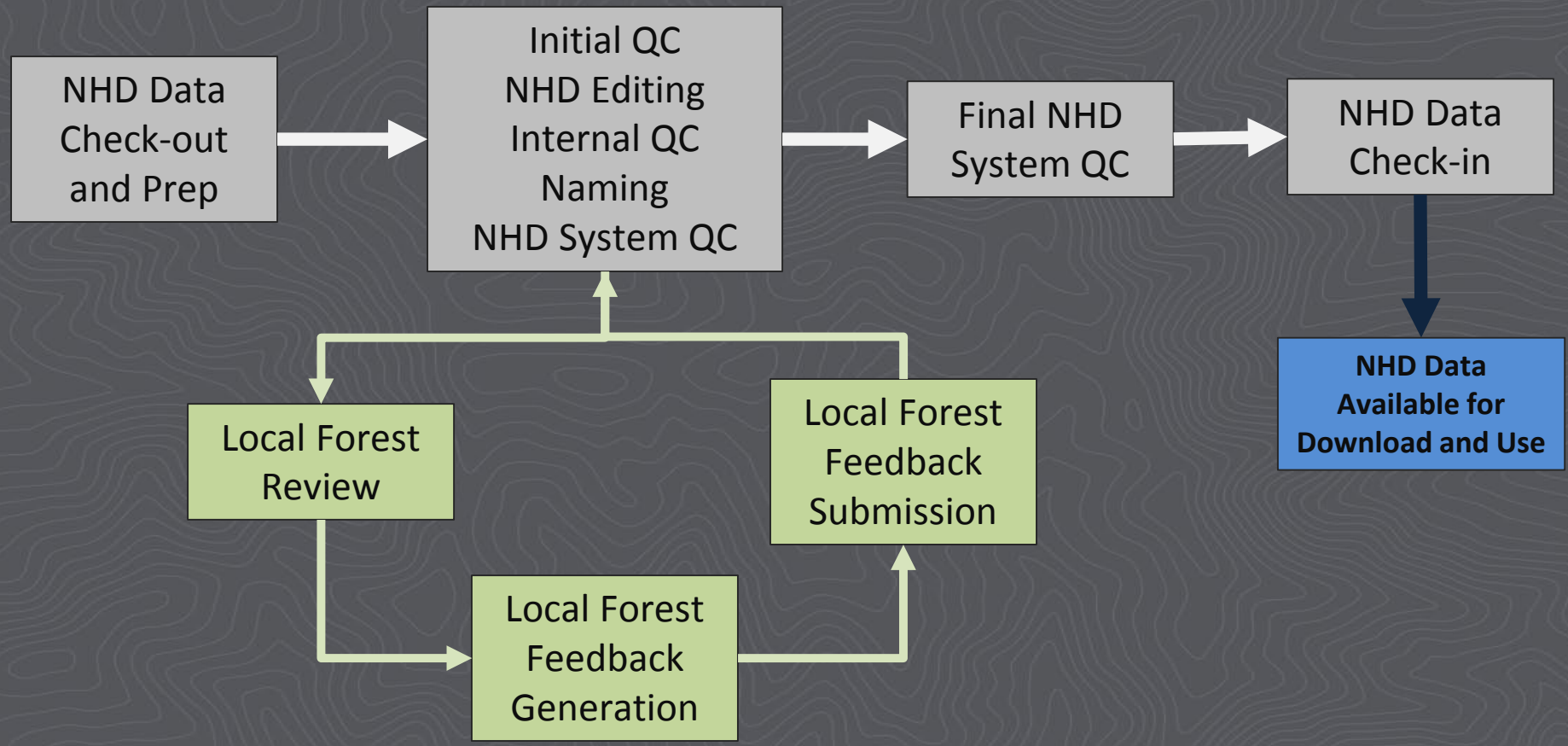
- Business Rules
  - Densification
  - Seasonality Rules
    - ✓ RMap Data
    - ✓ Spring-Based
    - ✓ Elevation-Based
- Local Forest Review
- Naming



	OBJECTID *	PERMANENT_IDENTIFIER	Prov_Name
	64	140454811	Buttes Tank
	65	140454875	Tonto Tank
	66	140454908	Fred's Sediment Trap Tank
	67	140454918	South Tank
	68	140454874	D-9 Tank
	69	140454967	RR Tank
	70	140455008	Siphon Tank
	71	140454991	Brushy Tank
	72	140454743	Section 2 Tank
	73	140454974	South Bald Mtn. Tank
	74	140454783	South Benches Tank
	75	140454786	Willow Tank
	76	140454784	Alkaline Spring Tank
	77	140454797	Lee Tank
	78	{9A25F107-6E1F-46F9-960D-0321C8A715D9}	Whiskey
	79	{64E7495D-C705-4936-8B73-18ED071E708B}	Tonto
	80	{11C6A7EF-DB50-4DEE-9C23-1CD5244F564E}	Canfield Spring
	81	{AF826CBA-17EB-46BD-8E25-7016DE4210D5}	Upper Basin
	82	{99BBF888-438C-462B-ADE1-A416672B51C7}	Finch
	83	{256FCE4B-1BEB-455A-A55E-F6A201E95BFB}	Buttes
	84	140456060	Hogan

Scope and Work Specifics

USFS Specific Requirements



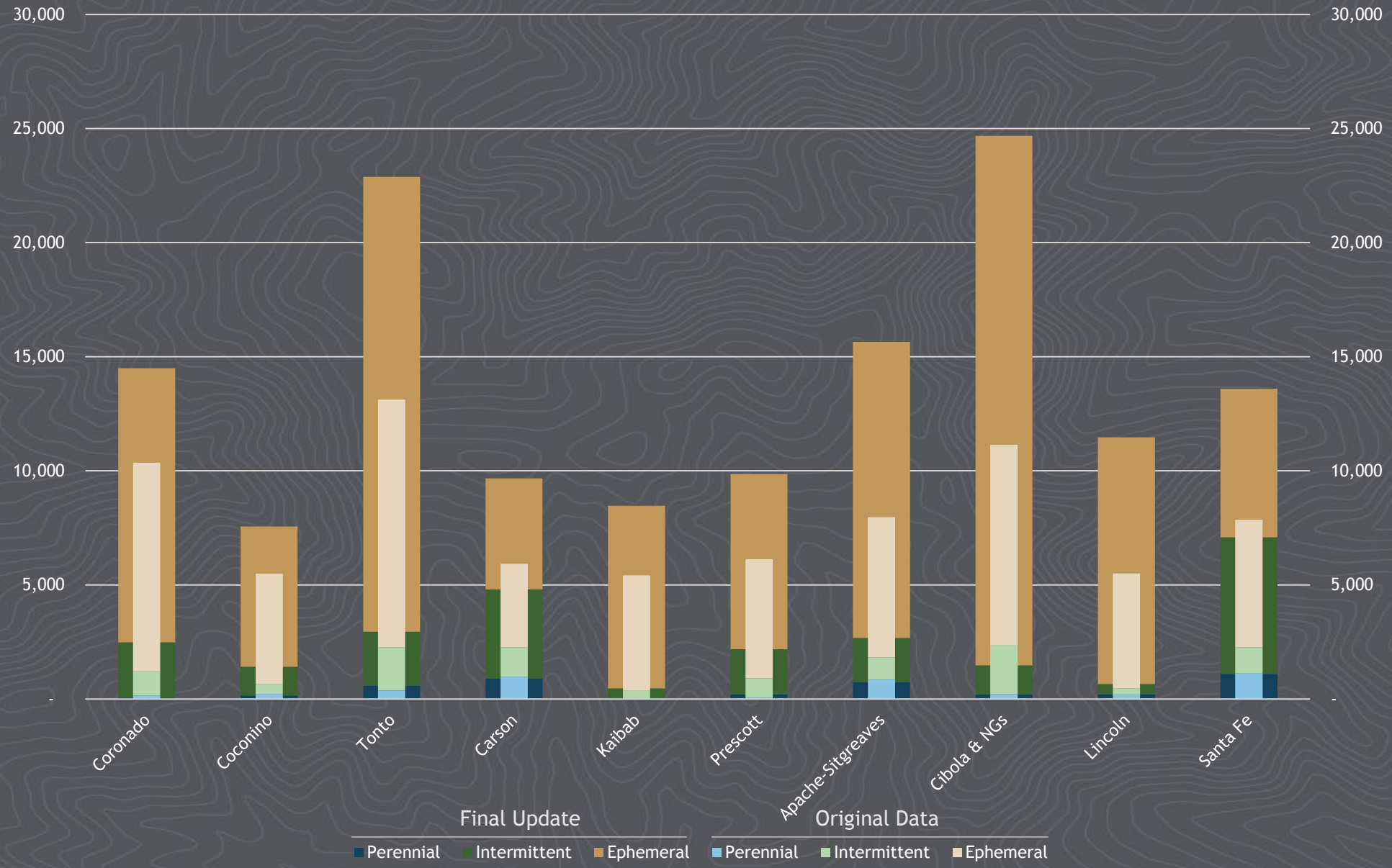
Results and Outcomes

Stream Densification

Forest Name	Total Stream Length (km) by Stream Type								
	Ephemeral			*Intermittent*			*Perennial*		
	Before	After	% Change	Before	After	% Change	Before	After	% Change
Coronado	14,716	**19,322**	**31%**	1,702	**3,892**	**129%**	239	**103**	**-57%**
Coconino	7,787	**9,882**	**27%**	682	**2,035**	**199%**	362	**238**	**-34%**
Tonto	17,460	**32,067**	**84%**	3,054	**3,801**	**24%**	598	**944**	**58%**
Carson	5,877	**7,829**	**33%**	2,091	**6,309**	**202%**	1,569	**1,423**	**-9%**
Kaibab	8,109	**12,875**	**59%**	553	**713**	**29%**	58	**39**	**-33%**
Prescott	8,397	**12,355**	**47%**	1,363	**3,187**	**134%**	92	**318**	**247%**
A-S	9,906	**20,881**	**111%**	1,549	**3,124**	**102%**	1,367	**1,179**	**-14%**
Cibola + NG's	14,132	**37,335**	**164%**	3,451	**2,068**	**-40%**	345	**308**	**-11%**
Lincoln	8,079	**17,400**	**115%**	471	**737**	**57%**	294	**318**	**8%**
Santa Fe	8,983	**10,488**	**17%**	1,848	**9,623**	**421%**	1,802	**1,769**	**-2%**
TOTALS:	**103,447**	**180,435**	**74%**	**16,762**	**35,489**	**112%**	**6,725**	**6,639**	**-1%**

Results and Outcomes

Stream Miles



Results and Outcomes

Spring Densification

Forest Name	Original No. of Springs	No. of Springs Added	Final No. of Springs	% Change
Coronado	866	3	**869**	**0.3%**
Coconino	251	64	**315**	**25.5%**
Tonto	1168	193	**1361**	**16.5%**
Carson	233	15	**248**	**6.4%**
Kaibab	136	56	**192**	**41.2%**
Prescott	626	150	**776**	**24.0%**
A-S	1111	258	**1369**	**23.2%**
Cibola + NG's	420	90	**510**	**21.4%**
Lincoln	440	95	**535**	**21.6%**
Santa Fe	287	285	**572**	**99.3%**
TOTALS:	**5538**	**1209**	**6747**	**21.8%**

Results and Outcomes

Local Name Assignment

Naming Method	Forest Name	Polygons	Flowlines	Points	TOTALS
USGS PN Tool	Coronado, Coconino, Tonto, Kaibab, Carson	770	210	863	**1,843**
USFS Naming Workaround	Apaches Sitgreaves	43	201	401	**645**
	Cibola	51	50	59	**160**
	Lincoln	53	411	150	**614**
	Prescott	124	33	88	**245**
	Santa Fe	61	83	332	**476**
	TOTALS:	**1,102**	**988**	**1,893**	**3,983**

Results and Outcomes

Overview of Improved Forests

OID	Forest	State(s)	Area (Sq Miles)	Project Phase	No. of HUC08's	No. of Local Forest Review Comments	Work Start	Work End
1	Coronado NF	AZ, NM	2,800	1	13	647	September, 2016	November, 2017
2	Tonto NF	AZ	4,650	1	7	1,894	September, 2016	December, 2017
3	Coconino NF	AZ	3,150	1	7	38	September, 2016	November, 2017
4	Carson NF	NM	2,350	1	9	4,915	May, 2017	December, 2017
5	Kaibab NF	AZ	2,500	1	8	106	May, 2017	December, 2017
6	Prescott NF	AZ	2,200	2	8	349	August, 2017	April, 2018
7	Apache-Sitgreaves NF	AZ	4,300	2	13	3,264	January, 2018	December, 2018
8	Cibola NF + NGs	NM, TX, OK	3,750	2	26	17,432	January, 2018	December, 2018
9	Lincoln NF	NM	2,000	3	6	985	April, 2018	December, 2018
10	Santa Fe NF	NM	2,700	3	8	803	April, 2018	December, 2018

Results and Outcomes

TABLE 1: FOREST CHALLENGES COMPARISON

NHD ISSUE	CORONADO	GILA	CARSON	SANTA FE	PRESCOTT	KAIBAB	COCONINO	TONTO	APACHE-SITGREAVES	CIBOLA	LINCOLN	TOTAL RANK
1. Stream Type Attributes (Perennial/Intermittent/Ephemeral)	■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■	■■	29
2. Completeness Standard	■■■	■■	■■■	■■■	■■	■■■	■■■	■■	■	■	■	24
3. Names (GNIS)	■■	■■	■■■	■■	■■	■■	■■■	■■	■■	■■	■■	24
4. Hydrology Point Data (Springs/Tanks)	■■	■	■■	■■	■■	■■	■■■	■■	■	■■	■■	21
5. Water Rights & Uses Database	■	■	■■	■■	■	■■	■■	■■	■■■	■■	■■■	21
6. Consistency Standard	■■■	■■	■■■	■■■	■	■■	■■	■	■■	■	■	21
7. Flowline Geometry	■■■	■■	■■	■■	■	■	■	■■	■■■	■■■	■	21
8. Borderline/Peripheral Watersheds	■■■	■■	■■	■■	■	■■	■■	■■	■	■	■■	20
9. Wetlands						■	■■■	■	■■	■	■	9
10 Acequias/Diversions			■	■■					■	■	■	6

Key:

■■■ – Major Priority

■■ – Moderate Priority

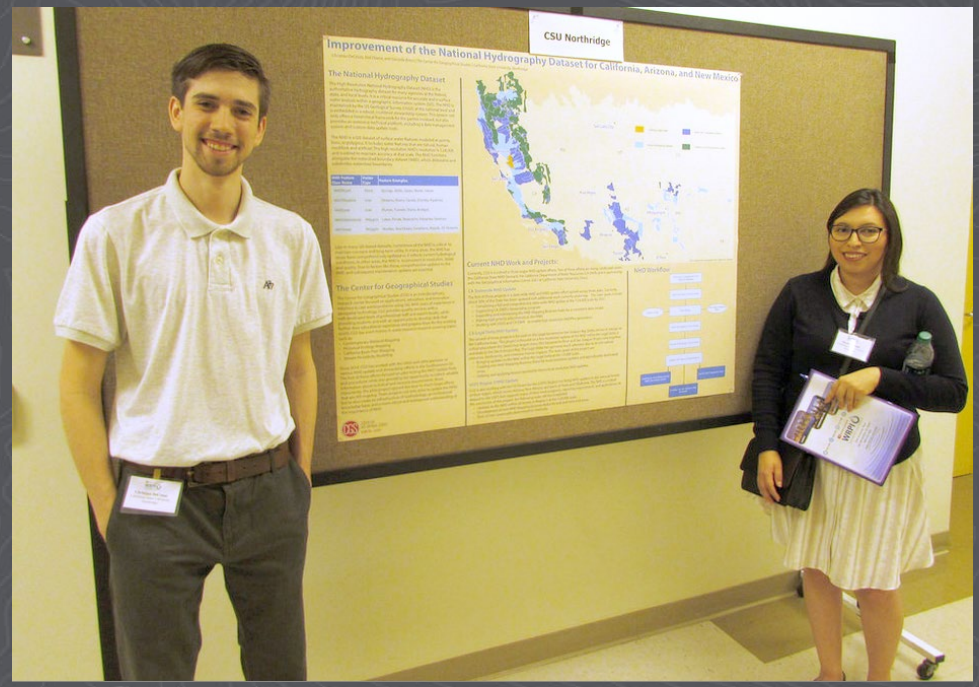
■ – Low Priority

<blank> – Not identified as a priority.

Benefits

Student Success and Learning Outcomes

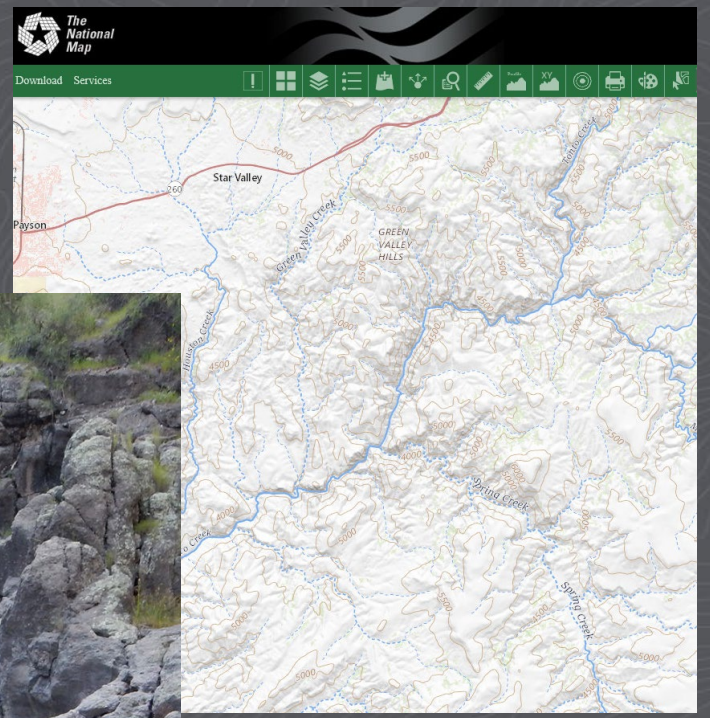
- Approximately 25 staff between Sept 2016 – Dec 2018
  - Undergraduate Students
  - Graduate Students
  - 1 GIS Technician
  - 3 GIS Analysts
- Multiple NHD Basic Training Sessions
- Multiple Specialized/Refinement Training Sessions
- Team Development and Transferable Experience



Benefits

Improved Data Products

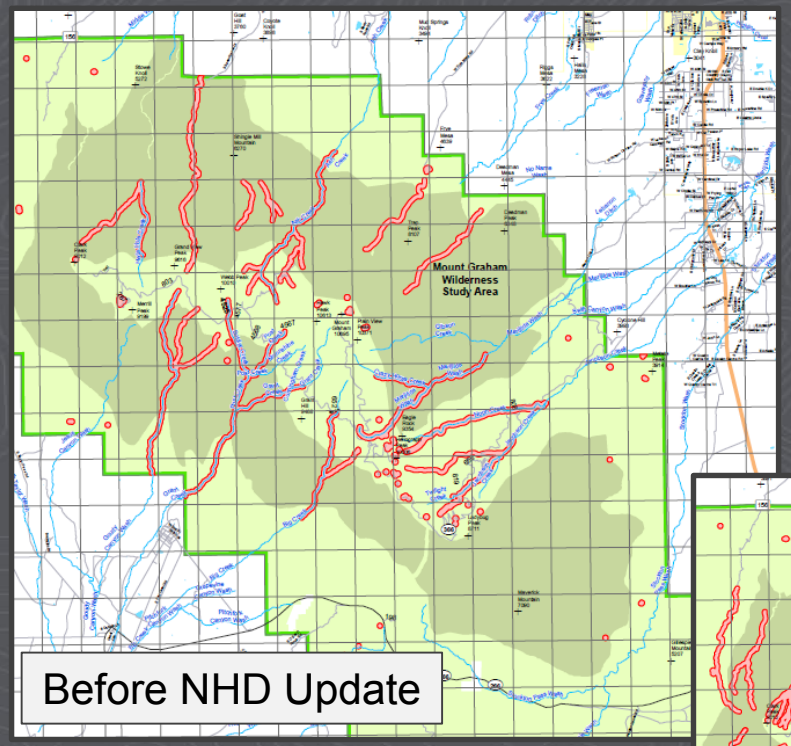
- Local knowledge captured and built into NHD
- Foundational dataset for water rights and stewardship
- The National Map and FS applications
- Agencies, organization, or the public that use or request NHD data on FS lands

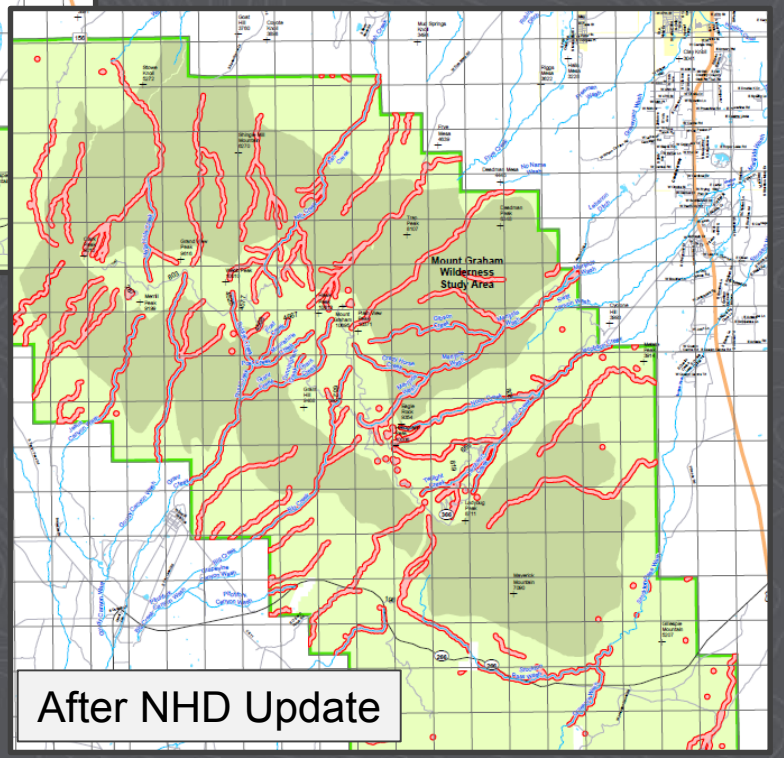


Benefits

Fire Retardant Avoidance Maps

- Datasets
  - Threatened and endangered species
  - Hydrologic
- Present/Not Present
- Increase in water protection





Q&A Session

Joel Osuna
joel.osuna@csun.edu
Project Manager
Center for Geospatial Science and Technology
California State University, Northridge

Veronica Lopez
veronica.a.lopez@usda.gov
GIS Analyst
USDA Forest Service
Southwestern Region

Smokey Bear's 75th Birthday is August 9th, 2019. The iconic fire prevention bear is famous around the world for saying: Only You Can Prevent Wildfires. (Ad Council artwork)