

# SQL-Mongo Project – Spatial Data of US Wildfires

BUAN 6320

Submitted by:

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Activity
Prepared Data Model and Created Physical DB
Loaded Data into Database
Wrote SQL Queries
Prepared Mongo Database
Loaded data into Mongo DB
Wrote Mongo Queries
Prepared Report
Reviewed Report

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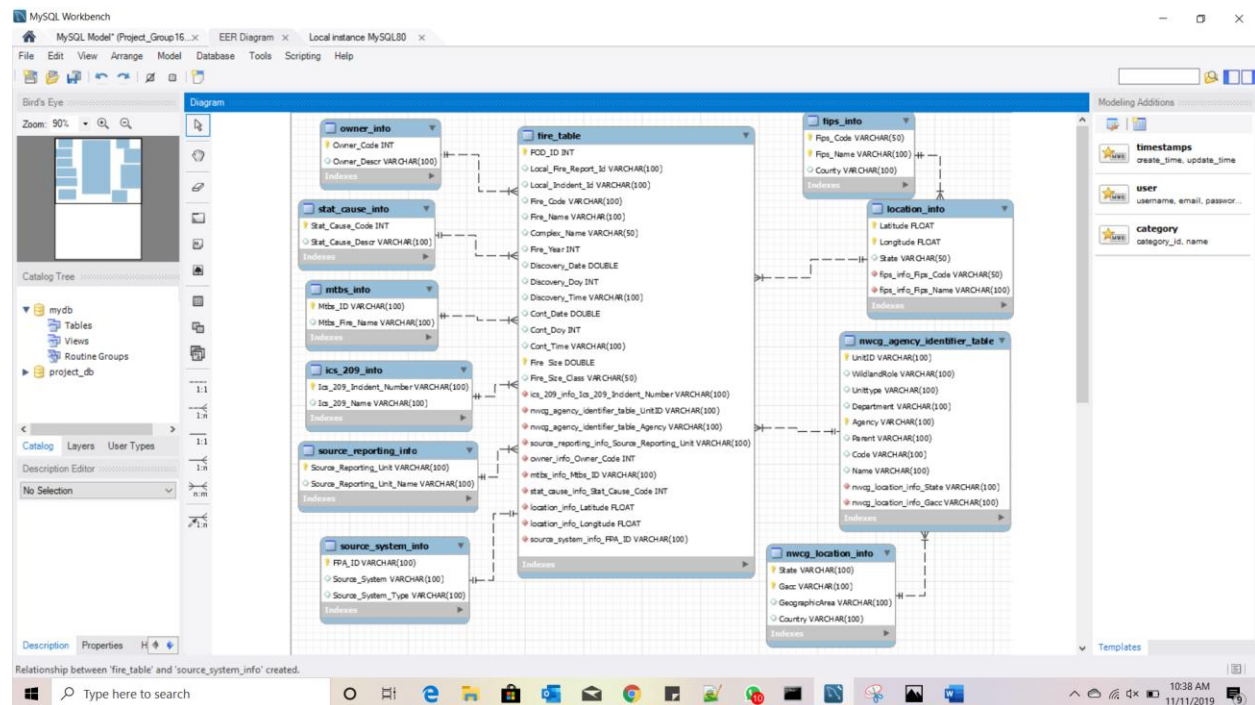
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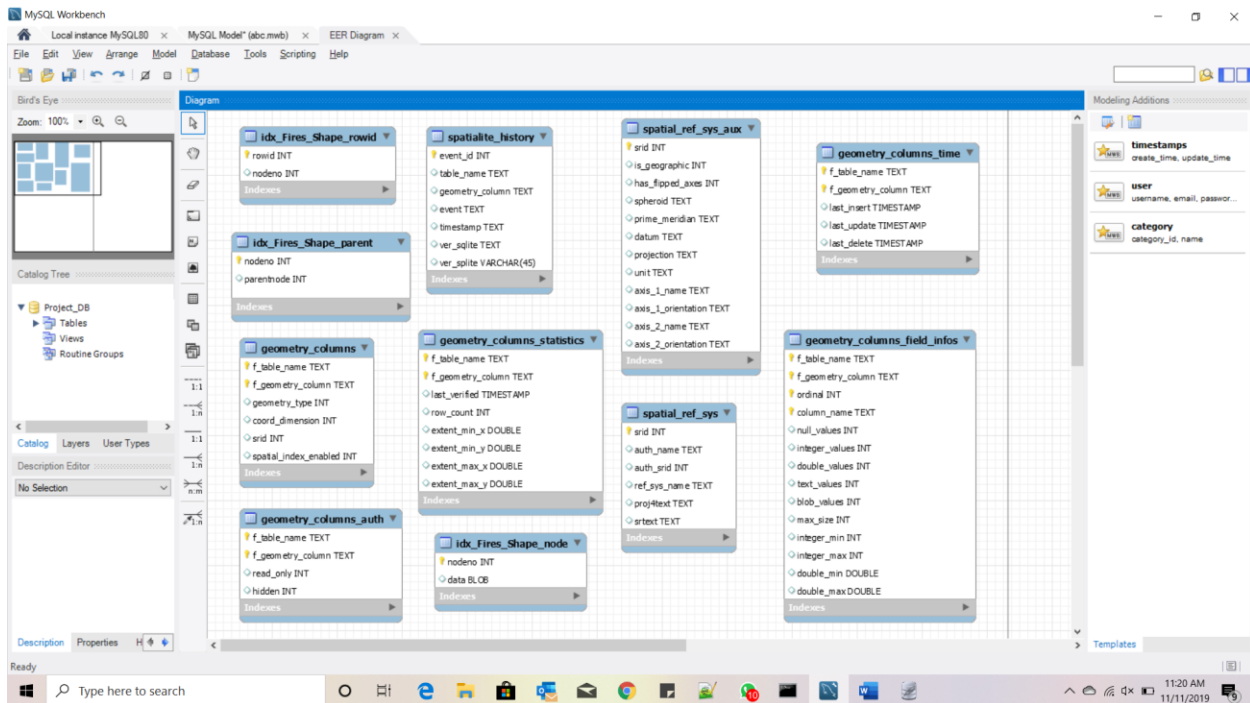
## Data Model

### Assumptions/Notes About Data Entities and Relationships

Include assumptions about data entities and their relationships with each other.

1. The relationship between the primary key in the above-mentioned tables with the **fire\_table** main table is **one to many relationships** other than Source\_System\_info as the FPA\_ID, which is primary key has single record mapping with the foreign key, all other tables have multiple values repeated in foreign key column.
2. The **nwcg\_agency\_identifier\_table** has the primary key unitID which has a **one to many relationships** to the **Fire\_data\_Table**.
3. nwcg\_location\_info has one to many relationship with **nwcg\_agency\_identifier\_table** with State and Gacc Columns as primary composite key.
4. stat\_cause\_table has one to many relationship with fire\_table with stat\_cause\_code as primary key.
5. location\_info has one to many relationship with fire\_table with Latitude and Longitude as primary composite key.
6. fips\_info has one to many relationship with location\_info with FIPS\_CODE and FIPS\_NAME as composite primary key.
7. mtbs\_info has one to many relationship with fire\_table with MTBS\_ID as primary key.
8. Source\_reporting\_info has one to many relationship with fire\_table with Source\_Reporting\_Unit as the primary key.
9. Owner\_info has one to many relationship with fire\_table with Owner\_ID as the primary key.
10. Ics\_209\_info has one to many relationships with fire\_table with ICS\_209\_Incident\_number as the primary key with Non Identifying relationship.
11. Each owner may own land on many locations, while every single location can have only one land owner.
12. Many fire incidents may occur due to one statistical cause, each fire incident is caused by only one statistical cause.
13. Each MTBS identifier may identify many fire incidents, each fire is identified by only one MTBS identifier.
14. Each ICS-209 report identifier may identify many fire incidents, each fire is identified by only one MTBS identifier.
15. Each FIPS may represent many locations, each location is represented by one FIPS.





## Physical Database

### Assumptions/Notes About Data Set

Include any assumptions made about data such as empty fields, sparse data, bad data, etc.

#### Bad Data:

1. The column county in the original fire table does not have a **normalized entry** for example the county name harding is entered as Harding or Harding-county or 39 in different rows because of which we are unable to take the combination of state and county as unique values
2. The combination of columns fips\_code, state should be unique value but due to no normalized entry of fips\_name we are unable to use the combination as a primary key.



## Screen shot of Physical Database objects

- owner\_info

The first screenshot shows a query window with the following SQL code:

```
1 use project_db;
2
3 select * from owner_info;
```

The result grid displays the following data:

Owner_Code	Owner_Descr
0	"FOREIGN"
1	"BLM"
2	"BIA"
3	"NPS"
4	"FWS"
5	"USFS"
6	"OTHER FEDERAL"
7	"STATE"
8	"PRIVATE"
9	"TRIBAL"
10	"BOR"
11	"COUNTY"
12	"MUNICIPAL/LOC..."
13	"STATE OR PRIVA..."
14	"MISSING/NOT SP..."
15	"UNDEFINED FED..."

The second screenshot shows the same query window with an additional query added:

```
1 use project_db;
2
3 select * from owner_info;
4
5 select count(*) from owner_info;
```

The result grid for the second query shows:

count(*)
16

stat\_cause\_info

Query 1 x

Limit to 1000 rows

```
1 use project_db;
2
3 • select * from stat_cause_info;
4
5 • select count(*) from stat_cause_info;
```

Result Grid

Stat_Cause_Code	Stat_Cause_Descr
1	"Lightning"
2	"Equipment Use"
3	"Smoking"
4	"Campfire"
5	"Debris Burning"
6	"Railroad"
7	"Arson"
8	"Children"
9	"Miscellaneous"
10	"Fireworks"
11	"Powerline"
12	"Structure"
13	"Missing/Undefined"
•	NULL

stat\_cause\_info 3 x

Apply Revert

Result Grid  
Form Editor  
Field Types  
Query Stats  
Execution Plan

Query 1 x

Limit to 1000 rows

```
1 use project_db;
2
3 • select * from stat_cause_info;
4
5 • select count(*) from stat_cause_info;
```

Result Grid

count(*)
13

Result 4 x

Read Only

Result Grid  
Form Editor  
Field Types  
Query Stats  
Execution Plan

▪ mtbs\_info

Query 1 x

Limit to 1000 rows

```
1 use project_db;
2
3 • select * from mtbs_info;
4
5 • select count(*) from mtbs_info;
```

Result Grid

Mtbs_ID	Mtbs_Fire_Name
"AFS-B307-19950614"	"CLEARWATER #2"
"AK5674215793820060522"	"MESHAK RIVER"
"AK5683615710019920517"	"YANTARNI"
"AK5759815753720050529"	"PILOT POINT"
"AK5761615232120150828"	"TWIN CREEKS"
"AK5884115754320150622"	"COPENHAGEN CREEK"
"AK5884415640120150621"	"PAULS CREEK"
"AK5890415740520150704"	"COPENHAGEN"
"AK5899315855220121102"	"SNAKE RIVER"
"AK5903315365920030428"	"KAMISHAK BAY"
"AK5925816024020150622"	"GECHIAK LAKE"
"AK5955415836020150711"	"LITTLE KOKWOK"
"AK5960815825420150621"	"KOKWOK RIVER"
"AK5975315141520050429"	"TRACY AVE"
"AK5978615491320030523"	"ILIAMNA"
"AK6000115759420130728"	"NUYAKUK RIVER"
"AK6002415119720070619"	"CARIBOU HILLS"
"AK6011915081019940830"	"WINDY POINT"
"AK6012815061920040814"	"GLACIER CREEK"

mtbs\_info 7 x

Apply Revert

Query 1 x

Limit to 1000 rows

```
1 use project_db;
2
3 • select * from mtbs_info;
4
5 • select count(*) from mtbs_info;
```

Result Grid

count(*)
10481

Result 8 x

Read Only

- ics\_209\_info

Query 1 x

Limit to 1000 rows

```
1 use project_db;
2
3 • select * from ics_209_info;
4
5 • select count(*) from ics_209_info;
```

Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content: | Fetch rows: |

Ics_209_Incident_Number	Ics_209_Name
-10699	ASH
-22215	Lebec
-80009	Bluff
02-42311040X	Tejon
03-0198	Cholla
03-20250235X	GOAT
03-40780438X	Porter
04-ALS-002	Baldwin
04-ALS-005	Cleburne
04-ALS-006	Conecuh
04-ALS-007	Covington
04-ALS-008	Lee
04-ALS-009	Lowndes #1
04-ALS-010	Lowndes #2
04-ALS-011	Macon
04-ALS-012	Monroe
04-ALS-015	Girl Scout Camp
04-ALS-016	Etowah
04-ALS-018	Calhoun

ics\_209\_info 12 x

Apply Revert

Result Grid  
Form Editor  
Field Types  
Query Stats  
Execution Plan

Query 1 x

Limit to 1000 rows

```
1 use project_db;
2
3 • select * from ics_209_info;
4
5 • select count(*) from ics_209_info;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: |

count(*)
22734

Result 13 x

Read Only

Result Grid  
Form Editor  
Field Types  
Query Stats  
Execution Plan

▪ source\_system\_info

Query 1 x

Limit to 1000 rows

```
1 use project_db;
2
3 • select * from source_system_info;
4
5 • select count(*) from source_system_info;
```

Result Grid

FPA_ID	Source_System_Type	Source_System
"2008CAIRS10092975"	"NONFED"	"ST-CACDF"
"2008CAIRS10163484"	"NONFED"	"ST-CACDF"
"2008CAIRS10222599"	"NONFED"	"ST-CACDF"
"2008CAIRS10345987"	"NONFED"	"ST-CACDF"
"2008CAIRS10419166"	"NONFED"	"ST-CACDF"
"2008CAIRS10858097"	"NONFED"	"ST-CACDF"
"2008CAIRS11104163"	"NONFED"	"ST-CACDF"
"2009CAIRS11104592"	"NONFED"	"ST-CACDF"
"2009CAIRS11108635"	"NONFED"	"ST-CACDF"
"2009CAIRS11125800"	"NONFED"	"ST-CACDF"
"2009CAIRS11144527"	"NONFED"	"ST-CACDF"
"2009CAIRS11144953"	"NONFED"	"ST-CACDF"
"2009CAIRS11144959"	"NONFED"	"ST-CACDF"
"2009CAIRS11154629"	"NONFED"	"ST-CACDF"
"2009CAIRS11157234"	"NONFED"	"ST-CACDF"
"2009CAIRS11168549"	"NONFED"	"ST-CACDF"
"2009CAIRS11168950"	"NONFED"	"ST-CACDF"
"2009CAIRS11171696"	"NONFED"	"ST-CACDF"
"2009CAIRS11172110"	"NONFED"	"ST-CACDF"

source\_system\_info 16 x

Apply Revert

Query 1 x

Limit to 1000 rows

```
1 use project_db;
2
3 • select * from source_system_info;
4
5 • select count(*) from source_system_info;
```

Result Grid

count(*)
1880462

Result 17 x

Read Only

Output

- source\_reporting\_info

Query 1

```
1 use project_db;
2
3 • select * from source_reporting_info;
4
5 • select count(*) from source_reporting_info;
```

Result Grid

Source_Reporting_Unit	Source_Reporting_Unit_Name
"00102"	"ADAIR CO RFD #3"
"00203"	"FILLMORE FIRE DEPT"
"00206"	"SAVANNAH RFD"
"00307"	"FAIRFAX RFPD"
"00308"	"ROCK PORT FIRE DEPT"
"00501"	"CASSVILLE FORESTRY"
"00504"	"CASSVILLE CITY FD"
"00505"	"BUTTERFIELD FD"
"00506"	"BUTTERFIELD FD"
"00510"	"CE CROSSING FD"
"00614"	"WHEATON CITY FD"
"00703"	"BUTLER FD"
"00804"	"COLE CAMP CITY & RFD"
"00805"	"DEER CREEK FPD"
"00806"	"LAKEVIEW HGTS VFD"
"00810"	"WARSAW RPPA"
"00814"	"BENT TREE HARBOR FPA"
"00855"	"BENT TREE HARBOR FPA"
"0102"	"Beaverhead/Deerlodge Nati..."

source\_reporting\_info 19 x

Apply Revert

Query 1

```
1 use project_db;
2
3 • select * from source_reporting_info;
4
5 • select count(*) from source_reporting_info;
```

Result Grid

count(*)
4991

Result 20 x

Read Only

- fips\_info

Query 1

```

1 use project_db;
2
3 select * from fips_info;
4
5 select count(*) from fips_info;

```

Result Grid

Filter Rows:

Edit

Export/Import

Wrap Cell Content

Fetch rows

	Fips_Code	Fips_Name	County
1	1	Abbeville	Abbeville County
1	1	Acadia	Acadia
1	1	Accomack	ACCOMACK
1	1	Ada	Ada
1	1	Adair	Adair/Guthrie
1	1	Adams	ADAMS
1	1	Addison	Addison
1	1	Aitkin	Aitkin
1	1	Alachua	Alachua
1	1	Alamance	Alamance
1	1	Alameda	ALAMEDA
1	1	Albany	ALBANY
1	1	Alcona	ALCONA ...
1	1	Allegany	Allegany
1	1	Allen	Allen County
1	1	Anderson	ANDERSON
1	1	Androsco...	Androsco...
1	1	Apache	APACHE
1	1	Appling	Appling

fips\_info 23

Apply Revert

Query 1

```

1 use project_db;
2
3 select * from fips_info;
4
5 select count(*) from fips_info;

```

Result Grid

Filter Rows:

Export

Wrap Cell Content

	count(*)
1	2693

Result 24

Read Only

- location\_info

Query 1 x

Limit to 1000 rows

```
1 use project_db;
2
3 • select * from location_info;
4
5 • select count(*) from location_info;
```

Result Grid

Fips_Code	Fips_Name	Latitude	Longitude	State
NA	NA	17.9397	-67.1902	"PR"
"023"	"Cabo Rojo"	17.9449	-67.1809	"PR"
NA	NA	17.95	-67.1167	"PR"
"023"	"Cabo Rojo"	17.9514	-67.1956	"PR"
"023"	"Cabo Rojo"	17.9519	-67.2125	"PR"
"023"	"Cabo Rojo"	17.9539	-67.2008	"PR"
NA	NA	17.9553	-67.1353	"PR"
NA	NA	17.9565	-66.1219	"PR"
"023"	"Cabo Rojo"	17.9567	-67.2101	"PR"
"023"	"Cabo Rojo"	17.9571	-67.2086	"PR"
"023"	"Cabo Rojo"	17.9578	-67.2013	"PR"
"023"	"Cabo Rojo"	17.9579	-67.2074	"PR"
NA	NA	17.9584	-66.1729	"PR"
NA	NA	17.9584	-66.4073	"PR"
NA	NA	17.9594	-66.948	"PR"
"023"	"Cabo Rojo"	17.9598	-67.1979	"PR"
NA	NA	17.9603	-67.1972	"PR"
NA	NA	17.9606	-67.1969	"PR"
NA	NA	17.9608	-67.2003	"PR"

location\_info 26 x

Apply Revert

Result Grid  
Form Editor  
Field Types  
Query Stats  
Execution Plan

Query 1 x

Limit to 1000 rows

```
1 use project_db;
2
3 • select * from location_info;
4
5 • select count(*) from location_info;
```

Result Grid

count(*)
1565730

Result 27 x

Read Only

Result Grid  
Form Editor  
Field Types  
Query Stats  
Execution Plan



- nwcg\_location\_info

Query 1 x

Limit to 1000 rows

```
1 use project_db;
2
3 • select * from nwcg_location_info;
4
5 • select count(*) from nwcg_location_info;
```

Result Grid

Filter Rows:

State Gacc GeographicArea Country

76	USGASAC	SA	UM
AB	CAMBCIFC	IN	CA
AK	USAKACC	AK	US
AL	USGASAC	SA	US
AR	USGASAC	SA	US
AS	USCAONCC	CA	US
AZ	USNMSWC	SW	US
AZ	USUTGBC	GB	US
BC	CAMBCIFC	IN	CA
CA	USCAONCC	CA	US
CA	USCAOSCC	CA	US
CO	USCORMC	RM	US
CT	USWIEACC	EA	US
DC	USGASAC	SA	US
DE	USWIEACC	EA	US
FL	USGASAC	SA	US
GA	USGASAC	SA	US
GU	USCAONCC	CA	US
HI	USCAONCC	CA	US

nwcg\_location\_info 29 x

Apply Revert

Result Grid  
Form Editor  
Field Types  
Query Stats  
Execution Plan

Query 1 x

Limit to 1000 rows

```
1 use project_db;
2
3 • select * from nwcg_location_info;
4
5 • select count(*) from nwcg_location_info;
```

Result Grid

Filter Rows:

Export: Wrap Cell Content: IA

count(*)
84

Result 30 x

Read Only

Output

Result Grid  
Form Editor  
Field Types  
Query Stats  
Execution Plan

- nwcg\_agency\_identifier\_table

Query 1

```

1 • select count(*) from nwcg_agency_identifier_table;
2
3 • select * from nwcg_agency_identifier_table;

```

SQLAdditions

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

Result Grid

UnitID	Wildandrole	Unittype	Department	Agency	Parent	Code	Name
CAABABN	Dispatch/Coordination Center	International Country Subdivision(State/Province)				ABN	Alberta Environment and Sus
CABCBON	Incident Host Geographic	International Country Subdivision(State/Province)				BCN	British Columbia Wildfire Mana
CAMBCIFC	Dispatch/Coordination Center	Interagency				CIFC	Canadian Interagency Forest
CAMBMEN	Incident Host Geographic	International Country Subdivision(State/Province)				MBN	Manitoba Wildfire Program
CANBNBN	Incident Host Geographic	International Country Subdivision(State/Province)				NBN	New Brunswick Forest Fire Ma
CANLNLN	Incident Host Geographic	International Country Subdivision(State/Province)				NLN	Newfoundland and Labrador I
CANSNSN	Incident Host Geographic	International Country Subdivision(State/Province)				NSN	Nova Scotia Forest Protector
CANTNTN	Incident Host Geographic	International Country Subdivision(State/Province)				NTN	Northwest Territories Forest I
CAONONN	Incident Host Geographic	International Country Subdivision(State/Province)				ONN	Ontario Aviation
CAPEPEN	Incident Host Geographic	International Country Subdivision(State/Province)				PEN	Prince Edward Island Forests
CAQPCPN	Incident Host Geographic	International Country Subdivision(State/Province)				PCN	Parks Canada National Fire M
CAQCCQN	Incident Host Geographic	International Country Subdivision(State/Province)				QCN	Quebec SOPFEU
CASKSKN	Incident Host Geographic	International Country Subdivision(State/Province)				SKN	Saskatchewan Wildfire Mana
CAYTYTN	Incident Host Geographic	International Country Subdivision(State/Province)				YTN	Yukon Wildland Fire Managem

nwcg\_agency\_identifier\_table 17 x

Output

#	Time	Action	Message	Duration / Fetch
47	02:59:56	select * from fire_location_table LIMIT 0, 100	100 row(s) returned	0.000 sec / 0.000 sec
48	03:00:29	select count(*) from mtbs_table LIMIT 0, 100	1 row(s) returned	0.265 sec / 0.000 sec
49	03:00:51	select * from mtbs_table LIMIT 0, 100	100 row(s) returned	0.000 sec / 0.000 sec
50	03:01:21	select count(*) from nwcg_agency_identifier_table LIMIT 0, 100	1 row(s) returned	0.234 sec / 0.000 sec
51	03:01:39	select * from nwcg_agency_identifier_table LIMIT 0, 100	100 row(s) returned	0.016 sec / 0.000 sec

Query 1

```

1 • select count(*) from nwcg_agency_identifier_table;
2
3 • select * from nwcg_agency_identifier_table;

```

SQLAdditions

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

Result Grid

count(*)
5867

Result 16 x

Output

#	Time	Action	Message	Duration / Fetch
46	02:59:27	select count(*) from fire_location_table LIMIT 0, 100	1 row(s) returned	4.578 sec / 0.000 sec
47	02:59:56	select * from fire_location_table LIMIT 0, 100	100 row(s) returned	0.000 sec / 0.000 sec
48	03:00:29	select count(*) from mtbs_table LIMIT 0, 100	1 row(s) returned	0.265 sec / 0.000 sec
49	03:00:51	select * from mtbs_table LIMIT 0, 100	100 row(s) returned	0.000 sec / 0.000 sec
50	03:01:21	select count(*) from nwcg_agency_identifier_table LIMIT 0, 100	1 row(s) returned	0.234 sec / 0.000 sec

- fire\_table

Query 1

Limit to 100 rows

1

2

3

select count(\*) from fire\_table;

select \* from fire\_table;

Result Grid

Filter Rows:

Export/Import:

Wrap Cell Contents:

Fetch rows:

FOD_ID	LOCAL_FIRE_REPORT_ID	LOCAL_INCIDENT_ID	FIRE_CODE	FIRE_NAME	COMPLEX_NAME	FIRE_YEAR	DISCOVERY_DATE	DISCOVERY_DOY
1	1	PNF-47	B38K	FOUNTAIN		2005	2453403.5	33
2	13		AAC0	PIGEON		2004	2453137.5	133
3	27	021	A32W	SLACK		2004	2453156.5	152
4	43	6		DEER		2004	2453184.5	180
5	44	7		STEVENOT		2004	2453184.5	180
6	54	8		HIDDEN		2004	2453186.5	182
7	58	9		FORK		2004	2453187.5	183
8	3	02	BKSX	SLATE		2005	2453437.5	67
9	5	03	BLPQ	SHASTA		2005	2453444.5	74
10	61	10		TANGLEFOOT		2004	2453187.5	183
11	64	11		FORK #2		2004	2453188.5	184
12	71	14		MOKE #2		2004	2453188.5	184
13	91	26		WRIGHTS		2004	2453251.5	247
14	99	21		TIGER		2004	2453276.5	272

Result Grid

Form Editor

Field Types

Query Stats

Apply

Context Help

Snippets

Output

Action Output

#	Time	Action	Message	Duration / Fetch
35	02:54:15	select count(*) from fire_table LIMIT 0, 100	1 row(s) returned	4.797 sec / 0.000 sec
36	02:54:24	SELECT * FROM projectfires.owner_table LIMIT 0, 100	16 row(s) returned	0.000 sec / 0.000 sec
37	02:54:26	SELECT * FROM projectfires.owner_table LIMIT 0, 100	16 row(s) returned	0.000 sec / 0.000 sec
38	02:54:40	select count(*) from fire_table LIMIT 0, 100	1 row(s) returned	4.797 sec / 0.000 sec
39	02:55:35	select * from fire_table LIMIT 0, 100	100 row(s) returned	0.000 sec / 0.000 sec

Query 1

Limit to 100 rows

1

2

3

select count(\*) from fire\_table;

select \* from fire\_table;

Result Grid

Filter Rows:

Export:

Wrap Cell Contents:

count(*)
1880465

Result Grid

Form Editor

Field Types

Query Stats

Read Only

Context Help

Snippets

Output

Action Output

#	Time	Action	Message	Duration / Fetch
34	02:53:25	select count(*) from fire_table LIMIT 0, 100	1 row(s) returned	2.063 sec / 0.000 sec
35	02:54:15	select count(*) from fire_table LIMIT 0, 100	1 row(s) returned	4.797 sec / 0.000 sec
36	02:54:24	SELECT * FROM projectfires.owner_table LIMIT 0, 100	16 row(s) returned	0.000 sec / 0.000 sec
37	02:54:26	SELECT * FROM projectfires.owner_table LIMIT 0, 100	16 row(s) returned	0.000 sec / 0.000 sec
38	02:54:40	select count(*) from fire_table LIMIT 0, 100	1 row(s) returned	4.797 sec / 0.000 sec

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

## Data in the Database

Table Name	Primary Key	Foreign Key	# of Rows in Table
stat_cause_info	Stat_Cause_Code		13
owner_info	Owner_Code		16
ics_209_info	Ics_209_Incident_Index		22734
mtbs_info	Mtbs_ID		10481
source_reporting_info	Source_Reporting_Unit		4991
source_system_info	FPA_ID		1880462
location_info	Latitude, Longitude	fips_info_Fips_Code fips_info_Fips_Name	1565730
fips_info	Fips_Code, Fips_Name		2693
nwcg_location_info	State,Gacc		84
nwcg_agency_identififier_table	UnitID, Agency	nwcg_location_info_State nwcg_location_info_Gacc	5867
fires_table	FOD_ID, Fire_Size	ics_209_info_Ics_209_Incident_Number source_system_info_FPA_ID nwcg_agency_identififier_table_UnitID nwcg_agency_identififier_table_Agency source_reporting_info_Source_Reportin g_Unit owner_info_Owner_Code mtbs_info_Mtbs_ID stat_cause_info_Stat_Cause_Code location_info_Latitude location_info_Longitude	1880465

## SQL Queries

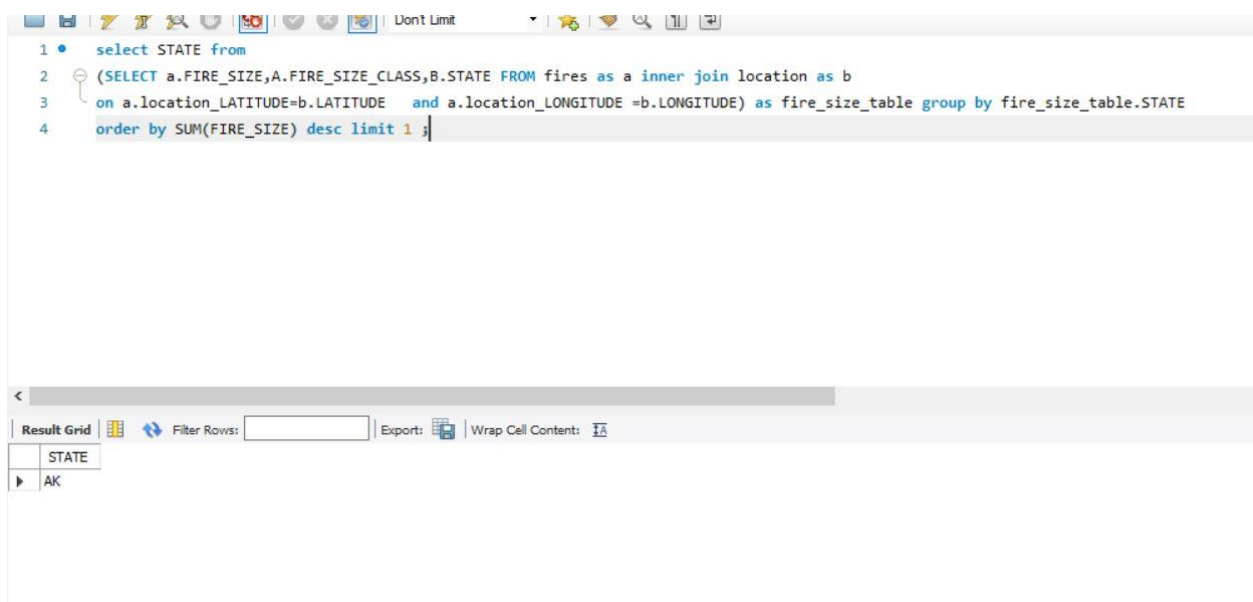
### Query 1

A leading beverage company has announced a billion-dollar fund for removing debris from forests, rivers and mountains in the US. All states are interested. Which state has the best chance to win a share of the fund?

As all the states are interested in the billion-dollar fund we group by state, but the state with which has highest number of fires will receive the fund. AK has the highest fires.

Translation : Select states from location by joining it with fires on latitude and longitude and group by state in descending order.

Screen Shot of SQL Query and Results:



The screenshot displays a SQL query editor with the following query:

```
1 • select STATE from
2 (SELECT a.FIRE_SIZE,A.FIRE_SIZE_CLASS,B.STATE FROM fires as a inner join location as b
3 on a.location_LATITUDE=b.LATITUDE and a.location_LONGITUDE =b.LONGITUDE) as fire_size_table group by fire_size_table.STATE
4 order by SUM(FIRE_SIZE) desc limit 1 ;
```

Below the query editor, the results grid is shown with the following data:

STATE
AK

## Query 2

One of the reporting agencies has suggested that children be banned from its forests unless there is one adult for every 3 children in a group visiting a forest. Name 3 forests where this would be the most appropriate.

As the reporting agencies has suggested every 3 children should be accompanied by one adult, we group by source reporting unit in descending order and selecting first three forests will give us 3 rows.

Translation: select source\_reporting\_unit\_name from source\_reporting table by joining on source reporting unit where stat\_cause\_code is 8 and source\_reporting\_unit name is like forest and grouping them by source\_reporting\_unit\_name in descending order.

Screen Shot of SQL Query and Results:

The screenshot shows a SQL query editor window with a toolbar at the top. The query is as follows:

```
1 • select SOURCE_REPORTING_UNIT_NAME
2 from fires as a join source_reporting as b
3 on a.source_reporting_table_SOURCE_REPORTING_UNIT = b.SOURCE_REPORTING_UNIT
4 where a.stat_cause_STAT_CAUSE_CODE = 8 and b.SOURCE_REPORTING_UNIT_NAME like "%Forest"
5 group by SOURCE_REPORTING_UNIT_NAME order by COUNT(SOURCE_REPORTING_UNIT_NAME) desc limit 3;
```

Below the query editor, the results are displayed in a table with the column header `SOURCE_REPORTING_UNIT_NAME`. The results are:

SOURCE_REPORTING_UNIT_NAME
San Bernardino National Forest
Angeles National Forest
Coconino National Forest

### Query 3

One advocacy group says human actions and not Nature is to blame for most wildfires. Write a query that supports this statement.

As the statement states human actions are to be blamed for most wildfires, we need the count the number of fires that are caused by human and nature. If the count of fires caused by human are more this proves the above statement is true. 2 rows are retrieved.

Translation: select cause and count of fires from fires table where the stat\_cause\_descr is lightning, nature and human and group by cause.

Screen Shot of SQL Query and Results:



```
1
2 • SELECT cause,count(*) as count
3   from (select IF(STAT_CAUSE_DESCR= 'Lightning' , 'Nature', 'Human') as cause
4   from fires
5   where STAT_CAUSE_DESCR not in ('Miscellaneous','Missing/Undefined')) as type_damage group by cause;
```

cause	count
Nature	278451
Human	1110963

#### Query 4

How many wildfires were reported by more than one unit/agency?

Retrieve the number of wildfires reported in more than one unit/agency. One row is retrieved.

Translation : select count of source\_reporting\_name from fires and source\_reporting table by them on source \_reporting\_unit group by fire\_name and having no of units greater than 1.

Screen Shot of SQL Query and Results:

```
1 • select count(*) as no_of_fires from
2 (select a.FIRE_NAME, count(SOURCE_REPORTING_UNIT) as No_of_units_reported
3 from fires as a join source_reporting as b
4 on a.source_reporting_table_SOURCE_REPORTING_UNIT=b.SOURCE_REPORTING_UNIT
5 group by a.FIRE_NAME having No_of_units_reported>1) as fires;
```

Result Grid	Filter Rows:	Export:	Wrap Cell Content:
no_of_fires			
76634			



## Query 5





What were the forests that had more than one fire that lasted more than two days?

Retrieve the forests where the fires lasted for more than 2 days. 128 rows were retrieved.

Translation: select source reporting unit name from source\_reporting table by joining it with fires on source reporting unit where the difference between controlled date and discovery date is greater than 2 and source reporting unit name like forest and grouping by source reporting unit having count of source reporting unit name is greater than 1.

Screen Shot of SQL Query and Results:

```
1 • select SOURCE_REPORTING_UNIT_NAME
2 from fires as a join source_reporting as b
3 on a.source_reporting_table_SOURCE_REPORTING_UNIT = b.SOURCE_REPORTING_UNIT
4 where (a.CONT_DATE-a.DISCOVERY_DATE)>2 and SOURCE_REPORTING_UNIT_NAME like "%Forest"
5 group by SOURCE_REPORTING_UNIT_NAME having count(SOURCE_REPORTING_UNIT_NAME)>=1;
```

result Grid			Filter Rows: <input type="text"/>	Export: 	Wrap Cell Content: 
SOURCE_REPORTING_UNIT_NAME					
Beaverhead-Deerlodge National Forest					
Bitterroot National Forest					
Idaho Panhandle National Forest					
Clearwater National Forest					
Custer National Forest					
Deerlodge National Forest					
Flathead National Forest					
Gallatin National Forest					
Helena National Forest					
Kootenai National Forest					

## Query 6

Which forest had the most number of fires?


Report the forest which has most number of fires. One row is retrieved


Translation: select source\_reporting\_unit\_name from source\_reporting\_unit table by joining it with fires table on source\_reporting\_unit where source\_reporting\_unit\_name like forest and grouping it by source\_reporting\_unit\_name in descending order.

Screen Shot of SQL Query and Results:

```
1 • select SOURCE_REPORTING_UNIT_NAME, COUNT(SOURCE_REPORTING_UNIT_NAME) as Min_Fire_count
2 from fires as a join source_reporting as b
3 on a.source_reporting_table_SOURCE_REPORTING_UNIT = b.SOURCE_REPORTING_UNIT
4 where b.SOURCE_REPORTING_UNIT_NAME like "%Forest"
5 group by SOURCE_REPORTING_UNIT_NAME order by COUNT(SOURCE_REPORTING_UNIT_NAME) desc limit 1;
6 |
```


Result Grid






Filter Rows:

Export:



Wrap Cell Content:



SOURCE_REPORTING_UNIT_NAME	Min_Fire_count
Coconino National Forest	8812

## Data Review for MongoDB

### Assumptions/Notes About Data Collections, Attributes and Relationships between Collections

The wildfires database in MongoDB contains 2 collections:

1) Fires

2) NWCG

Relationship: NWCG\_REPORTING\_UNIT\_ID field in Fires collection is linked with UnitId field in NWCG Collection

# Physical Mongo Database

## Assumptions/Notes About Data Set

### Screen shot of Physical Database objects (Database, Collections and Attributes)

```
C:\Program Files\MongoDB\Server\4.2\bin>mongoimport --db=wildfires --collection=fires --drop --headerline --type=csv --file="D:\Fall'19\BUAN 6320 - DB foundations - Ravi N\Project\tables\fires_info.csv"
2019-12-08T14:16:14.319-0600 connected to: mongodb://localhost/
2019-12-08T14:16:14.320-0600 dropping: wildfires.fires
2019-12-08T14:16:17.321-0600 [#.....] wildfires.fires 32.8MB/539MB (6.1%)
2019-12-08T14:16:20.321-0600 [##.....] wildfires.fires 64.4MB/539MB (12.0%)
2019-12-08T14:16:23.321-0600 [###.....] wildfires.fires 96.2MB/539MB (17.9%)
2019-12-08T14:16:26.320-0600 [####.....] wildfires.fires 132MB/539MB (24.5%)
2019-12-08T14:16:29.321-0600 [#####.....] wildfires.fires 168MB/539MB (31.2%)
2019-12-08T14:16:32.320-0600 [#####.....] wildfires.fires 203MB/539MB (37.6%)
2019-12-08T14:16:35.320-0600 [#####.....] wildfires.fires 237MB/539MB (43.9%)
2019-12-08T14:16:38.320-0600 [#####.....] wildfires.fires 268MB/539MB (49.7%)
2019-12-08T14:16:41.321-0600 [#####.....] wildfires.fires 302MB/539MB (56.1%)
2019-12-08T14:16:44.320-0600 [#####.....] wildfires.fires 338MB/539MB (62.7%)
2019-12-08T14:16:47.320-0600 [#####.....] wildfires.fires 376MB/539MB (69.8%)
2019-12-08T14:16:50.320-0600 [#####.....] wildfires.fires 408MB/539MB (75.8%)
2019-12-08T14:16:53.319-0600 [#####.....] wildfires.fires 442MB/539MB (81.9%)
2019-12-08T14:16:56.319-0600 [#####.....] wildfires.fires 472MB/539MB (87.5%)
2019-12-08T14:16:59.321-0600 [#####.....] wildfires.fires 507MB/539MB (94.1%)
2019-12-08T14:17:01.964-0600 [#####.....] wildfires.fires 539MB/539MB (100.0%)
2019-12-08T14:17:01.964-0600 1880465 document(s) imported successfully. 0 document(s) failed to import.

C:\Program Files\MongoDB\Server\4.2\bin>mongoimport --db=wildfires --collection=nwgc --drop --headerline --type=csv --file="D:\Fall'19\BUAN 6320 - DB foundations - Ravi N\Project\tables\nwgc (1).csv"
2019-12-08T14:19:30.901-0600 connected to: mongodb://localhost/
2019-12-08T14:19:30.902-0600 dropping: wildfires.nwgc
2019-12-08T14:19:30.991-0600 5867 document(s) imported successfully. 0 document(s) failed to import.
```

```
> show collections
fires
nwgc
> show dbs
admin 0.000GB
config 0.000GB
employees 0.147GB
local 0.000GB
wildfires 0.264GB
> use wildfires
switched to db wildfires
> show collections
fires
nwgc
>
```

MongoDB Compass Community - localhost27017/wildfires.fires

Connect View Collection Help

My Cluster

- DBS
- COLLECTIONS

HOST localhost:27017

CLUSTER Standalone

EDITION MongoDB 4.2.1 Community

Filter your data

- admin
- config
- employees
- local
- wildfires
  - fires
  - nwcg

wildfires.fires

Documents

DOCUMENTS 1.9m TOTAL SIZE 1.6GB AVG. SIZE 931B INDEXES 1 TOTAL SIZE 17.9MB AVG. SIZE 17.9MB

Documents Aggregations Explain Plan Indexes

FILTER

INSERT DOCUMENT VIEW LIST TABLE

Displaying documents 1 - 20 of 1880465

```
{ "_id": "ObjectID('5de5a0e9583de103d5a9a19')", "FID": 2, "FW_ID": "FS-1418827", "SOURCE_SYSTEM_TYPE": "FED", "SOURCE_SYSTEM": "FS-FIRESTAT", "NKG_REPORTING_AGENCY": "FS", "NKG_REPORTING_UNIT_ID": "USCAEW", "NKG_REPORTING_UNIT_NAME": "Eldorado National Forest", "SOURCE_REPORTING_UNIT": 503, "LOCAL_FIRE_REPORT_ID": 13, "LOCAL_INCIDENT_ID": 13, "FIRE_CODE": "AACB", "FIRE_NAME": "PISGON", "ICS_209_INCIDENT_NUMBER": "NA", "ICS_209_NAME": "NA", "MTBS_ID": "NA", "MTBS_FIRE_NAME": "NA", "COMPLEX_NAME": "NA", "FIRE_YEAR": 2004, "DISCOVERY_DATE": 2453137.5, "DISCOVERY_DOY": 133, "DISCOVERY_TIME": 845, "STAT_CAUSE_CODE": 1, "STAT_CAUSE_DESCR": "Lightning", "CONT_DATE": 2453137.5, "CONT_DOY": 133, "CONT_TIME": 1530, "FIRE_SIZE": 0.25, "FIRE_SIZE_CLASS": "A", "LATITUDE": 38.93305556, "LONGITUDE": -120.40444444, "OWNER_CODE": 5, "OWNER_DESCR": "USFS", "STATE": "CA", "COUNTY": 61 }
```

MongoDB Compass Community - localhost27017/wildfires.nwcg

Connect View Collection Help

My Cluster

- DBS
- COLLECTIONS

HOST localhost:27017

CLUSTER Standalone

EDITION MongoDB 4.2.1 Community

Filter your data

- admin
- config
- employees
- local
- wildfires
  - fires
  - nwcg

wildfires.nwcg

Documents

DOCUMENTS 5.9k TOTAL SIZE 1.7MB AVG. SIZE 296B INDEXES 1 TOTAL SIZE 68.0KB AVG. SIZE 68.0KB

Documents Aggregations Explain Plan Indexes

FILTER

INSERT DOCUMENT VIEW LIST TABLE

Displaying documents 1 - 20 of 5867

```
{ "_id": "ObjectID('5de5ad287bcc09b051c34ad')", "UnitId": "USACECX", "GeographicArea": "JAL", "Gacc": "USABACE", "WildlandRole": "Incident Host Geographic", "UnitType": "US County/Local", "Department": "JAL", "Agency": "CBL", "Parent": "JA", "Country": "US", "State": "JAL", "Code": "CECX", "Name": "Central Emergency Services" }, { "_id": "ObjectID('5de5ad287bcc09b051c34ae')", "UnitId": "USACEFPX", "GeographicArea": "JAL", "Gacc": "USABACE", "WildlandRole": "Incident Host Geographic", "UnitType": "US County/Local", "Department": "JAL", "Agency": "CBL", "Parent": "JA", "Country": "US", "State": "JAL", "Code": "CFPX", "Name": "City Fairbanks Fire Department" }, { "_id": "ObjectID('5de5ad287bcc09b051c34af')", "UnitId": "USACECX", "GeographicArea": "JAL", "Gacc": "USABACE", "WildlandRole": "Incident Host Geographic", "UnitType": "US County/Local", "Department": "JAL", "Agency": "CBL", "Parent": "JA", "Country": "US", "State": "JAL", "Code": "CECX", "Name": "Central Emergency Services" }
```

## Data in the Database

Collection Name	Relationships With Other Collections (if any)	# of Documents in Collection
Fires	NWCG_REPORTING_UNIT_ID field in Fires is linked with UnitId field in NWCG Collection	1880465
NWCG	NWCG_REPORTING_UNIT_ID field in Fires is linked with UnitId field in NWCG Collection	5867

## MongoDB Queries/Code

### Query 1

A leading beverage company has announced a billion-dollar fund for removing debris from forests, rivers and mountains in the US. All states are interested. Which state has the best chance to win a share of the fund?

As all the states are interested in the billion-dollar fund we group by state, but the state with which has highest number of fires will receive the fund. AK has the highest fires.

Translation: Project the highest fire\_damage grouping by state in descending order.

Screen Shot of MongoDB Query/Code and Results:

```
> db.FIRES.aggregate([
...   {$group: {_id: "$STATE", Fire_damage: {$sum: "$FIRE_SIZE"}}},
...   {$sort: {Fire_damage: -1}},
...   {$project: {Fire_damage: 0}},
...   { $limit : 1 }
... ])
{ "_id" : "AK" }
>
```

## Query 2

One of the reporting agencies has suggested that children be banned from its forests unless there is one adult for every 3 children in a group visiting a forest. Name 3 forests where this would be the most appropriate.

As the reporting agencies has suggested every 3 children should be accompanied by one adult, we group by source reporting unit in descending order and selecting first three forests will give us 3 documents.

Translation: Report the source\_reporting\_unit\_name where the source\_reporting\_unit\_name contains forest and stat\_cause\_code is 8 by sorting them in descending order.

Screen Shot of MongoDB Query/Code and Results:

```
> db.FIRES.aggregate([
...   {$match: {"SOURCE_REPORTING_UNIT_NAME":/Forest$/, STAT_CAUSE_CODE: 8}},
...   {$group: {_id:{SOURCE_REPORTING_UNIT_NAME: "$SOURCE_REPORTING_UNIT_NAME"}, Firescount:{$sum:1}}},
...   {$sort: {Firescount:-1, _id:-1}},
...   {$limit:3}
... ])
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "San Bernardino National Forest" }, "Firescount" : 162 }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Angeles National Forest" }, "Firescount" : 156 }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Huron-Manistee National Forest" }, "Firescount" : 94 }
>
```



### Query 3

One advocacy group says human actions and not Nature is to blame for most wildfires. Write a query that supports this statement.

As the statement states human actions are to be blamed for most wildfires, we need the count the number of fires that are caused by human and nature. If the count of fires caused by human are more this proves the above statement is true. 2 documents are retrieved.

Translation: Projecting the summary which contains human and nature. If the stat\_cause\_code is 1 then its nature else human based on which the count of each stat\_cause\_code is projected.

Screen Shot of MongoDB Query/Code and Results:

```
> db.FIRES.aggregate( [
...
...   {$match:{STAT_CAUSE_CODE:{$nin:[9,13]}}},
...
...   {
...     $project:
...     {
...       "STAT_CAUSE_CODE" : 1,
...       "summary" :
...       {
...         $switch:
...         {
...           branches: [
...             { case: { $eq : [ '$STAT_CAUSE_CODE',1 ]}, then: "Nature" }
...           ],
...           default: "Human"
...         }
...       }
...     }
...   },
...   {$group:{_id:"$summary",count: {$sum:1 }}}
... ] )
{ "_id" : "Human", "count" : 1111469 }
{ "_id" : "Nature", "count" : 278468 }
```

#### Query 4

How many wildfires were reported by more than one unit/agency?

Retrieve the number of wildfires reported in more than one unit/agency. One document is retrieved.

Translation: Projecting the fire\_name and the source\_reporting\_unit where the no\_of\_units\_reported is greater than 1.

Screen Shot of MongoDB Query/Code and Results:

```
> db.FIRES.aggregate([
... {$project:{FIRE_NAME:1,SOURCE_REPORTING_UNIT:1}},
... {$group:{_id:"$FIRE_NAME",No_of_units_reported:{$sum:"$SOURCE_REPORTING_UNIT"}}},
... {$match:{No_of_units_reported:{$gte:1}}}
... ]).toArray().length
76442
```

## Query 5

What were the forests that had more than one fire that lasted more than two days?

Retrieve the forests where the fires lasted for more than 2 days. 128 documents were retrieved.

Translation: Projecting the source\_unit\_reporting\_name where the difference between controlled date and discovery date is greater than 2 and source\_unit\_reporting\_name contains “forest” and firecount is greater than 1.

Screen Shot of MongoDB Query/Code and Results:

```
> db.FIRES.aggregate([
... { $addFields: { date_diff: { $subtract: ["$CONT_DATE", "$DISCOVERY_DATE"]} } },
... { $match: { date_diff: { $gte : 2}} },
... { $project: { SOURCE_REPORTING_UNIT_NAME : 1 } },
... { $match: { "SOURCE_REPORTING_UNIT_NAME":/Forest$/ } },
... { $group: { _id:{SOURCE_REPORTING_UNIT_NAME: "$SOURCE_REPORTING_UNIT_NAME"}, Firescount:{ $sum:1} } },
... { $match: { Firescount: { $gte : 1}} },
... { $project: { SOURCE_REPORTING_UNIT_NAME : 1 } } ])
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Caribou National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Modoc National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Uinta-Wasatch-Cache National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Homochitto National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Nebraska National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Colville National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Manti-LaSal National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Custer National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Chequamegon-Nicolet National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "George Washington and Jefferson National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Ottawa National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Inyo National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Santa Fe National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Caribou-Targhee National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Umatilla National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Kootenai National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Savannah River Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Boise National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Mark Twain National Forest" } }
{ "_id" : { "SOURCE_REPORTING_UNIT_NAME" : "Hoosier National Forest" } }
Type "it" for more
```

## Query 6

Which forest had the most number of fires?

Report the forest which has most number of fires. One document is retrieved

Translation: Project nwcg\_reporting\_unit\_name which contains “forest” by sorting in descending order.

Screen Shot of MongoDB Query/Code and Results:

```
> db.FIRES.aggregate([
... {$match: {"NWCg_REPORTING_UNIT_NAME":/Forest$/}},
... {$group: {_id:{NWCg_REPORTING_UNIT_NAME: "$NWCg_REPORTING_UNIT_NAME"}, Firescount:{$sum:1}}},
... {$sort: {Firescount:-1, _id:-1}},
... {$limit:1}])
{ "_id" : { "NWCg_REPORTING_UNIT_NAME" : "Coconino National Forest" }, "Firescount" : 8812 }
```