

Incorporation of Federal Land Manager Estimates of Prescribed Burning into Emission Projections Developed for the VISTAS Regional Planning Organization

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VISTAS Fire Emissions Development

- VISTAS Fire Workgroup convened in 2003 to oversee development of 2002 base year emission inventory
 - Fire Workgroup included Federal and State fire officials
- States and local agencies, National Park Service, and Forest Service provided 2002 acreage for wildfire, prescribed fire, agricultural burning, and land clearing categories
- Methods to calculate emissions from acreage and fuel type developed with Fire Workgroup
- Emissions developed on a fire-by-fire basis wherever data sufficient

VISTAS Base Year Fire Emissions

- Data solicited from Fire Workgroup on acreage, fuel loading/fuel characteristics, emission factors and other parameters necessary to estimate fire emissions
- Base year inventory provided to Fire Workgroup for review and comment prior to submittal for modeling

Fire-by-Fire Data Submitted

Fire Type	AL	FL	GA	KY	MS	NC	SC	TN	VA	WV
Land Clearing	✓	✓	✓				✓			
Ag Burning	✓	✓	✓				✓			
Wildfires	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rx	✓	✓	✓	✓	✓	✓	✓	✓		✓

VISTAS Fire Projections

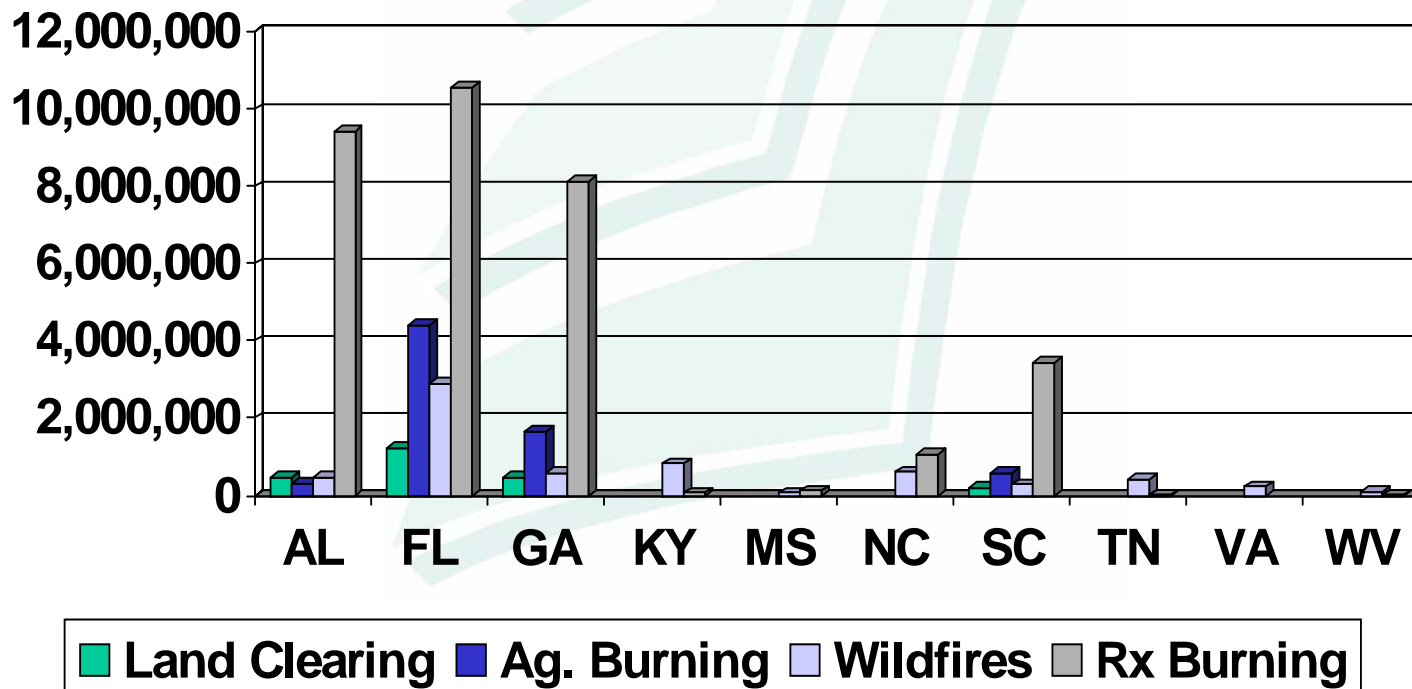
- To project fire emissions, VISTAS developed a “typical” fire year to use with all projection modeling
- Kept 2002 fuel loadings/characteristics and dates the same but used long term (greater than 3 years) data to develop “typical” annual burned acreage
- Developed a ratio between 2002 and long term acreage to apply to each fire type
- Multiplied the ratio times the 2002 acreage to obtain the “typical” year emissions

How To Capture Increases In Rx Burning In Future Years?

- Federal agencies indicate that Rx burning in future years is likely to increase significantly
- VISTAS will consider this as a “control strategy” scenario (e.g., does increased Rx burning affect regional haze?)
- How best to incorporate the data?

Why Are Future Rx Fire Increases Important In The SE U.S.?

Typical Acreage by Fire Type



Rx Future Year Data Submitted

- FWS and FS submitted data
- FWS – Annual acreage data by NWR/county with estimates of acres burned per day
- FS – fire-by-fire acreage estimates based on mapping projected burning acreage to current modeling days

Issues Related to Data Incorporation

- FWS did not submit data for VISTAS original base year preparation
 - Proposed method would use county level data for FWS data
- FS submitted data, but VISTAS can't do a simple replacement
 - Some VISTAS States run a Rx fire permitting program
 - To avoid double counting, only State data were used in those States; FS records are marked in database for those States without a permit program
 - Proposed method would use county level data for FS data where a State Rx fire permitting program exists and fire-by-fire replacement for FS data in States without permit programs
- How to handle added acreage when there were no fires for a county/forest/NWR in 2002

State-level Acres Burned As Submitted by FWS with 2002 VISTAS Typical

State	VISTAS 2002 Typical	2002	2009	2018
AL	858,652	356	5,370	5,920
FL	960,850	59,333	69,547	68,547
GA	738,204	10,245	22,460	22,460
MS	10,645	10,031	16,300	19,800
NC	97,896	15,799	22,900	31,500
SC	311,526	17,294	18,000	18,000

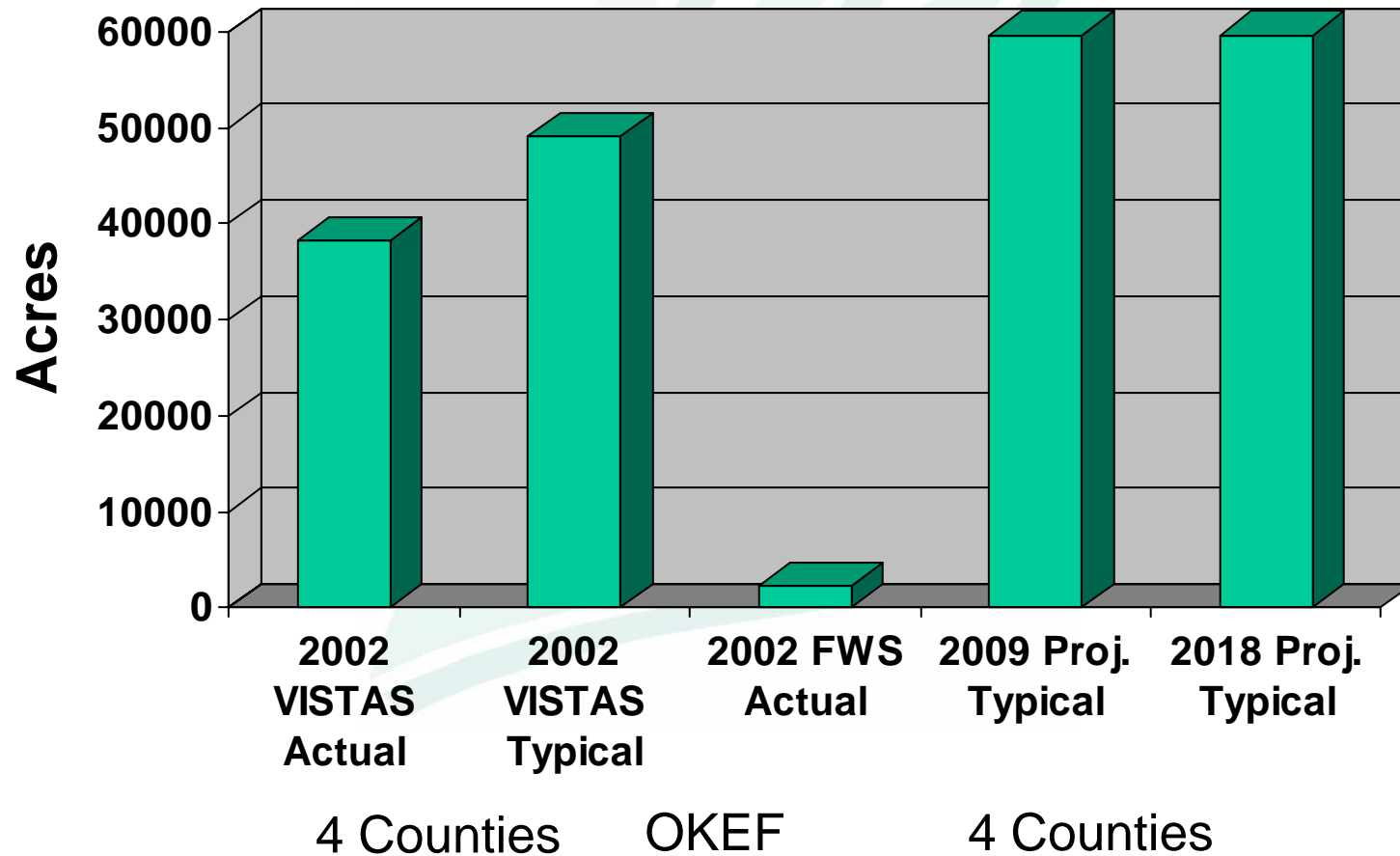
FWS data - County level approach

- Sum annual acres burned for FWS across all NWRs in a county
- Subtract out 2002 acreage from projected acreage to avoid double counting.
- Multiply resultant acreage by 0.8 to account for blackened acres instead of total reported
- Add revised total FWS acreage provided to total county “typical” acreage to determine future acreage burned
- Allocate acreage increase to current modeling days
- Use average daily acres burned to allocate to the number of days
 - *According to FWS guidance up to 3x average daily acres burned can be allocated to any one day. If insufficient number of days available, used either 2x or 3x average daily acres burned to allocate to the first couple of days.*

FS Approach

- For States that have permit programs, use similar approach to FWS county level approach
 - Sum FS data at county level, add to typical and then allocate to modeling days based on mapping done by Bill Jackson,USFS
- For States that don't have a permit program, replace current fire-by-fire records in database with fire-by-fire records from FS and recalculate emissions based on fuel model and fuel loading.
- 0.8 correction for blackened acres applied to all FS acres.

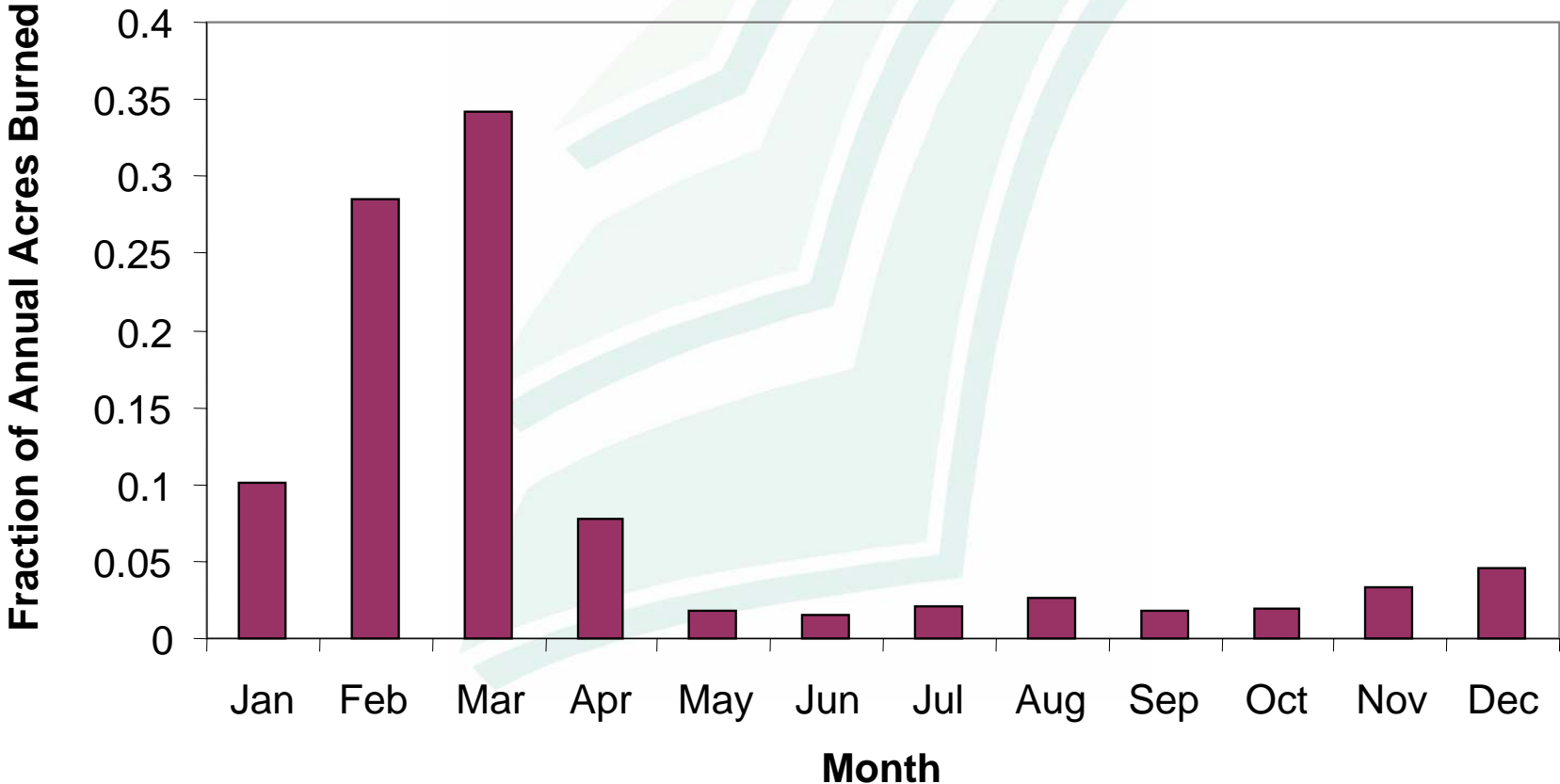
Annual Average Rx Fires - 4 Counties with Okefenokee NWR



How to capture temporal profile for fire?

- In 2002 actual fire inventory, fires occur on same days as state/FLM records.
- In 2002 “typical” year, fire acreage increased or decreased from acreage on fire days in 2002 actual inventory
- When adding Rx fire in future year, add acreage to individual fire days proportional to annual increase (days with the largest acres burned in 2002 typical received the largest fraction of acres in the allocation)

Monthly Fraction of Annual Prescribed Acres Burned - 2002 Actual Profile

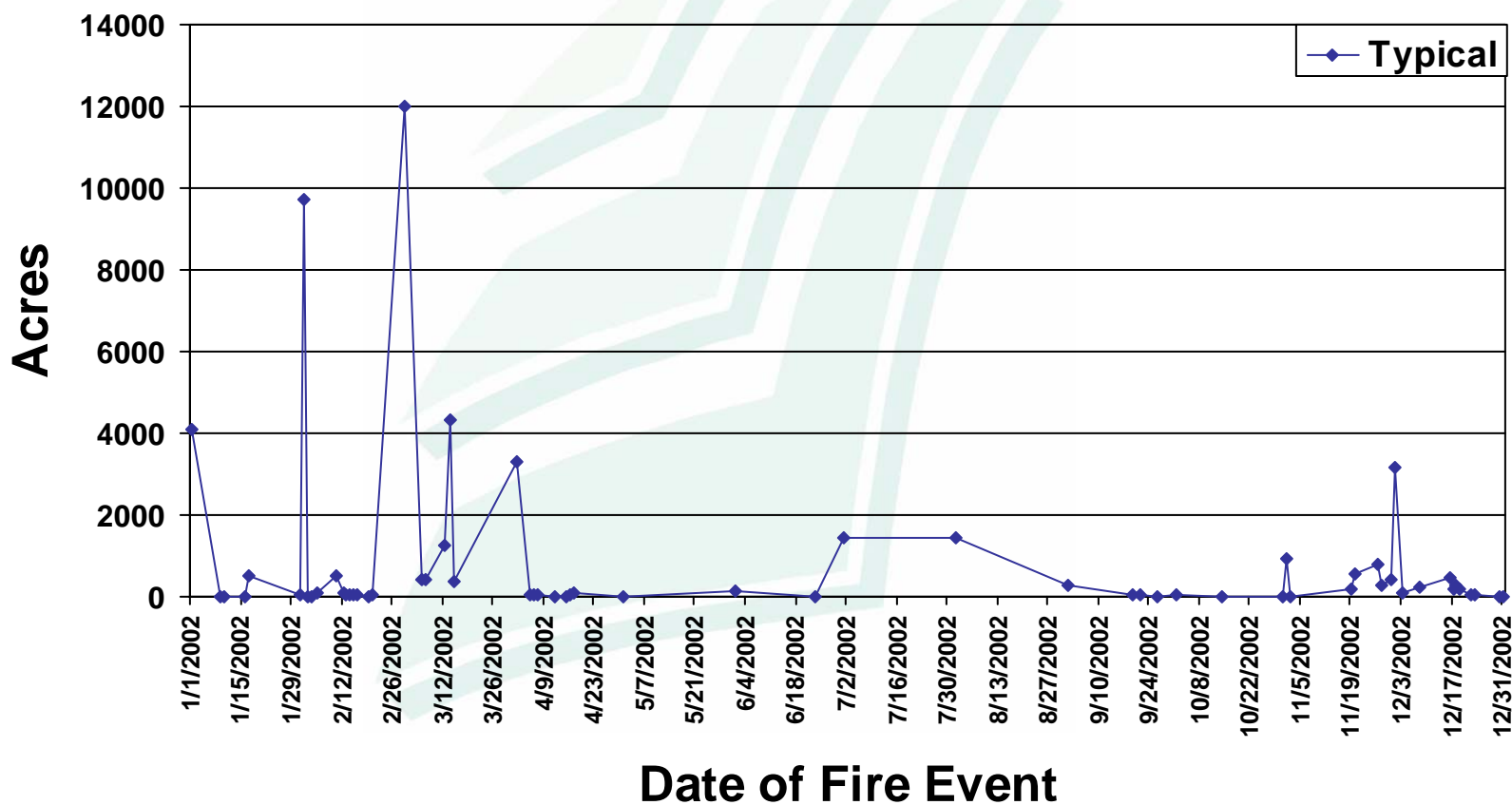


VISTAS Prescribed Fire Data



Specific NWR/NF Fire Event Distribution

(Temporal Plot of Current Typical Acres Burned in 4 Counties Containing Okefenokee NWR)



Individual NWR/NF distribution used for future burn plans

Okefenokee Example – 2009/2018 FWS data

BAKER COUNTY	3/14/2002	3/12/2002	Total annual
Acres (typical)	4315	1233	12,415
Add on FWS Projection	280	111.2	391.2
Total	4,595	1,344	12,806
Percent increase	6.5%	9.0%	3.2%

Total annual represents total annual acres for all days, not just days needed to allocate increased burning acreage

Okefenokee Example – 2009/2018 FWS Data (cont'd)

CHARLTON COUNTY	3/1/02	1/1/02	12/1/02	2/1/02	4/1/02	11/1/02	7/1/02	Total
Acres (typical)	6,021	1,831	1,758	1,196	492	303	138	11,827
Add on FWS Projection	560	560	560	560	329.6	280	280	3,130
Total	6,581	2,391	2,318	1,756	822	583	418	14,957
Percent Increase	9.3%	30.6%	31.9%	46.8%	67.0%	92.4%	202.9%	26.5%

Total annual represents total annual acres for all days, not just days needed to allocate increased burning acreage



Okefenokee Example 2009/2018 FWS Data (cont'd)

CLINCH COUNTY	3/1/2002	4/1/2002	2/1/2002	1/1/2002	11/1/2002	12/1/2002	Total Annual
Acres (typical)	3,757	2,612	1,996	1,801	616	472	11,764
Add on FWS Projection	560	280	280	280	280	276	1,956
Total	4,316	2,891	2,276	2,080	895	747	13,720
Percent Increase	14.9%	10.7%	14.0%	15.6%	45.5%	58.5%	14.3%

Total annual represents total annual acres for all days, not just days needed to allocate increased burning acreage



Okefenokee Example 2009/2018 FWS Data (cont'd)

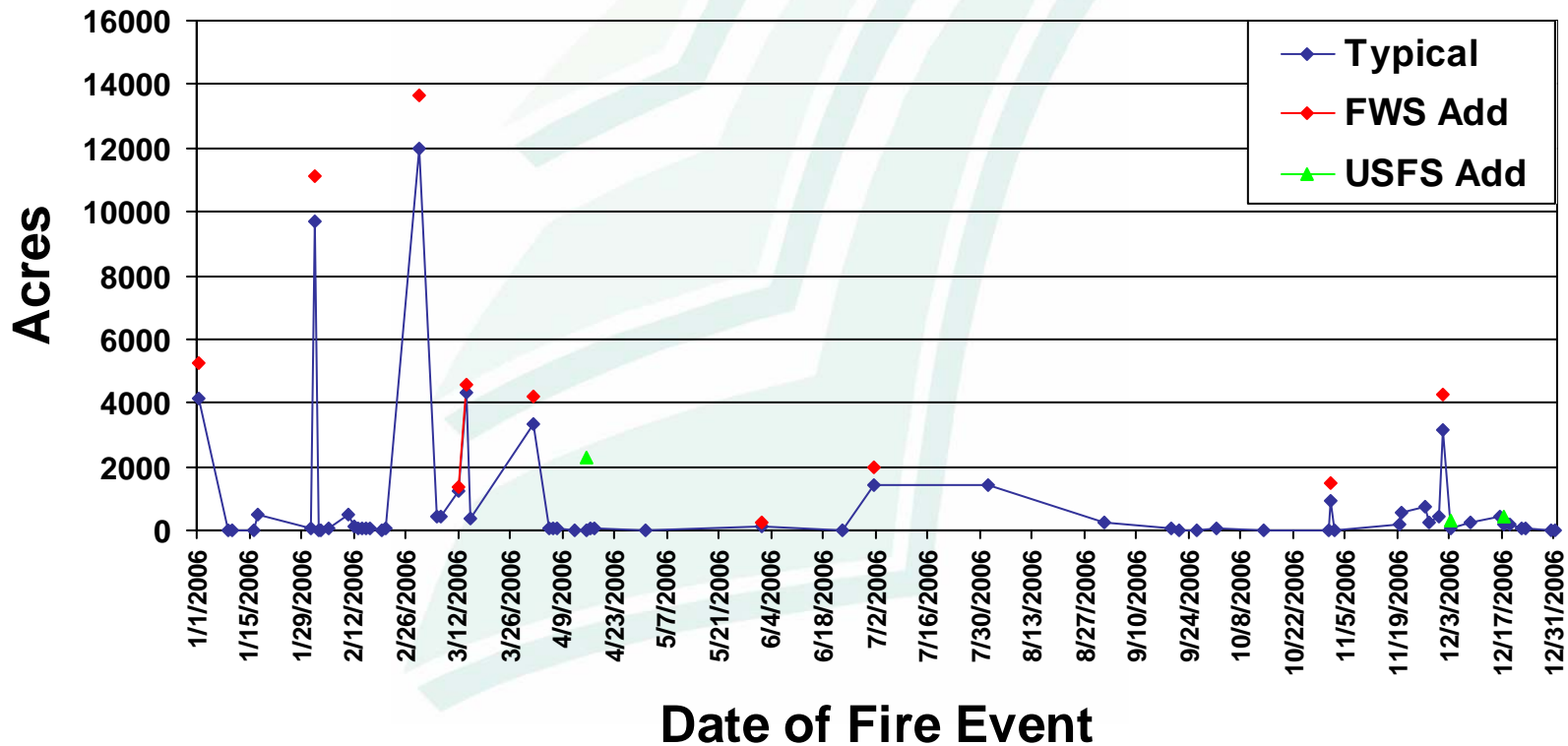
WARE COUNTY	2/1/02	3/1/02	7/1/02	12/1/02	1/1/02	4/1/02	6/1/02	Total Annual
Acres (typical)	6,535	2,221.3	1,355.0	947.3	482.6	218.8	104.9	13,019
Add on FWS Projection	560	560	280	280	280	280	107.2	2,347.2
Total	7,095	2,781.3	1,635	1,227.3	762.6	498.8	212.1	15,366.2
Percent Increase	8.6%	25.2%	20.7%	29.6%	58.0%	128.0%	102.2%	15.3%

Total annual represents total annual acres for all days, not just days needed to allocate increased burning acreage



Specific NWR/NF Fire Event Distribution

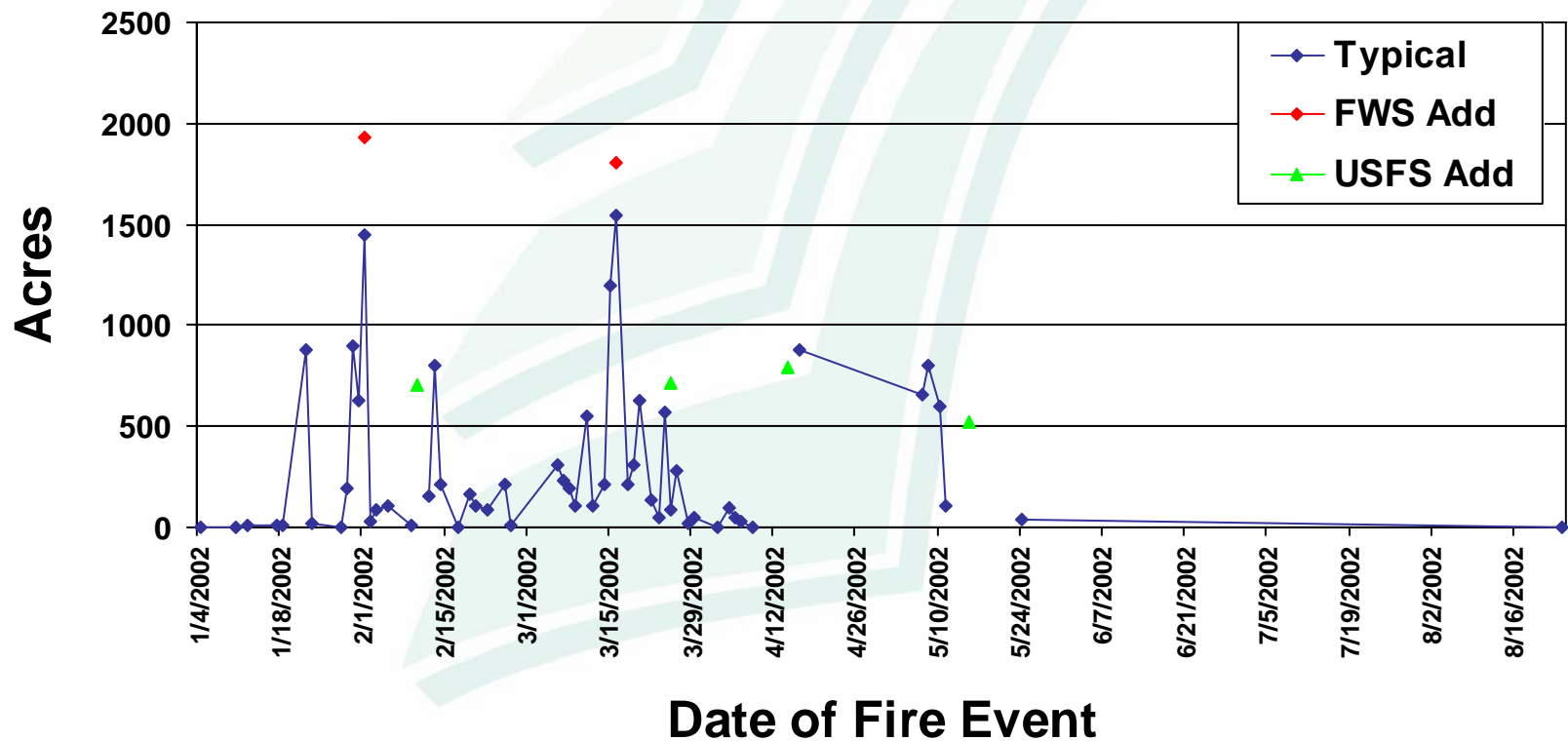
(Annual Temporal Plot of Acres Burned in Okefenokee NWR – 4 Counties)



Individual NWR/NF distribution used for future burn plans

Specific NWR/NF Fire Event Distribution

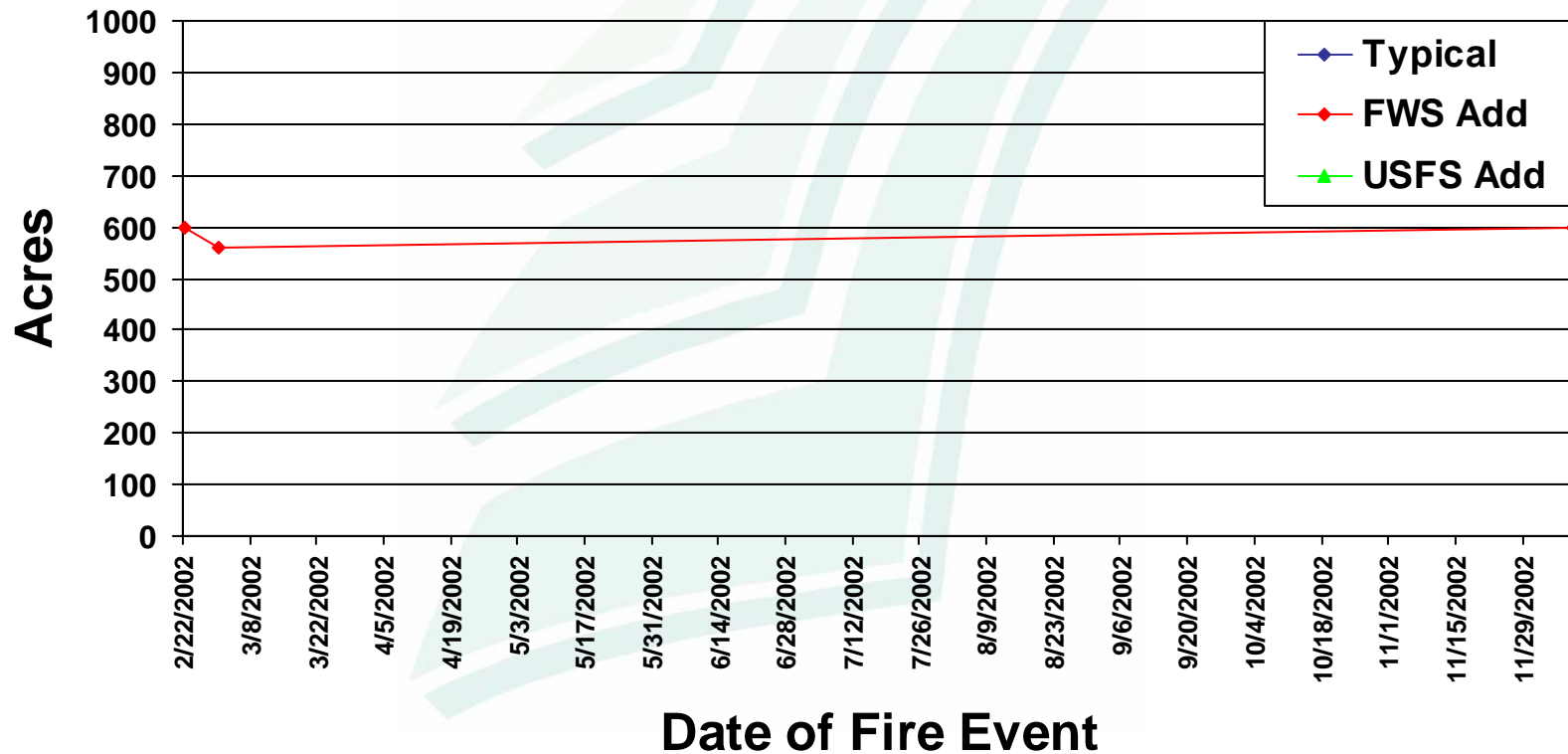
(Annual Temporal Plot of Acres Burned in Cape Romain NWR – 1 County)



Individual NWR/NF distribution used for future burn plans

Specific NWR/NF Fire Event Distribution

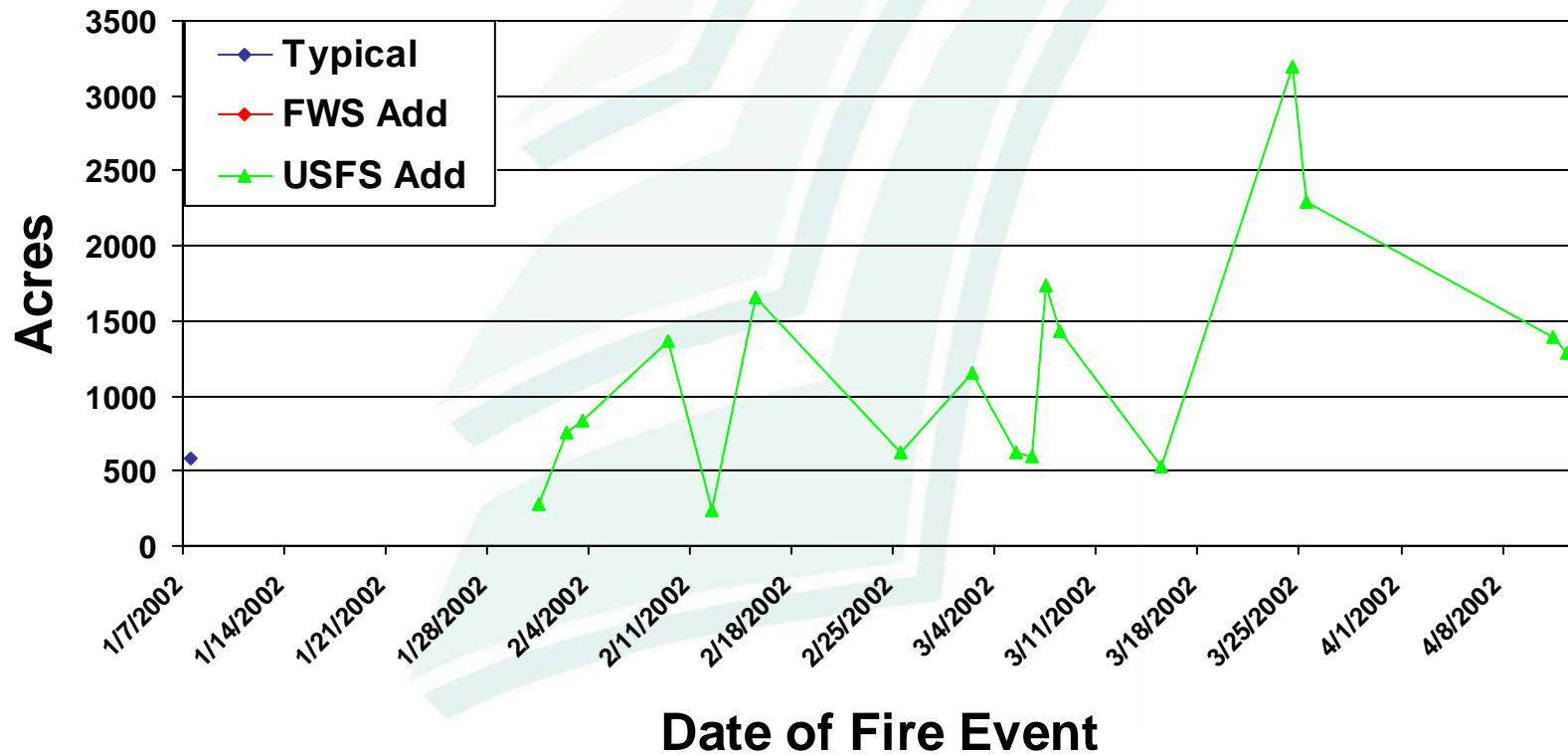
(Annual Temporal Plot of Acres Burned in Swan Quarter NWR – 1 County)



Individual NWR/NF distribution used for future burn plans

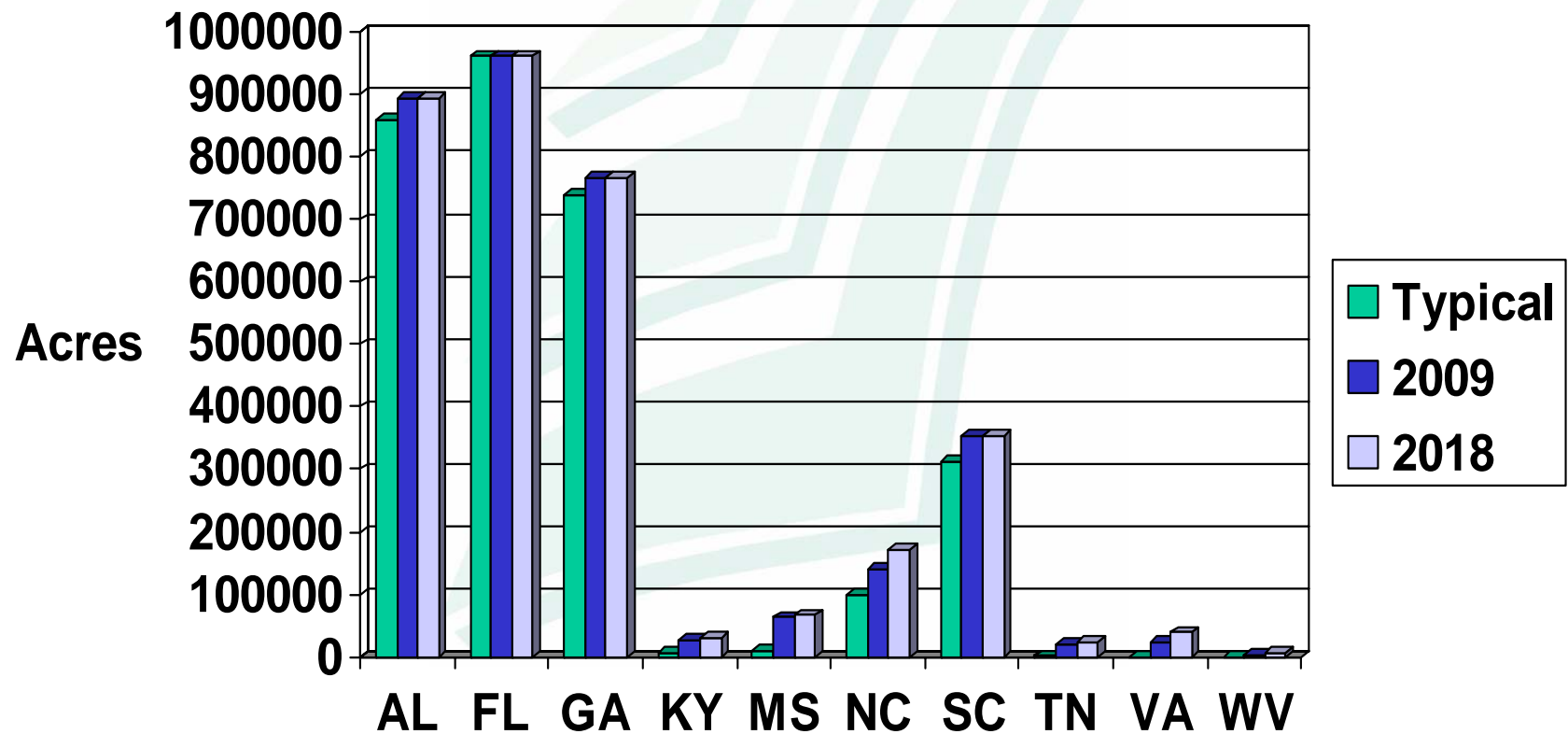
Specific NWR/NF Fire Event Distribution

(Annual Temporal Plot of Acres Burned in Cherokee NF – 7 Counties)

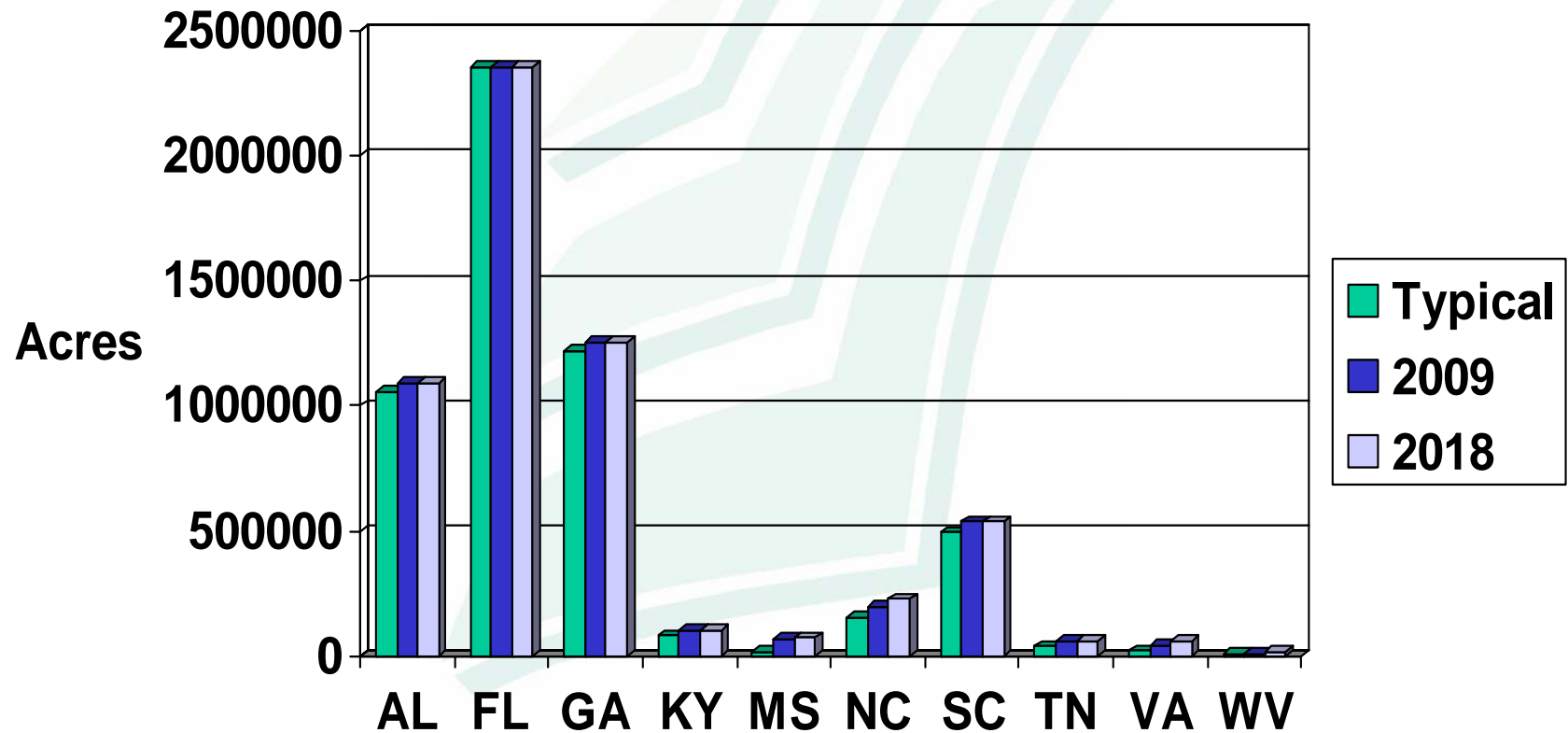


Individual NWR/NF distribution used for future burn plans

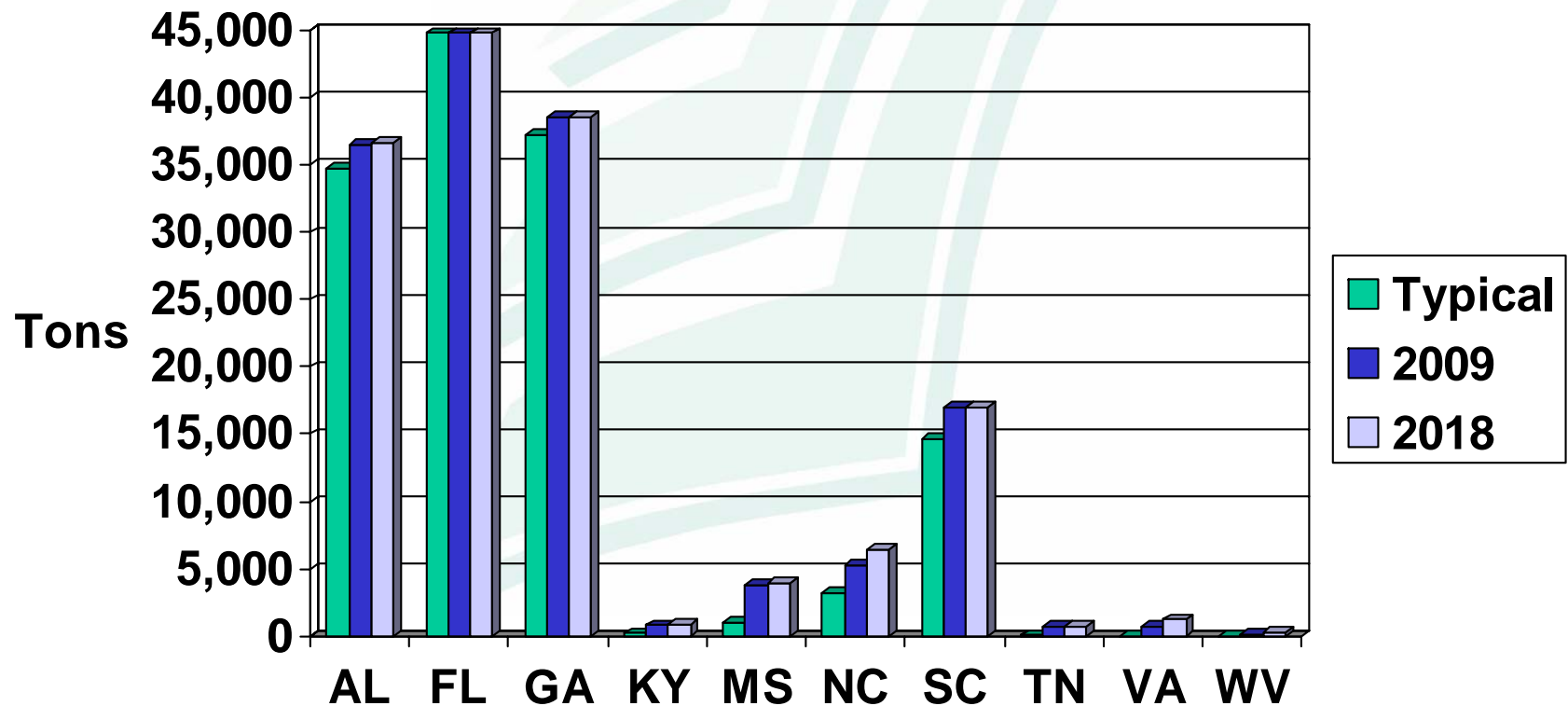
Rx Acreage by State



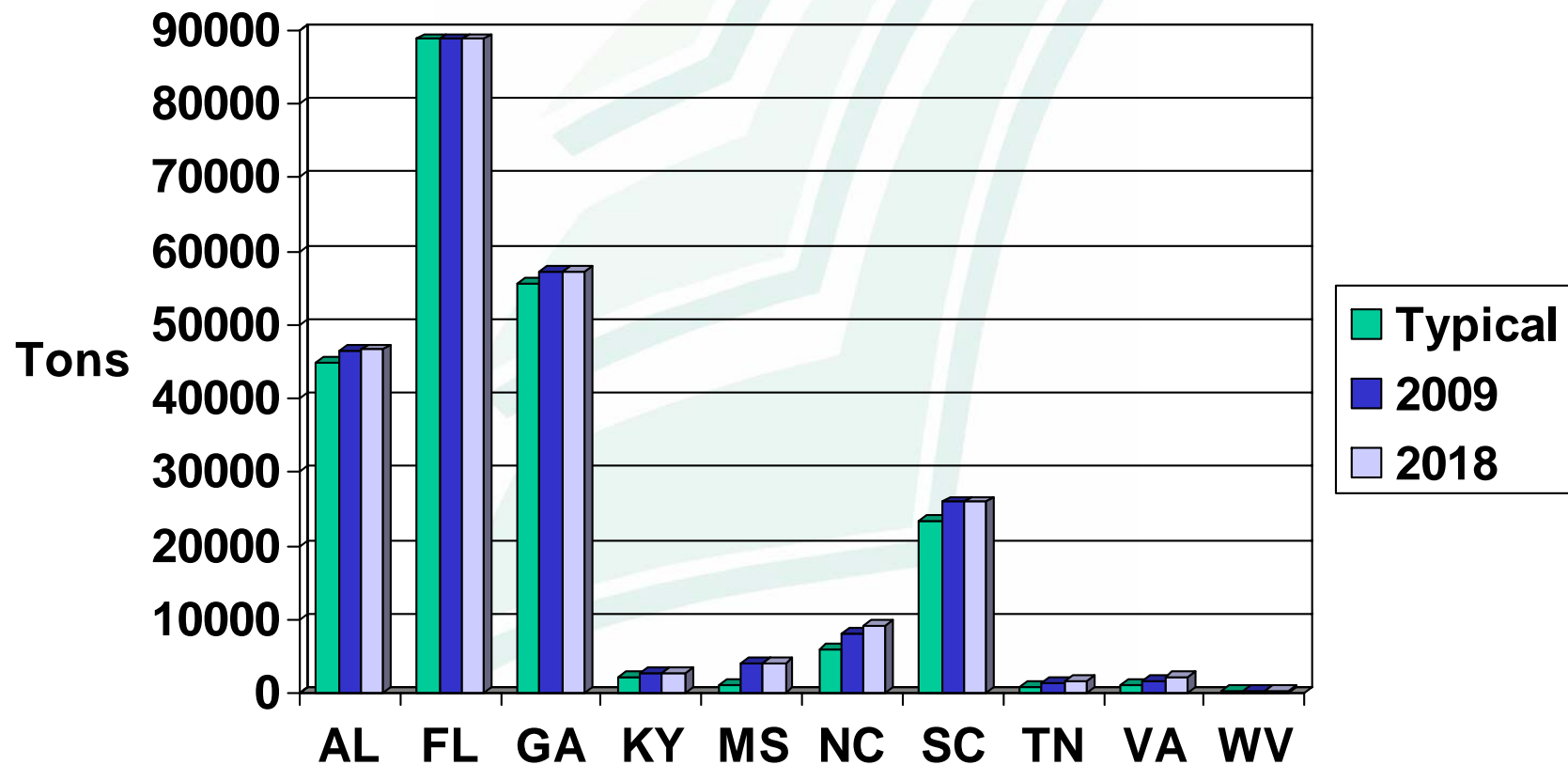
Total Fire Acreage by State



PM2.5 Rx Emissions After FWS and FS Rx Projections



PM2.5 Emissions for All Fire Types After FWS and FS Rx Projections



CONCLUSIONS

- In the southeastern U.S., prescribed fire emissions are an important part of total fire emissions.
 - Thus proposed increases in prescribed burning on Federal and other land types are important to capture in evaluating projected emissions for regional planning with respect to regional haze and PM SIPs.
- Developing a method to capture these increases in projected emission inventories can be difficult because of differences in the way that data are reported and handled by both State divisions of forestry and by FLMs which can cause difficulties in assimilating these data into projected emission inventories.
- Consistent reporting of individual fires with information on start and end date, location (latitude and longitude), land owner (private, Federal, State), fuel type, acreage blackened, and acreage burned would facilitate improvement of the fire inventory for VISTAS and other States.