

Illinois Fire Needs Assessment



February 2016



This fire needs assessment is a product of the Illinois Prescribed Fire Council. The Fire Council's mission is to promote the safe and effective use of prescribed fire in Illinois.

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Acknowledgements

We wish to thank the staff from 25 various agencies and organizations who took the time to give us the data that we have requested.

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Executive Summary

For thousands of years landscape scale fire has shaped the habitats and ecologies of Illinois, the Prairie State. Today prescribed fire is the most important management practice in maintaining and restoring healthy landscapes. The future of Illinois natural areas depends on repeated application of large scale fire; fire that will keep brush from taking the sunlight from woodlands, wetlands and grasslands.



This is the first systematic report in Illinois documenting the number of acres being burned annually and identifying how many acres need to burn annually to maintain and restore ecosystem health. This review is a call to action for land managers, legislators and the general public.

This Assessment Demonstrates:

- Dramatically more acres need to be burned annually across Illinois
- Natural areas need to be managed with prescribed fire with a much higher frequency
- Far too many ecologically degraded acres across the state are in need of fire
- Considerably more resources need to be allocated to prescribed fire programs

Key Data Points

- Of the 1,049,000 acres reported, 790,000 (76%) are held in habitat acres, of which only 50,789 (6%) were managed with prescribed fire between 6/14-5/15
- 213,000 more acres must burn annually in Illinois to effectively manage and restore target acres
- 20% of conservation lands are too degraded to carry effective, healthy, needed fire. Without committed and supported conservation efforts, these numbers will increase over time.

To simply maintain the current condition of Illinois natural areas and to restore degraded acres to ecological health in the future, dramatically more prescribed fire needs to be implemented across the state. Prescribed fire programs urgently need considerable increases in budgets and funding in order to effectively manage Illinois natural areas. It is imperative that state leadership, agency administrators and the general public understand the profound importance of prescribed fire and the vital role it plays in managing Illinois' natural wonders.

Recommendations of the Prescribed Fire Council:

- Funding for prescribed fire programs must be increased to meet land management goals
- Promote a culture of fire wherein the use of prescribed fire is valued, supported and expected
- Trainings must be readily available and encouraged to all staff
- During fire season, agency staff must be focused on fire programs with an All Hands on Deck mentality
- Volunteers are an asset and can support fire programs in many capacities
- Private land owners need support of agency resources and mentorship from experienced programs
- Land managers need more equipment to efficiently and safely implement fire
- Burn units must be large and encompass all habitat types with well prepped, wide fire breaks
- IDNR needs to liaison with EPA on new clean air standards
- Agencies should use this assessment to motivate and reach out to the public
- Agencies need to write comprehensive fire action plans
- This Fire Needs Assessment should be updated in 2019

Introduction

For many millennia landscape scale fire has shaped the habitats of North America. The native flora and fauna have adapted to fire's selective force. When native people migrated to the continent, they increased the presence of fire on the landscape, utilizing fire as a tool and shaping the ecologies of the land. In more recent history, the prairies have been tilled, forests have been leveled and the fires have ceased. Today, the natural areas we have inherited are waiting for the return of restorative fires. Natural areas managers are working to literally carry the torch.

Prescribed fire is the most important stewardship practice in maintaining and restoring healthy landscapes. The health of natural areas depends on repeated application of large-scale fire; fire that will keep brush from taking the sunlight from woodlands, wetlands and grasslands. Without fire, natural areas become thickets of invasive brush with plants and animals languishing in unhealthy habitat.

To promote and expand the use of prescribed fire in Illinois, the Fire Council developed this state-wide fire needs assessment. This is the first systematic report in Illinois documenting the number of acres being burned annually and identifying how many acres need to burn annually to promote ecosystem health. This snap shot review is a call to action for land managers, legislators and the general public.

The fire needs assessment demonstrates:

- Dramatically more acres need to be burned annually
- Natural areas need to be managed with prescribed fire with a much higher frequency
- Far too many degraded acres across the state are in need of fire
- Considerably more resources need to be allocated to prescribed fire programs

This assessment is not a complete picture of prescribed fire in Illinois. Not all agencies using prescribed fire in the state are represented in this report. Data is lacking on lands held by agencies not utilizing fire as a management tool. Conditions on private lands are largely unknown. If data were available from these sources, the statewide percentage of acres receiving fire would surely decrease.

Across Illinois fire crews have been doing good work, becoming more efficient over the years, more aware of how to get the job done safely and have been increasing the number of acres burned. But a considerable increase in annual acres burned needs to take place and more resources need to be allocated to fire programs. Land managers need support from their agencies. Returning regular fire to the natural areas of Illinois needs to be a priority for land owners.

The take home message of this assessment is that every year considerably more acres need to be burned across the state as supported by the following data, graphs and analyses.

Section 1: **Justification for Frequent Fire** – the science supporting prescribed fire

Section 2: **Current Use of Fire on Conservation Lands** – a snap shot look at fire in Illinois today

Section 3: **Fire Gap on Conservation Lands** – Fire Return Interval (FRI) data from Illinois practitioners

Section 4: **Assessing the Fire Gap** – applying FRI data to actual acres burned across the state

Section 5: **Successful Implementation** – examples of organizations/agencies expanding fire programs

Section 6: **Statewide Fire Needs** – based on LANDFIRE, field-referenced data and satellite imagery

Section 7: **Recommendations of the Fire Council** – our proposals to increase the use of fire in Illinois

Section 1: Justification for Frequent Fire

Land managers consider many factors when determining how, when and where to implement prescribed fire on the landscape. Personal experience, anecdotal evidence and hard science can inform these decisions.

Historic frequency of landscape fire and the current use of fire as a restoration tool has been the subject of a great volume of scientific inquiry and published research. Peer reviewed journals regularly feature articles investigating all aspects of fire's impact on natural areas. Journals include the International Journal of Wildland Fire, Forest Ecology and Management, Fire Ecology, Conservation Biology and Restoration Ecology. Entire conferences have been convened to share data and research on wildland and prescribed fire including the Tallgrass Prairie & Oak Savanna Regional Fire Conference and the Illinois Prescribed Fire Council Symposium.

Support from the Literature:

"Results offer strong support for managing eastern tall grass prairie using comparatively high (e.g., >50%) fire frequencies to maintain species richness."

Marlin Bowles and Michael Jones, 2013. Repeated burning of eastern tallgrass prairie increases richness and diversity, stabilizing late successional vegetation. Ecological Applications 23(2), 464-478.

"Over the 15 year study, tree density increased by two- to 10-fold, except in watersheds burned annually where woody plants remained almost completely absent throughout the study."

Briggs et al., 2002. Expansion of Woody Plants in Tallgrass Prairie: A Fifteen-Year Study of Fire and Fire-Grazing Interactions. The American Midland Naturalist 147(2), 287-294.

"We performed a meta-analysis of 29 studies from 13 different grassland/savanna communities in North America to determine the consequences of woody encroachment on plant species richness. In all 13 communities, species richness declined with woody plant encroachment (average decline = 45%). Species richness declined more in communities with higher precipitation ($r^2 = 0.81$) and where encroachment was associated with a greater change in annual net primary productivity ($r^2 = 0.69$)."

Ratajczak et al., 2012. Woody encroachment decreases diversity across North American grasslands and savannas. Ecology, 93(4), 697-703.

"Our results agree with conclusions of previous studies that a burning schedule of annual to biennial fires is needed to produce the most rapid reductions in tree canopy density (Faber-Langendoen and Davis 1995)...We believe that efforts to restore degraded oak savannas should begin with annual burning."

David Peterson and Peter Reich, 2001. Prescribed Fire in Oak Savanna: Fire Frequency Effects on Stand Structure and Dynamics. Ecological Applications 11(3), 914-927.

"I conducted this research over seven seasons, focused on responses at the species level, distinguished between remnant-dependent and remnant-independent species, and included multiple fire events and sites. Among negatively affected populations, 68% recovered within 1 year; all 163 populations tracked to recovery did so in 2 years or less. My results support the judicious use of rotational cool-season burning within small, isolated grassland sites."

Ron Panzer, 2002. Compatibility of Prescribed Burning with the Conservation of Insects in Small, Isolated Prairie Reserves. Conservation Biology 16(5), 1296-1307.

“We performed a meta-analysis on the data from 32 prescribed fire studies conducted in mixed-oak forests to test whether they supported the latter assertion. Overall, the results suggested that prescribed fire can contribute to sustaining oak forests in some situations, and we identified several factors key to its successful use. Prescribed fire reduced midstory stem density, although this reduction was concentrated in the smaller-diameter stems. Prescribed fire preferentially selected for oak reproduction & against mesophytic hardwood reproduction.”

Brose et al., 2013. A Meta-Analysis of the Fire-Oak Hypothesis: Does Prescribed Burning Promote Oak Reproduction in Eastern North America? *Forest Science* 59(3), 322-334.

“Phylogenetic turnover decreased as fire frequency increased, echoing Bowles & Jones’ (2013) finding that community composition was more stable with frequent fire.”

Larkin et al., 2015. Phylogenetic measures of plant communities show long-term change and impacts of fire management in tallgrass prairie remnants. *Journal of Applied Ecology* 52(6), 1636-1648.

“Evaluations indicate that periodic high-intensity fires are important in restoring open savanna conditions in stands that have a long period of fire protection. They also suggest that repeated low-intensity fires can maintain, but may not create, these conditions. Occasional high-intensity fires also may be more similar to the pre-settlement fire regime that maintained barrens and open savanna communities.”

Haney et al., 2008. Gradient analysis of an eastern sand savanna’s woody vegetation and its long-term responses to restored fire processes *Forest Ecology and Management* 256, 1560-1571.

“The effect of 23 years of low intensity prescribed burning on soil and litter invertebrates was studied over 18 months. Collectively, the findings suggest that long term burning of the woodland for the purpose of vegetation management has not altered significantly the broadly classified invertebrate community.”

Jacobs et al., 2015. The Effects of Prescribed Burning on Soil and Litter Invertebrate Diversity and Abundance in an Illinois Oak Woodland. *Natural Areas Journal* 35(2), 318-327.

“Understory woody plant cover was highest in unburned woodlands and was negatively correlated with fire frequency. Total forb cover was maximized at fire frequencies of 4-7 fires per decade. Prescribed fires can then be used to suppress understory woody plants and promote establishment of light-demanding grasses and forbs.”

Peterson et al., 2007. Plant functional group responses to fire frequency and tree canopy cover gradients in oak savannas and woodlands. *Journal of Vegetation Science* 18, 3-12.

“Phylogenetic beta diversity was greatest between the most extreme fire treatments across the gradient, indicating that species in the most contrasting fire regimes were most distantly related. Fire strongly influenced diversity, co-occurrence patterns, and leaf trait means and variances within communities. The most frequently burned communities had the highest species richness, exhibited the most resource-conservative leaf traits, and spanned the greatest number of phylogenetic lineages but harbored more close relatives within those lineages than other communities. In contrast, unburned communities had the lowest species diversity, the most acquisitive leaf traits, and the fewest phylogenetic lineages.”

Jeannine Cavender-Bares and Peter Reich, 2012. Shocks to the system: community assembly of the oak savanna in a 40-year fire frequency experiment. *Ecology* 93(8): 52-69.

Section 2: Current Use of Fire on Conservation Lands

Methods

In 2015, the Illinois Prescribed Fire Council solicited data from partner agencies and organizations throughout the state of Illinois as an initial step in creating the fire needs assessment. Specifically, the Council asked respondents for (1) total area of land ownership, (2) area in land cover/land use types not appropriate for prescribed fire (buildings, roads, lawns, row-crop, open-water etc.); (3) degraded, non-flammable acres (buckthorn/honeysuckle thickets, etc.); (4) “burnable” area; and (5) total area burned between June 2014 and May 2015.

The distinction between degraded/non-flammable and burnable areas is subjective. Land manager’s understanding and use of the term “degraded” varies and should be understood for the purposes of this report to mean very low quality acres that should not be expected to carry fire. Burnable acres should be interpreted as higher quality areas, capable of carrying fire and to which managers would apply prescribed fire if they had adequate capacity to do so.

We acknowledge that challenges exist for some agencies to generate detailed data due to limited staffing resources, scale of holdings, organizational/agency priorities, etc.

For each respondent and totaled among responses, we calculated the percentage burnable acres that were burned during the one-year reporting interval, as well as the percentage of degraded + burnable habitats that were burned and percentage of total landownership burned.

Results

Twenty-five responses were received, representing over 1,000,000 acres. Respondents included federal, state, and local agencies, not-for-profit land trusts, a university and a private individual land owner. For reference, there are at least 1.3 million acres of conservation and park land in Illinois, owned by more than 200 agencies, organizations, and individuals (Aaron Lange, The Nature Conservancy, 20 January 2016). The total does not include the more than 150,000 acres in permanent Wetland Reserve Program or Conservation Reserve Enhancement Program easements, but not otherwise in conservation ownership.

Key Points

- Of over 1,000,000 acres held statewide, only 51,000 acres (5%) were burned June 2014-May 2015.
- Only 9% of total burnable acres were burned during the reporting period. Respondents identified 56% of total acreage as burnable, although this varied considerably (range 29-100%, average 61%) among respondents.
- Only 6% of total habitat acres, a combination of degraded and burnable acres representing 76% of total holdings (range 31-100%, average 79% among respondents) were burned during the reporting period.
- 24% of total reported holdings are held in lawns, buildings, open water, or row crop acres (range 0-69%, average 21% among respondents).

Table 1: All data reported by partner agencies/organizations. Habitat acres are the combined total of burnable and degraded acres.

Agency	Total acres owned	Acres lawns, water, crop, etc	% acres lawns, water, crop, etc	Acres degraded	% acres degraded	Burnable acres	% burnable acres	Burnable + Degraded	% habitat acres	Acres burned 6/14-5/15	% burnable acres burned	% total habitat burned	% total owned burned
Illinois DNR	445,003	181,003*	41%	121,553	27%	142,447	32%	264,000	59%	15,260	11%	6%	3%
US Forest Service	304,165	11,400	4%	2,500	1%	290,265	95%	292,765	96%	10,957	4%	4%	4%
Cook County FP	69,150	10,150	15%	20,000	29%	39,000	56%	59,000	85%	7,534	19%	13%	11%
US Fish & Wildlife	64,363	11,881	18%	29,463	46%	23,019	36%	52,482	82%	860	4%	2%	1%
Lake County FP	30,217	6,171	20%	8,218	27%	15,828	52%	24,046	80%	2,509	16%	10%	8%
DuPage County FP	25,987	3,192	12%	14,055	54%	8,740	34%	22,795	88%	2,114	24%	9%	8%
McHenry County CD	25,105	6,958	28%	5,547	22%	12,600	50%	18,147	72%	2,515	20%	14%	10%
Kane County FP	22,000	7,500	34%	500	2%	14,000	64%	14,500	66%	1,200	9%	8%	5%
Will County FP	21,026	4,026	19%	2,000	10%	15,000	71%	17,000	81%	2,323	15%	14%	11%
The Nature Conservancy	13,283	5,258	40%	2,110	16%	5,915	45%	8,025	60%	2,276	38%	28%	17%
Fermilab	6,800	4,720	69%	140	2%	1,940	29%	2,080	31%	608	31%	29%	9%
Boone County CD	3,500	1,000	29%	1,440	41%	1,060	30%	2,500	71%	200	19%	8%	6%
Peoria Park District	3,258	432	13%	519	16%	2,307	71%	2,826	87%	51	2%	2%	2%
SIU-Carbondale	3,100	372	12%	775	25%	1,953	63%	2,728	88%	250	13%	9%	8%
Parklands Foundation	2,762	701	25%	442	16%	1,619	59%	2,061	75%	53	3%	3%	2%
Byron FPD	1,923	593	31%	0	0%	1,330	69%	1,330	69%	1,044	78%	78%	54%
Natural Land Institute	1,853	4	0%	649	35%	1,200	65%	1,849	100%	390	33%	21%	21%
DeKalb County FP	1,312	192	15%	322	25%	798	61%	1,120	85%	82	10%	7%	6%
Illinois Audubon Society	1,300	92	7%	61	5%	1,147	88%	1,208	93%	125	11%	10%	10%
Dixon Park District	1,018	268	26%	0	0%	750	74%	750	74%	124	17%	17%	12%
Jo Daviess CF	957	179	19%	72	8%	706	74%	778	81%	97	14%	12%	10%
Urbana Park District	568	269	47%	35	6%	264	46%	299	53%	21	8%	7%	4%
The Land Conservancy of McHenry County	400	10	3%	65	16%	325	81%	390	98%	91	28%	23%	23%
The Conservation Foundation	375	8	2%	67	18%	300	80%	367	98%	55	18%	15%	15%
Sweet Fern Savanna	148	0	0%	0	0%	148	100%	148	100%	50	34%	34%	34%
TOTAL	1,049,573	256,379	24%	210,533	20%	582,661	56%	793,194	76%	50,789	9%	6%	5%

* IDNR data includes open water, developed open space, developed low density, developed medium density, developed high density, pasture/hay, cultivated crops, barren land (dry salt flats, beaches, sandy areas other than beaches; bare exposed rock; strip mines, quarries, and gravel pits; transitional areas; and mixed barren land)

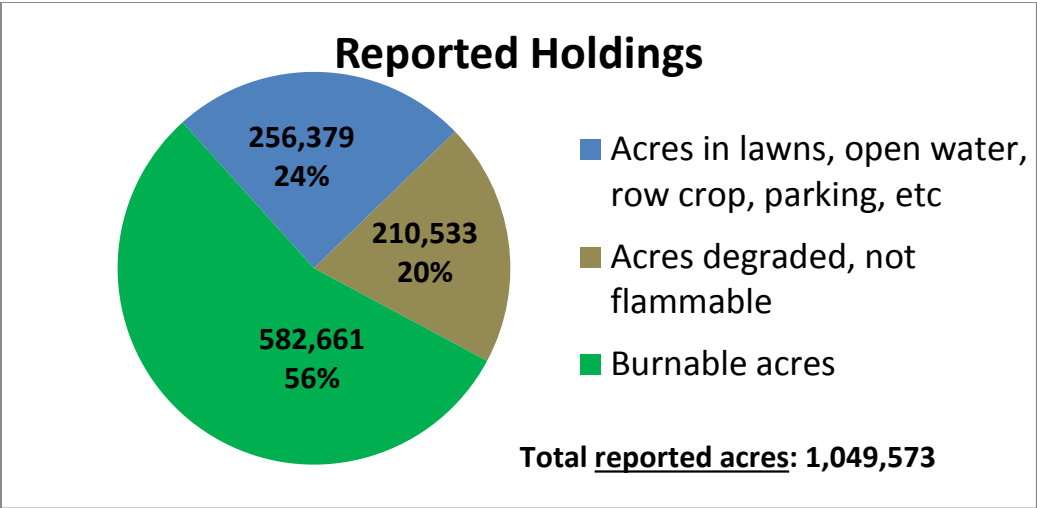


Figure 1: The 25 survey respondents reported general conditions on over 1 million acres of conservation land holdings. Of these lands, approximately 24% are not natural/terrestrial habitat, 20% are degraded to the point that they will not burn and only 56% are considered healthy enough to burn.

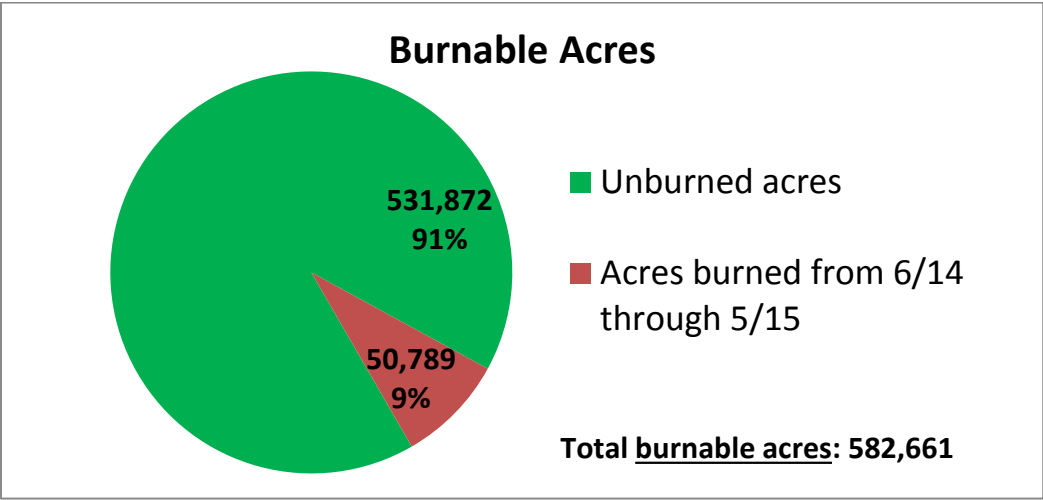


Figure 2: Of the 582,000 acres of reported burnable acres, only about 9% (50,789 acres) was burned during the survey period. This translates to a roughly 11-year Fire Return Interval (FRI).

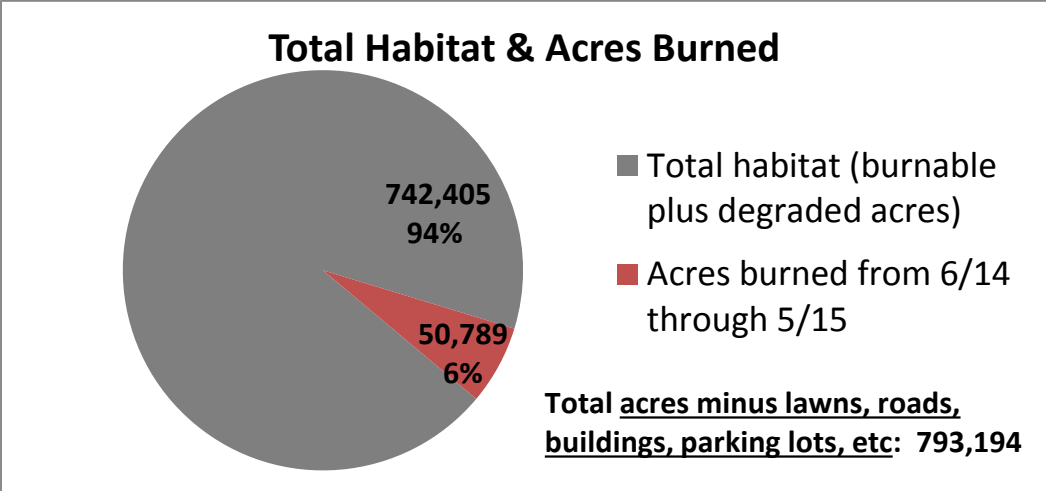


Figure 3: Of the 793,194 acres of reported burnable plus degraded acres, only about 6% (50,789 acres) was burned during the survey period. This translates to a roughly 16-year Fire Return Interval (FRI).

Discussion

Of the over 1,000,000 acres represented in this report, only 56% are deemed “burnable acres.” Lands qualified as burnable likely comprise the majority of conservation-owned, ecologically sensitive areas which provide habitat for our most imperiled species and ecotypes of concern in the state. These natural areas need to be well managed and stewarded effectively. Regular prescribed fire should be a key feature of any management plan focusing on these acres.

From a state-wide perspective, these data show that only 50,789 (9%) of burnable acres were burned during the reporting period, effectively an 11-year fire return interval (assuming that a different set of burnable acres are burned every year). To simply maintain the current health of these holdings, dramatically more prescribed fire needs to be implemented across Illinois.

These data show that, on average, respondents burned 19% of the acres they qualified as burnable acres of their respective holdings - effectively a 5-year fire return interval (FRI). Depending on habitat type and current ecological condition, a 5-year FRI is likely insufficient to restore and maintain the ecological integrity of most natural land cover types in Illinois (see Section 4: Assessing the Fire Gap).

Additionally, some 20% of total acres were reported as being too degraded to carry fire. For many of these acres we lack a detailed knowledge of their current ecological condition and they should not be automatically discounted as unable to carry fire. These natural systems are resilient and will respond to management. The next challenge for land managers is implementation of restoration strategies, of which fire is a key component, to better manage and steward these distressed acres. A goal for land managers should be to significantly reduce degraded acres on their holdings and to bring them into a state of quality, burnable habitat. Prescribed fire will be a vital tool to achieving this ambitious goal.

One challenge reported by respondents was the unavailability of GIS data and staffing resources. Many agencies/organizations could not provide detailed information on quality habitat versus degraded acres nor could they provide acres of specific habitat types. Future updates to the fire needs assessment would benefit from a more clearly defined definition for degraded, low quality, non-flammable acres. In the case of the Illinois Department of Natural Resources, burnable acres were defined as total acres within existing burn plans, and a way to estimate truly degraded and non-flammable areas was not possible.

Section 3: Fire Gap on Conservation Lands

Methods

We surveyed fire managers and experts across the state, asking them to provide a range of fire return intervals for 27 distinct habitat types as identified in the Illinois Natural Areas Inventory (INAI). We asked them to identify which communities were important to them as a fire manager, and to report the range of fire return intervals needed to restore or remediate degraded examples of each community type (“restoration” fire return interval), and the range of fire return intervals needed to maintain good quality examples of each community type (“maintenance” fire return interval).

Results

Table 2: Median Fire Return Intervals (FRI) for INAI habitat types in Restoration and Maintenance phases.

INAI Community Type	Responses	Restoration Phase		Maintenance Phase	
		Median Low FRI	Median High FRI	Median Low FRI	Median High FRI
Dry upland forest	20	2.5	4	4.5	7
Dry-mesic upland forest	23	2.5	4	5.5	6.5
Mesic upland forest	20	3	5.5	6	7
Mesic floodplain forest	15	4	5	4.5	15
Wet-mesic floodplain forest	12	5	8	12.5	15
Wet floodplain forest	12	7.5	7.5	10	12.5
Flatwoods	18	2.5	3	4.5	7.5
Dry Woodland	5	1	3	3	5
Dry-Mesic Woodland	5	1	3	2	5
Mesic Woodland	5	1	3	2	5
Dry Sand Woodland	5	1	3	3	5
Dry Mesic Sand Woodland	5	1	3	3	5
Dry/Dry-mesic prairie	21	2	2.5	2.5	4
Mesic/Wet-mesic prairie	22	2	3	2.5	3.5
Dry-mesic sand prairie	19	2	2.5	3	5
Mesic sand prairie	17	2	2.5	2.5	4.5
Hill prairie	20	2	3	2.5	3.5
Dry-mesic savanna	20	2	2.5	3	4.5
Mesic savanna	16	2	2.5	2.5	4.5
Dry-mesic barren	13	2	3.5	3.5	5
Swamp	11	4	7	7	10
Sedge meadow	17	2	3	3.5	5.5
Glade	9	2.5	3.5	3.5	5
Cliff/bluff/talus	7	3	4	4	5
Pastureland	13	3	4	3.5	4.5
Successional field	20	2.5	3	3.5	6
Tree plantation	6	7.5	10	8.5	12.5

Twenty-four (24) fire managers suggested restoration and maintenance fire return intervals (FRI) for one or more community types, varying from 23 suggesting FRI for dry-mesic upland forest to 5 suggesting FRI for woodlands. In the following graphs, if a FRI range of 1-3 years was given, it is represented in the data as a vote for a 1-year, 2-year and 3-year FRI.

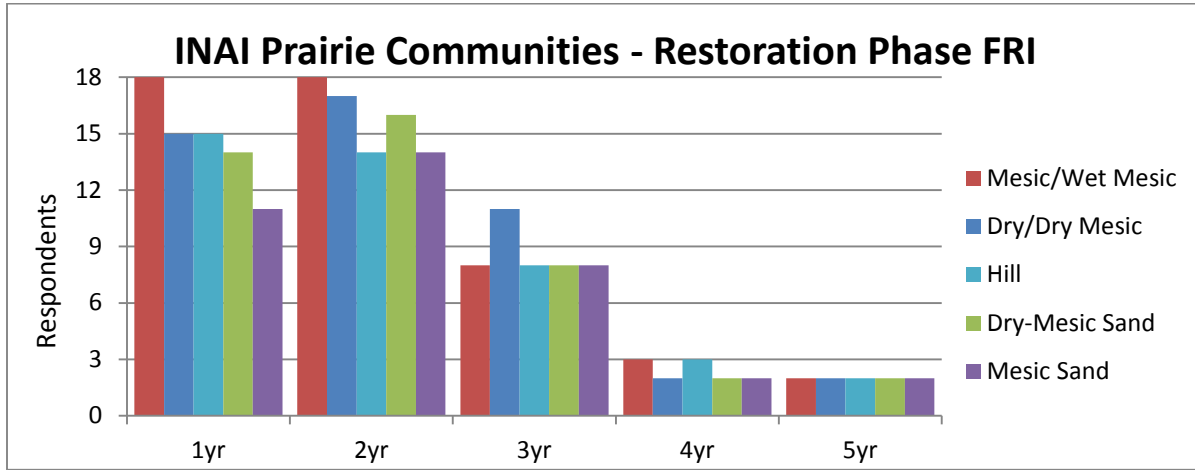


Figure 4: INAI Prairie Communities – Restoration Phase – Fire Return Interval

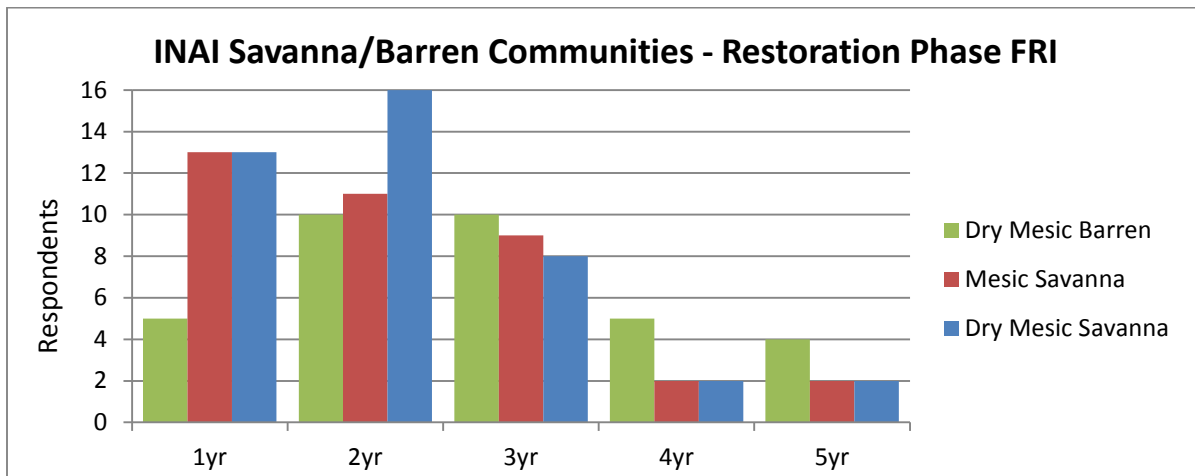


Figure 5: INAI Savanna/Barren – Restoration Phase – Fire Return Interval

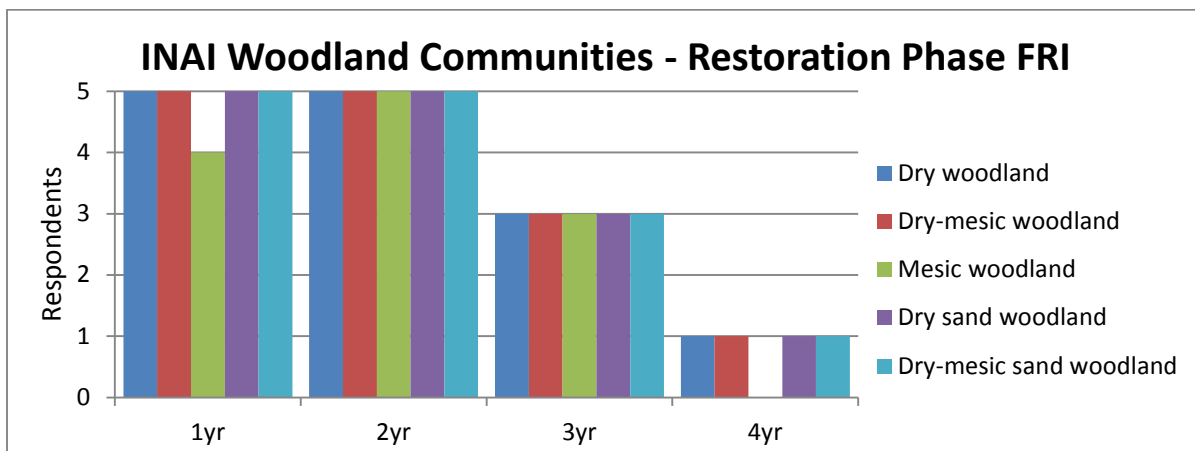


Figure 6: INAI Woodland Communities – Restoration Phase – Fire Return Interval

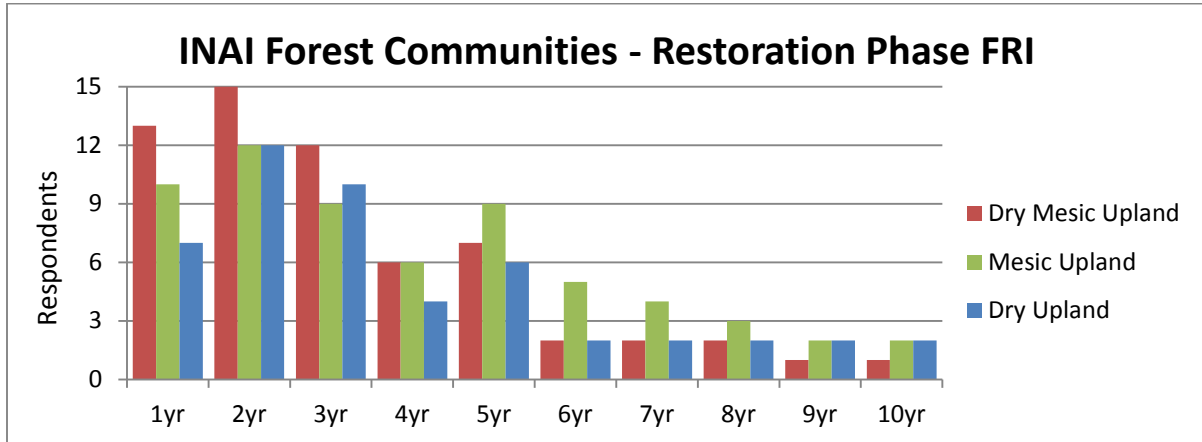


Figure 7: INAI Forest Communities – Restoration Phase – Fire Return Interval

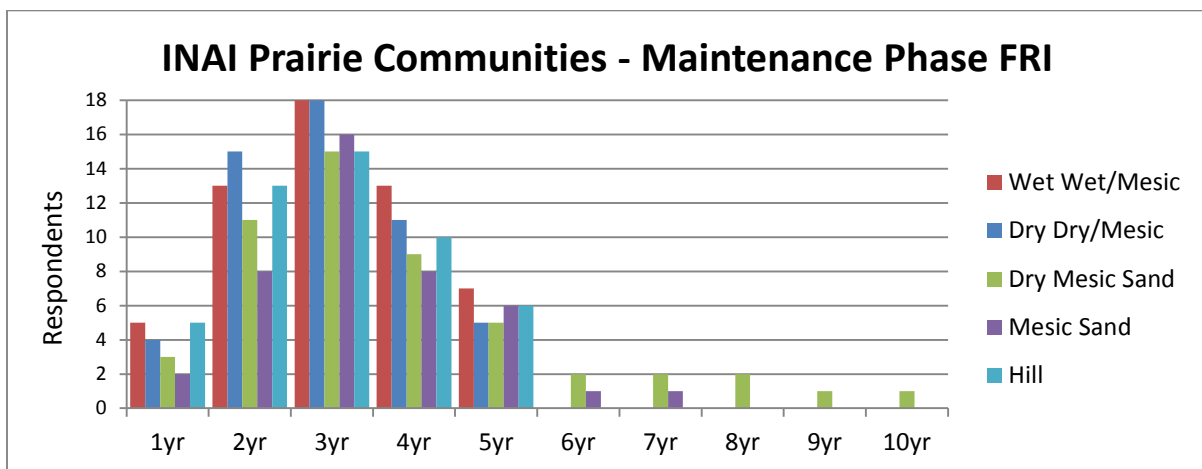


Figure 8: INAI Prairie Types – Maintenance Phase – Fire Return Interval

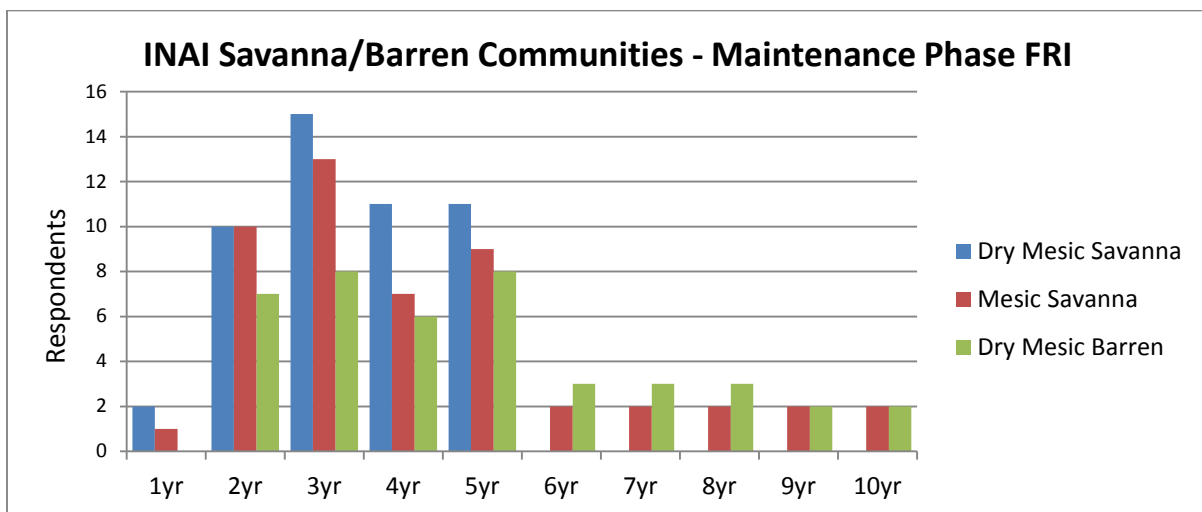


Figure 9: INAI Savanna/Barren – Maintenance Phase – Fire Return Interval

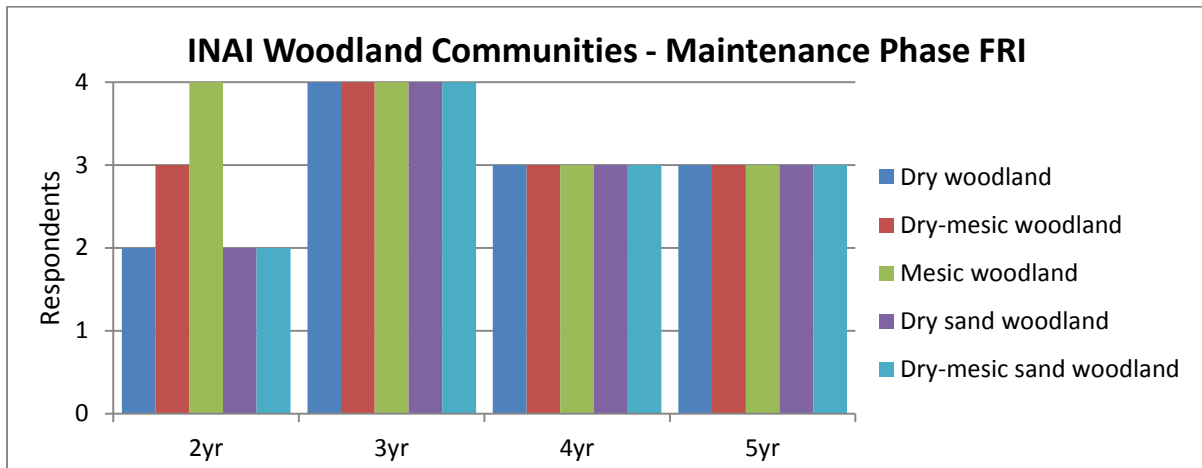


Figure 10: INAI Woodland Communities – Maintenance Phase – Fire Return Interval

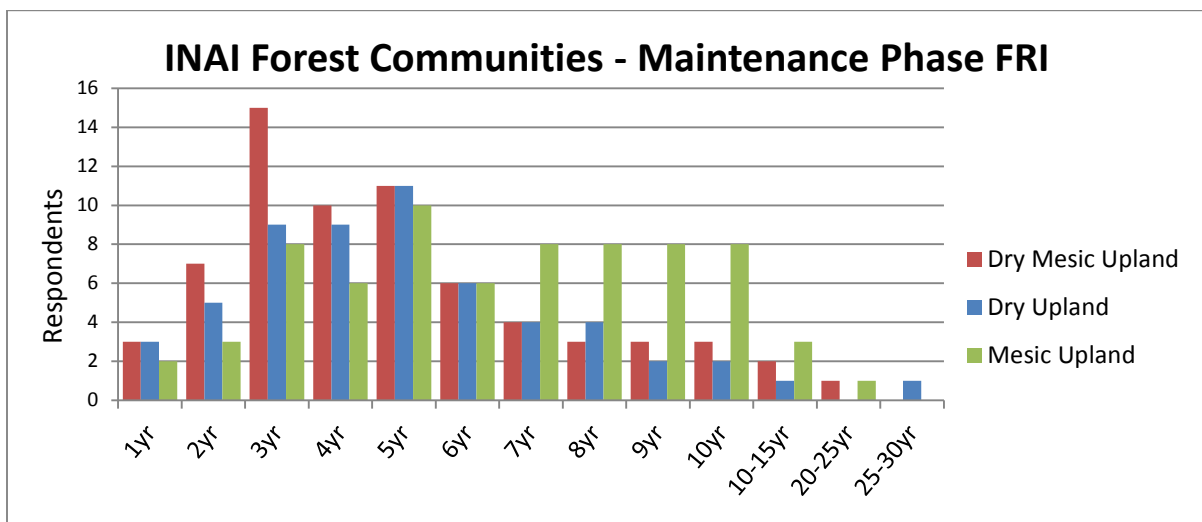


Figure 11: INAI Forest Communities – Maintenance Phase – Fire Return Interval

Discussion

The restoration phase is typically understood to be a period at the onset of management, usually requiring high levels of active management and resource allocation. Land managers face many challenges during this phase including influxes of invasive species (both herbaceous and woody), decreased burnability of the landscape, high levels of fragmentation and lower levels of species diversity.

The maintenance phase is generally understood to be the point at which natural areas require less intensive management than the very resource intensive restoration phase. In forest, woodland and savanna management, maintenance phase might suggest that invasive brush and over abundant, small diameter native tree populations have decreased to a low level, allowing for an increase in understory light levels and a more robust herbaceous layer. In prairie communities, maintenance phase might suggest a low level of brush, a decrease in invasive species populations and an increasing level of native species diversity.

Results suggest that fire managers recommended shorter fire return intervals during the restoration phase (most commonly 1-2 years in prairie communities, and 1-3 years in savanna, barren, woodland

and forest communities), and greater fire return intervals to maintain communities (most frequently 2-4 years for prairies, 2-5 years for savanna, barrens and woodlands, and 3-10 years for forest communities).

In savanna, woodland and forest communities specifically, decades of fire suppression have led to an increase in tree density and high level of invasive shrub cover including buckthorn and honeysuckle species. In areas choked by invasive brush, high FRIs are needed to limit the shrub layer and to thin out the mid-story stems, allowing more light into the understory. These brush choked areas will also likely need chemical and/or mechanical thinning.

Oak regeneration requires higher light levels than are typically found in dense, shrubby and degraded savannas, woodlands and forests. After a period of high FRIs, some natural areas might reach the point where understory light levels are sufficient for oak regeneration. At this point, lengthening the FRI might allow for oak recruitment, a conservation target for many land managers.

In grassland communities, frequent burning can facilitate invasive species management by clearing away duff and desiccated vegetation, allowing for easier location of invasives. It can also lead to decreases in cool season grasses that tend to dominate many degraded grassland habitats. Regular fires will limit the establishment of woody species and help control existing populations.



Section 4: Assessing the Fire Gap

Methods

To estimate the amount of prescribed fire that survey respondents would need to apply to restore or maintain ecological health of their land holdings, we applied the most frequently recommended ranges of fire return intervals (2-5 years) to burnable acres. Since area estimates of community types were not available from most respondents, we were not able to apply the recommended ranges of fire return intervals to specific community types. To achieve each example fire return interval, we calculated simple annual averages of prescribed fire that would be required (e.g., 2-year FRI = 50% burnable acres burned/year; for 5-year FRI = 20% burnable acres burned/year). We compared each of these FRI acreages to the acres reported burned from June 2014-May 2015, and calculated the shortfall in acres burned, if any, to achieve the target FRI (“Acres Short”) as well as the percentage of the acreage burned to achieve the target FRI (% target burned).

Key Points

- Respondents on average burned 52% of the acres needed in order to achieve a 3-year FRI on their respective holdings, effectively a 6-year FRI for burnable acres
- To achieve a 3-year FRI across the state, 143,431 additional acres need to be burned annually – nearly triple the 50,789 acres reported in the previous year
- 1 agency met the 2-year FRI for burnable acres
- 2 agencies/organizations and 1 private holding met 3-year FRI target for burnable acres
- For combined degraded and burnable acres (total habitat acres), the effective FRI statewide is a devastating 15 years for the 793,000 acres

These data show the number of acres identified by agencies/organizations as burnable, higher quality habitat and how many acres need to be burned annually in order to meet 2, 3, 4 and 5-year fire return intervals.



Table 3: Reported burnable acres by agency from 6/14-5/15. Green cells indicate having met FRI acreage.

Agency	Burnable Acres	Acres Burned 6/14-5/15	2yr FRI Acreage	Acres Short	% target burned	3yr FRI Acreage	Acres Short	% target burned	4yr FRI Acreage	Acres Short	% target burned	5yr FRI Acreage	Acres Short	% target burned
US Forest Service	290,265	10,957	145,133	134,176	8%	96,755	85,798	11%	72,566	61,609	15%	58,053	47,096	19%
Illinois DNR	142,447	15,260	71,224	55,964	21%	47,482	32,222	32%	35,612	20,352	43%	28,489	13,229	54%
Cook County FP	39,000	7,534	19,500	11,966	39%	13,000	5,466	58%	9,750	2,216	77%	7,800	266	97%
US Fish & Wildlife	23,019	860	11,510	10,650	7%	7,673	6,813	11%	5,755	4,895	15%	4,604	3,744	19%
Lake County FP	15,828	2,509	7,914	5,405	32%	5,276	2,767	48%	3,957	1,448	63%	3,166	657	79%
Will County FP	15,000	2,323	7,500	5,177	31%	5,000	2,677	46%	3,750	1,427	62%	3,000	677	77%
Kane County FP	14,000	1,200	7,000	5,800	17%	4,667	3,467	26%	3,500	2,300	34%	2,800	1,600	43%
McHenry County CD	12,600	2,515	6,300	3,785	40%	4,200	1,685	60%	3,150	635	80%	2,520	5	99%
DuPage County FP	8,740	2,114	4,370	2,256	48%	2,913	799	73%	2,185	71	97%	1,748	Met FRI	100%
The Nature Conservancy	5,915	2,276	2,958	682	77%	1,972	Met FRI	100%	1,479	Met FRI	100%	1,183	Met FRI	100%
Peoria Park District	2,307	51	1,154	1,103	4%	769	718	7%	577	526	9%	461	410	11%
SIU-Carbondale	1,953	250	977	727	26%	651	401	38%	488	238	51%	391	141	64%
Fermilab	1,940	608	970	362	63%	647	39	94%	485	Met FRI	100%	388	Met FRI	100%
Parklands Foundation	1,619	53	810	757	7%	540	487	10%	405	352	13%	324	271	16%
Byron FPD	1,330	1,044	665	Met FRI	100%	443	Met FRI	100%	333	Met FRI	100%	266	Met FRI	100%
Natural Land Institute	1,200	390	600	210	65%	400	10	98%	300	Met FRI	100%	240	Met FRI	100%
Illinois Audubon Society	1,147	125	574	449	22%	382	257	33%	287	162	44%	229	104	54%
Boone County CD	1,060	200	530	330	38%	353	153	57%	265	65	75%	212	12	94%
DeKalb County FP	798	82	399	317	21%	266	184	31%	200	118	41%	160	78	51%
Dixon Park District	750	124	375	251	33%	250	126	50%	188	64	66%	150	26	83%
Jo Daviess CF	706	97	353	256	27%	235	138	41%	177	80	55%	141	44	69%
The Land Conservancy of McHenry County	325	91	163	72	56%	108	17	84%	81	Met FRI	100%	65	Met FRI	100%
The Conservation Foundation	300	55	150	95	37%	100	45	55%	75	20	73%	60	5	92%
Urbana Park District	264	21	132	111	16%	88	67	24%	66	45	32%	53	32	40%
Sweet Fern Savanna	148	50	74	24	68%	49	Met FRI	100%	37	Met FRI	100%	30	Met FRI	100%
TOTAL	582,661	50,789	291,331	240,542	17%	194,220	143,431	26%	145,665	94,876	35%	116,532	65,743	44%

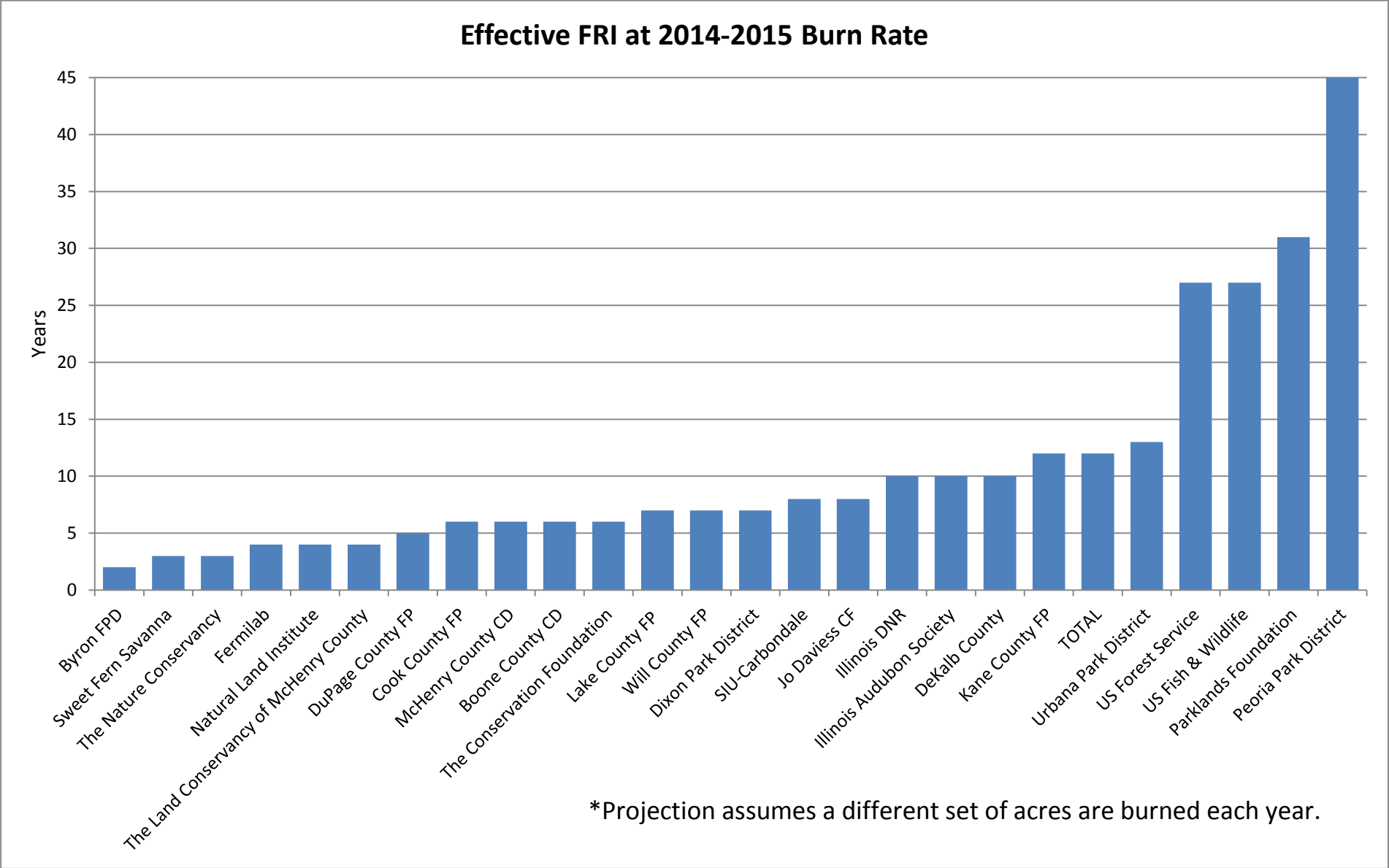


Figure 22: Fire Return Interval projection based on acres burned 6/14-5/15 and number of acres identified as burnable acres.

Discussion

In Section 3 – Fire Gap on Conservation Lands, survey data showed that fire managers recommended shorter fire return intervals during the restoration phase (most commonly 1-2 years in prairie communities and 1-3 years in savanna, barren, woodland and forest communities), and greater fire return intervals to maintain communities (most frequently 2-4 years for prairies, 2-5 years for savannas, barrens and woodlands, and 3-10 years for forest communities).

In this section, we compare fire return interval recommendations with actual reported fire activity from agencies and organizations across Illinois*. During the restoration phase, natural areas of all habitat types need to be burned frequently; 1-2 year FRI for prairies and 1-3 year for FRI savannas, woodlands and forests. During the reporting period 6/14-5/15, only 1 of 25 agencies/organizations, the Byron Forest Preserve District, burned enough acres to meet the 2-year FRI for their burnable acres. Only 7 agencies/organizations burned sufficient acreage in this same period to meet a 5-year or less fire return interval.

Based off acreages reported for 6/14-5/15, 9 agencies/organizations are implementing fire at a rate to meet a 10-year or higher FRI. At such high fire return intervals with fire so infrequent, many of these identified “burnable” acres are at risk of digressing into low quality acres, becoming too degraded to carry effective fires. Agencies report that 18% of holdings currently qualify as degraded acres. That percentage will increase if burnable acres backslide into poor ecological condition. Significant investment in restoration efforts and fire programs are needed to mitigate these risks.

The above fire return interval scenarios assume that land managers are implementing fire across all of their burnable holdings and not simply returning to the same preferential burn units.

If an agency reports 1,000 burnable acres and in a given year 200 acres (20%) are burned, a 5-year FRI for all burnable acres is projected. It is assumed that roughly the same number of different acres will be burned the following year and after 5 years, all 1,000 acres will have been burned. Often times, however, agencies burn the same units annually because they are easy units, carry fire well and have solid fire breaks. Other burnable acres may not receive fire because managers do not see a need to burn certain habitat types, good fire breaks may not be in place in all areas or features of the landscape make implementing fire challenging. The potential outcome is that large portions of quality natural areas are receiving no fire at all. The units receiving frequent fires are often surrounded by fire starved habitats where brush and shade persist and begin to expand, slowly degrading the areas.

A primary focus for land managers must be implementing fire on all quality acres and to expand fire into degraded areas by expanding burn units, improving fire breaks and investing great resources in active restoration.

**Because surveyed acreage responses were not reported by habitat type or by restoration phase/maintenance phase, a simple one-to-one comparison of habitat to FRI is not possible. Future updates to the Fire Needs Assessment would benefit greatly from more fine scale data, as reported by partners across the state. More recommendations for future assessments are listed in Section 7.*

Section 5: Successful Implementation

Byron Forest Preserve District is located in Ogle County in north central Illinois. The preserve totals 1,923 acres of which 1,330 are comprised of high quality prairies, savannas, woodlands and forests. A 5-person staff, aided by volunteer efforts, has yielded impressive prescribed fire results in the last decade.

Of all agencies/organizations included in this report, Byron FPD burned the highest percentage of burnable acres, habitat acres and total acres during reporting period 6/14 – 5/15. Byron was the only agency/organization to meet a 2-year FRI for their burnable acres and for their total habitat acres.

Table 4: Byron FPD 6/14-5/15 implementation of prescribed fire

Agency	Total acres owned	Acres in lawns, row crop, parking, etc	Degraded acres	Burnable acres	Degraded + Burnable	Acres burned 6/14-5/15	% burnable acres burned	% total habitat burned	% total owned burned
Byron FPD	1,923	593	0	1,330	1,330	1,044	78%	78%	54%

When asked about challenges facing their fire program and strategies for success, Austin Webb, assistant superintendent of restoration and maintenance, stated “For challenges, I’d say mostly what everyone else is facing. We’re constantly thinking about ways to refine our techniques and any equipment that can make burning safer and more efficient. Of course, the biggest challenge is the unpredictability of the weather, and we simply adjust rather than let it become an excuse. We like having wide and well-maintained fire breaks along our boundaries, finding in the past that they help us keep our lines moving quickly and without wearing out our crew members. The cumulative effect of our wide fire breaks allows us to take full advantage of the best burn conditions, using less water and hitting multiple units in an afternoon.”

There are many other examples of fire programs from varying agencies/organizations across the state that are increasing their annual acreages burned. Below are data showing improving trends in acres burned for the Forest Preserves of Cook County, The Nature Conservancy’s Nachusa Grasslands and McHenry County Conservation District.

Over time, these agencies/organizations have learned how to increase burn unit sizes, create better fire breaks, increase the size of fire crews, how to add extra fire crews and acquire better fire equipment. Equally as important has been their ability to increase acreage burned while maintaining safety on the fire line, building trust with the general public and adjacent land owners, and building a culture of fire within their organizations.

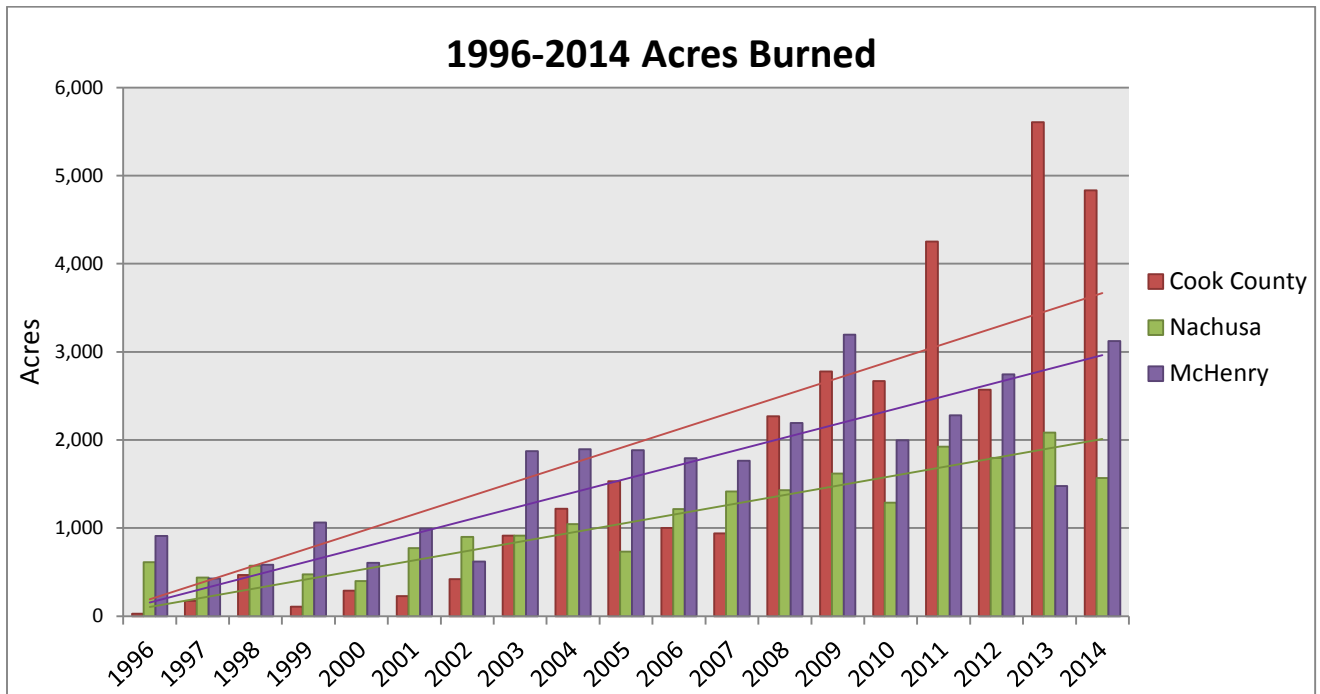


Figure 33: Increasing acres burned by agencies/organizations

The Illinois Department of Natural Resources is the largest land owner in the state of Illinois. Like many other large agencies, IDNR has numerous parcels of land of varying quality and size, a wide ranging mission with an array of shareholders and institutional limitations that go hand-and-hand with large bureaucratic organizations. In addition, budget issues within the State of Illinois have impacted the IDNR and all other aspects of state government. Despite these challenges, the IDNR has been able to achieve a trending increase in the number of acres burned over the past decade.

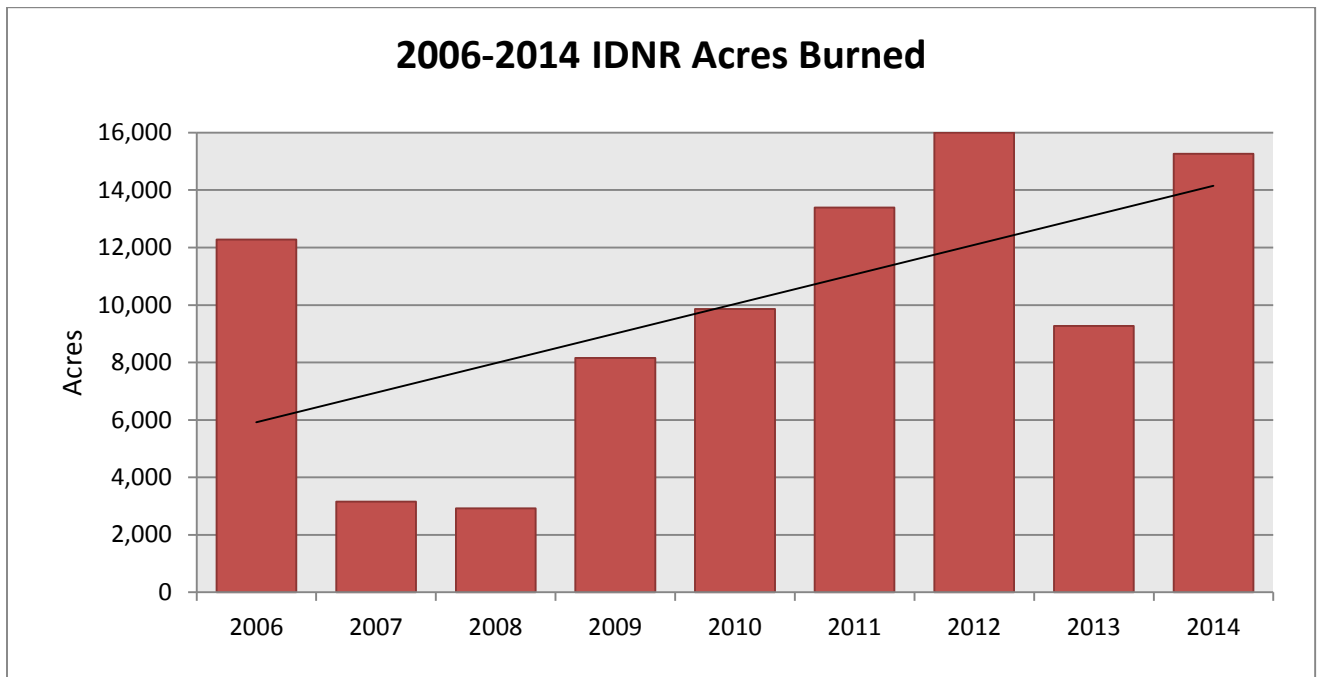


Figure 44: IDNR annual acres burned

Habits of Effective Prescribed Fire Programs

Speaking with fire managers from across the state, several traits and habits were consistent among the agencies that have been expanding their fire programs and increasing the numbers of acres burned.

- Annual burn reports are written that demonstrate what was done, what was not accomplished and suggest ways to improve the program
- Fire is viewed by the land owners as a vital stewardship activity
- Safe protocols are followed, crews have good maps and safety is seen as a priority
- All good fire weather days are used to put fire on the ground
- Burn units are as large as feasible with good and wide fire breaks
- Enough equipment is available to handle breakdowns and various contingencies
- Fire crews are motivated, trained, fit and empowered to put fire on the ground as often as possible
- A fire culture is encouraged, neighboring agencies are mentored, expertise is shared and a vision of sustainable fire programs for the entire region is envisioned

Limitations and Road Blocks to Implementing Fire

Robust and effective fire programs vary across the state and take many forms depending on the size of an agency/organization, the number and quality of managed acres and the amount of resources available to land managers. The Fire Council surveyed agencies and organizations, ranging from large statewide agencies to small non-profits, asking for the factors that limit their fire programs. Responses ranged from small challenges (I need 5 more radios.) to big challenges (I don't have enough trained staff.) to existential challenges (Fire is not a priority for my organization/agency).

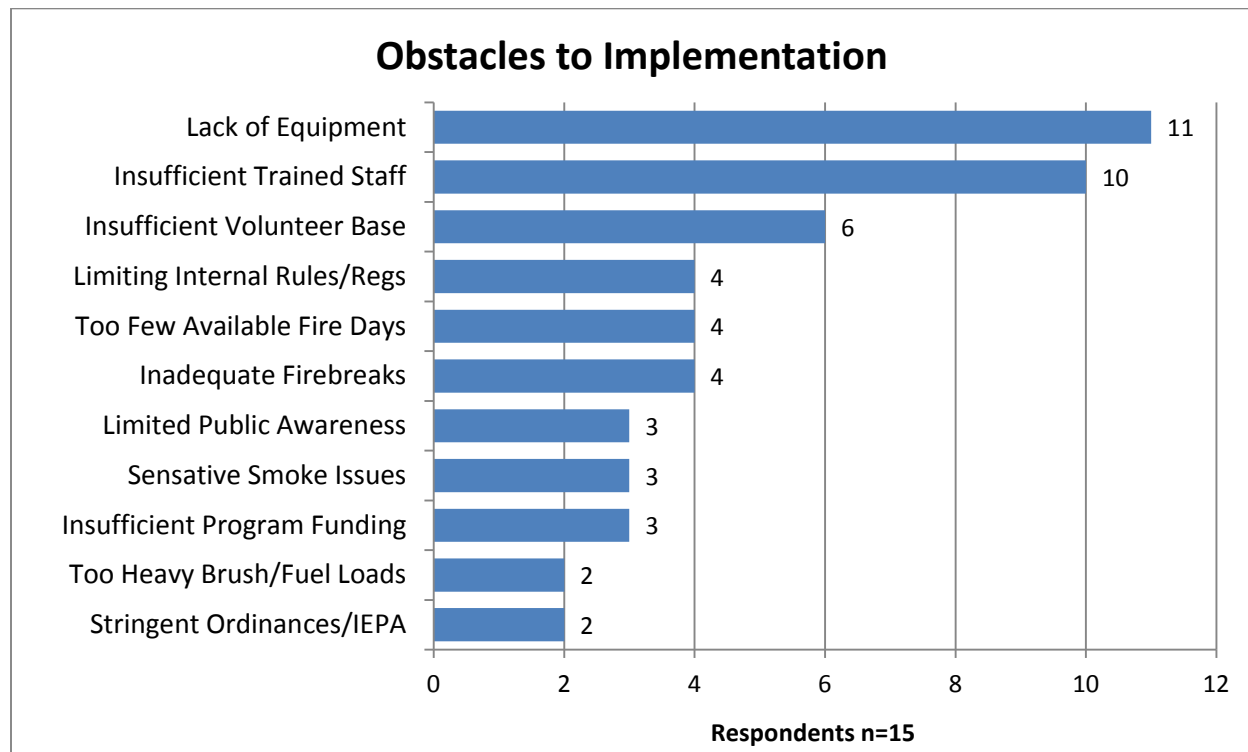


Figure 55: Challenges reported by respondents

While only 3 respondents stated that a lack of funding was an obstacle for implementing fire on the landscape, it can be reasonably assumed that nearly all agencies and organizations face limitations due to budgetary constraints. Increased prescribed fire budgets could help to alleviate the major challenges reported here of equipment and staffing shortages.

While no amount of budget increase can improve the weather or the number of available burn days, greater funding can make agencies better equipped, better staffed and more able to utilize marginal burn days. With increased budgets, land managers could allocate more resources to improving and expanding fire breaks, to training volunteers and to building partnerships with other agencies.

There are other strategies, in addition to increasing funding, that can help land managers overcome these obstacles and limitations. See Section 7, Recommendations of the Fire Council, for a more in-depth response to dealing with these identified obstacles.

Publications like this Illinois Prescribed Fire Needs Assessment can be used to inform policy makers, administrators, legislators and the general public as to the benefits of prescribed fire and can demonstrate the needs for greater allocation of resources to conservation.



Section 6: STATEWIDE FIRE NEEDS

Methods

To expand the scope of this fire needs assessment beyond the respondents and 1 million acres under their management, we estimated the total amount of annual prescribed fire that would be ecologically appropriate for the entire state, across all land ownership. This estimate was derived by applying the ranges of restoration and maintenance FRIs to the area of all fire-appropriate community types across the state, as mapped and defined by LANDFIRE.

LANDFIRE (Landscape Fire and Resource Management Planning Tools) is an innovative project designed to create and periodically update comprehensive vegetation, fire and fuel characteristics data using a consistent process for the entire United States. The LANDFIRE Program has created a fully integrated national data information framework that develops and improves vegetation and fuels data products based on the best available authoritative data and science in an all lands landscape conservation approach based on inter-agency/inter-organizational collaboration and cooperation.

LANDFIRE data were selected for this analysis because of their comprehensive, cross-boundary nature and their consistent processes that allow us to compare vegetation classes and fire regimes between data layers. In addition, LANDFIRE data were used as a starting point in both Wisconsin and Michigan Fire Needs Assessments and our teams identified a preference to keep the assessments comparable within the region wherever possible.

LANDFIRE has a large suite of products developed for a wide range of disciplines: vegetation, fuels, fire regime and disturbance. The primary layer used for this assessment was Existing Vegetation Type (current vegetation).

Current vegetation is mapped using predictive landscape models based on extensive field-referenced data, satellite imagery and biophysical gradient layers using classification and regression trees. LANDFIRE uses vegetation products to create fuel and fire regimes data. The Existing Vegetation Type (EVT) represents the species composition currently present at a given site. EVTs are mapped using regression tree models, field data, Landsat imagery, elevation and biophysical gradient data. To get a more accurate picture of what may realistically be considered for a fire analysis on our current landscape, we used ArcGIS Spatial Analyst tools to remove most agriculture and developed systems from analysis, though we did choose to leave in some of the developed types with ruderal vegetation.

Prior to conducting surveys to determine fire return intervals (Section 3 - Fire Gap on Conservation Lands) we conducted a data crosswalk to convert the vegetation community names in the LANDFIRE EVT to the more-familiar community names in the Illinois Natural Areas Inventory Classification of Natural Communities in Illinois. This was done in order to allow survey respondents to provide more meaningful answers to questions we posed. We acknowledge that these vegetation matches are not perfect, but are sufficiently accurate for our current assessment. If issues arise, we may refine the crosswalk later.

To create a measure of current fire return interval within each vegetation community, we selected the low-end and high-end FRI ranges from each survey response into a single table and identified the median value. This value was then added to a table showing current acres of each vegetation type on the landscape as calculated by LANDFIRE EVT data. From here, we were able to calculate the recommended acres of each vegetation type that should be burned each year in order to maintain good examples of

existing community types and in order to restore degraded examples of existing community types. This gave us a baseline against which to compare current on-the-ground fire practices within Illinois.

Table 5: LANDFIRE Crosswalk

LANDFIRE Community Type	INAI Community Type
Central Appalachian Dry Oak Forest	Dry upland forest
Central Appalachian Dry Pine Forest	Dry upland forest
North-Central Interior Dry Oak Forest and Woodland	Dry/dry-mesic upland forest
North-Central Interior Dry-Mesic Oak Forest and Woodland	Dry-mesic upland forest
Ozark-Ouachita Dry-Mesic Oak Forest	Dry-mesic upland forest
Southern Interior Low Plateau Dry-Mesic Oak Forest	Dry-mesic upland forest
North-Central Interior Beech-Maple Forest	Mesic upland forest
North-Central Interior Maple-Basswood Forest	Mesic upland forest
South-Central Interior Mesophytic Forest	Mesic upland forest
Urban Deciduous Forest	Upland forest
Central Interior and Appalachian Floodplain Systems	Floodplain forest
Central Interior and Appalachian Riparian Systems	Floodplain forest
Eastern Great Plains Floodplain Systems	Floodplain forest
North-Central Interior Wet Flatwoods	Flatwoods
Ozark-Ouachita Dry Oak Woodland	Dry woodland
Central Tallgrass Prairie	Dry, Dry-mesic, mesic and wet prairie
North-Central Interior Sand and Gravel Tallgrass Prairie	sand prairie
North-Central Interior Oak Savanna	Dry/Dry-mesic/mesic savanna
North-Central Oak Barrens	Savanna
Central Interior and Appalachian Swamp Systems	Swamp
Central Interior & Appalachian Shrub-Herbaceous Wetland Systems	Sedge meadow
Central Interior Highlands Calcareous Glade and Barrens	Glades, Barrens
Paleozoic Plateau Bluff and Talus	Cliff, Bluff and talus
Developed Ruderal Grassland	Cultural - cropland, pasture, successional
Undeveloped Ruderal Grassland	Cultural - cropland, pasture, successional
Modified/Managed Northern Tallgrass Grassland	Cultural - cropland, pasture, successional and maybe Dry, Dry-mesic, mesic and wet prairie
Urban Herbaceous	Cultural - developed, successional
Developed Ruderal Shrubland	Cultural - successional
Recently Logged-Herb and Grass Cover	Cultural - successional
Developed Ruderal Deciduous Forest	Developed - successional
Urban Shrubland	Developed - successional
Undeveloped Ruderal Deciduous Forest	Cultural - successional, grading towards upland forest
Introduced Upland Vegetation-Treed	Cultural - tree plantation
Ruderal Forest-Northern and Central Hardwood and Conifer	Cultural - tree plantation
Urban Evergreen Forest	Cultural - tree plantation
Urban Mixed Deciduous-Evergreen Forest	Cultural - tree plantation

Table 6: LANDFIRE data showing analysis of all Illinois acres including historic and modeled fire return intervals

Community Type	INAI Type	Current Acres	Historic Acres	Historic FRI	Adjusted FRI Maintenance	Adjusted FRI Degraded	Acres Burned/yr Historic	Acres Burned/yr Maintenance	Acres Burned/yr Degraded
Central Interior and Appalachian Riparian Systems	Floodplain forest	2,192	4,962	167	10	5	30	219	438
Central Interior and Appalachian Swamp Systems	Swamp	7,074	10,515	994	8	5	11	884	1,415
North-Central Interior Oak Savanna	Dry/Dry-mesic/mesic savanna	3,700	262,108	5	3	2	740	1,233	1,850
Introduced Upland Vegetation-Treed	Cultural - tree plantation	9,290	0		10	5	-	929	1,858
Ozark-Ouachita Dry Oak Woodland	Dry woodland	4,686	81,857	5	4	2	937	1,172	2,343
North-Central Interior Sand and Gravel Tallgrass Prairie	Sand Prairie	6,445	15,417	3	3	2	2,148	2,148	3,222
Undeveloped Ruderal Deciduous Forest	Cultural - successional, grading towards upland forest	6,750	0	-	3	2	-	2,250	3,375
Urban Mixed Deciduous-Evergreen Forest	Cultural - tree plantation	21,318	0	-	10	5	-	2,132	4,264
Paleozoic Plateau Bluff and Talus	Cliff, Bluff and talus	19,485	35,942	11	5	3	1,771	3,897	6,495
Central Appalachian Dry Pine Forest	Dry upland forest	22,051	0		5	3		4,410	7,350
Developed Ruderal Shrubland	Cultural - successional	15,026	0	-	3	2	-	5,009	7,513
North-Central Interior Wet Flatwoods	Flatwoods	27,333	104,588	974	5	3	28	5,467	9,111
Urban Evergreen Forest	Cultural - tree plantation	46,167	0	-	10	5	-	4,617	9,233
North-Central Interior Beech-Maple Forest	Mesic upland forest	53,150	10,804	454	5	5	117	10,630	10,630
Modified/Managed Northern Tallgrass Grassland	Cultural - cropland, pasture, successional and maybe Dry, Dry-mesic, mesic and wet prairie	23,419	0	-	4	2	-	5,855	11,709
Central Interior and Appalachian Shrub-Herbaceous Wetland Systems	sedge meadow	29,731	2,533	16	4	2	158	7,433	14,866
Central Tallgrass Prairie	Dry, Dry-mesic, mesic and wet prairie	51,239	20,100,235	3	3	2	17,080	17,080	25,620
Ruderal Forest-Northern and Central Hardwood and Conifer	Cultural - tree plantation	132,161	0	-	10	5	-	13,216	26,432

Community Type	INAI Type	Current Acres	Historic Acres	Historic FRI	Adjusted FRI Maintenance	Adjusted FRI Degraded	Acres Burned/yr Historic	Acres Burned/yr Maintenance	Acres Burned/yr Degraded
Eastern Great Plains Floodplain Systems	Floodplain forest	152,948	95,354	48	10	5	1,987	15,295	30,590
North-Central Oak Barrens	Savanna	68,338	7,117	5	3	2	13,668	22,779	34,169
Central Appalachian Dry Oak Forest	Dry upland forest	115,684	0		5	3		23,137	38,561
Urban Deciduous Forest	Upland forest	100,805	0		5	2		20,161	50,403
Undeveloped Ruderal Grassland	Cultural - cropland, pasture, successional	107,220	0	-	4	2	-	26,805	53,610
Recently Logged-Herb and Grass Cover	Cultural - successional	125,619	0	-	3	2	-	41,873	62,810
Ozark-Ouachita Dry-Mesic Oak Forest	Dry-mesic upland forest	129,853	89,921	11	5	2	11,805	25,971	64,926
Urban Shrubland	Developed - successional	155,949	0	-	3	2	-	51,983	77,974
Developed Ruderal Deciduous Forest	Developed - successional	157,030	0	-	3	2	-	52,343	78,515
Southern Interior Low Plateau Dry-Mesic Oak Forest	Dry-mesic upland forest	160,861	170,500	6	5	2	26,810	32,172	80,431
Central Interior Highlands Calcareous Glade and Barrens	Glades, Barrens	243,486	43,610	3	5	3	14,537	48,697	81,162
Central Interior and Appalachian Floodplain Systems	Floodplain forest	406,888	196,155	130	10	5	1,509	40,689	81,378
North-Central Interior Maple-Basswood Forest	Mesic upland forest	464,664	1,204,945	455	5	5	1,021	92,933	92,933
South-Central Interior Mesophytic Forest	Mesic upland forest	712,968	1,053,474	148	5	5	4,817	142,594	142,594
North-Central Interior Dry Oak Forest and Woodland	Dry/dry-mesic upland forest	614,769	246,050	12	5	2	51,231	122,954	307,384
Urban Herbaceous	Cultural - developed, successional	763,576	0	-	3	2	-	254,525	381,788
Developed Ruderal Grassland	Cultural - cropland, pasture, successional	1,241,970	0	-	4	2	-	310,492	620,985
North-Central Interior Dry-Mesic Oak Forest and Woodland	Dry-mesic upland forest	2,319,062	10,560,344	20	5	2	115,953	463,812	1,159,531
	TOTAL	8,522,904	34,296,432				266,357	1,877,795	3,587,467

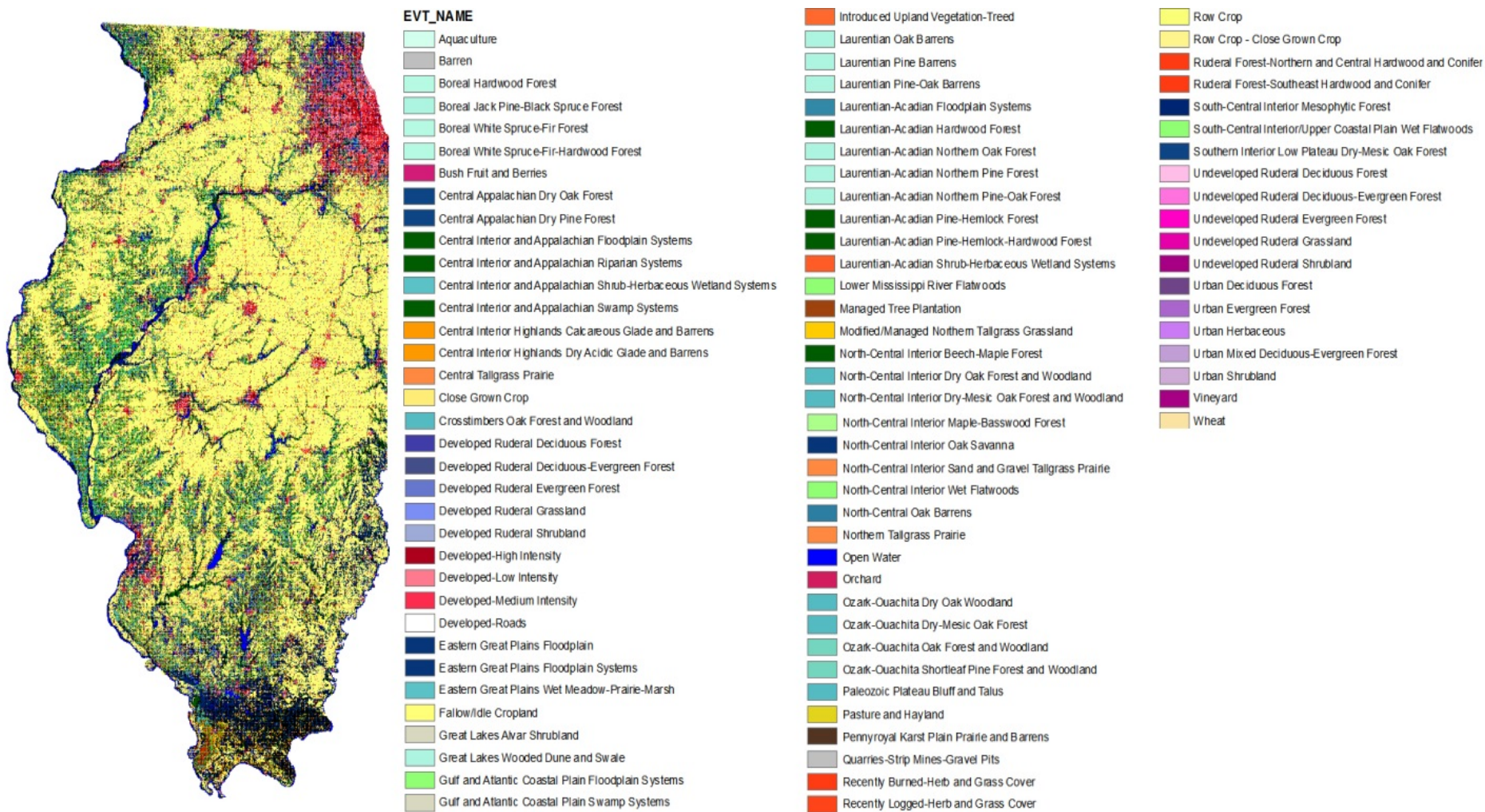


Figure 66: LANDFIRE, 2008, Existing Vegetation Type Layer, LANDFIRE 1.3.0, U.S. Department of the Interior, Geological Survey.

Section 7: Recommendations of the Fire Council

In order to continually maintain and further restore the ecological health of Illinois' natural areas, a substantial increase in the use of prescribed fire needs to take place across the state.

As demonstrated in this fire needs assessment, only 9% of burnable acres were managed with fire between 6/14-5/15, effectively an 11-year fire return interval for Illinois' most quality habitat acres. To meet a fire return interval of 3-years for these acres, nearly 145,000 additional acres need to be burned annually. To meet this challenge, a substantial increase in funding and resources must occur statewide.

Of over 1,000,000 acres represented in this report, over 200,000 acres (20%) were qualified as ecologically degraded. These areas are in dire need of active management and restoration. To meet a fire return interval of 3-years for degraded and burnable acres, an additional 213,000 acres need to be burned annually. To meet this and other ambitious targets, the Illinois Prescribed Fire Council recommends the following for agencies and organizations across the state:

Funding: Prescribed fire programs urgently need considerable increases in budgets and funding in order to close the fire gap and effectively manage Illinois natural areas. It is imperative that the fire community clearly demonstrate to state leadership, agency administrators and the general public the profound importance of prescribed fire and the vital role it plays in managing Illinois' natural wonders.

Training and Mentoring: Promote a culture of fire wherein the use of prescribed fire is valued, supported & expected. It is essential for conservation groups to lead by example (modeling appropriate fire management for the public, private landowners, other organizations) and for the IDNR and USFS in particular to meet intra-agency fire targets to measurably close the overall fire gap on conservation lands. Agencies with fire experience and resources need to support and mentor inexperienced agencies and private land owners. Basic fire trainings should be offered to all staff with hands-on experience included. Bring members of your team to other restoration sites to meet with fire managers, look at fire breaks and equipment, share skills, tell stories and help other agencies burn when possible.

Private Land Support: State and federal agencies with private lands programs need to put greater emphasis on fire management of wildlife habitat and natural areas. Habitat plans for private lands should be designed to make prescribed fire safe and efficient for the land owner. Governmental agencies need to empower their staff to lead and participate in prescribed fire on private lands.

Staffing: In Illinois, prescribed fire is a seasonal endeavor. Agencies need to direct permanent staff with various duties to support fire programs with tasks such as fire break creation and maintenance, equipment repair and maintenance, as well as filling out fire crews. Agencies of size need to have multiple roaming fire crews and hiring seasonal help will be necessary. In order to reach target fire return interval acres, there must be an "All Hands on Deck" mentality wherein agencies prioritize fire preparation and fire operations with additional staffing during prescribed fire season.

Volunteer Opportunities: Volunteers have been important additions to fire crews across Illinois for decades. Committed volunteers should be offered the same training and opportunities as paid staff. Volunteers can support a fire program in a variety of ways including maintenance of vehicles and pumper units, prepping fire breaks, assisting on the fire line, conducting citizen science and monitoring and by being strong vocal advocates in the community.

Equipment: Fire crews need to have access to low volume/high pressure (10 gallon per minute at over 200 psi) water sprayers bolted onto mobile utility vehicles and/or pickup trucks. Most fire crews need a minimum of three such units on a fire. To refill these water sprayers, backup water supplies need to be

on site. This backup could be a large water tank on a trailer with a centrifugal pump to refill sprayers; or perhaps a pump set up in a pond or creek for refills. Other equipment needs include portable radios, fire retardant suits and drip torches. To burn more acres, fire programs needs to be better equipped.

Burn Unit Design: Burn units should be large and follow well-marked property boundaries whenever possible. Working with neighbors may allow fire breaks to bypass obstacles such as steep terrain or wetlands. All habitat types should be included in the burn units. Fires should burn through woodlands, across wetlands and into prairies. Too many land managers and fire practitioners are repeat burning little prairies and not including adjacent habitats.

Fire Breaks: Effective fire breaks allow crew and vehicles safe and efficient control of the fire perimeter. Good fire breaks will be used repeatedly for years. Fire breaks should be free of brush, stumps and impassable wet areas when possible. Season long mowing of fire breaks keeps fuel loads down. For fire breaks mowed once, raking is effective to remove fuel from the break. In woodlands, leaves can be blown off the break with backpack or tractor mounted air blowers. Scratching in make shift, day of control lines may be sufficient in some cases but should be the exception, not the norm. Invest time and resources in durable, wide breaks that support safe and effective fire operations.

Available Fire Days: The number of good fire weather days is limited to about two dozen days from late fall to early spring. In the northern half of the state, crews are burning from mid-October to late-November and from mid-March to mid-April. Managers must utilize every burn day possible. Agencies should do what is possible to not have meetings and deadlines due during these critical periods. Hunting programs should be designed to not interfere with fire operations. Agencies with hunting programs should rotationally burn areas or allow for portions of the preserve to be burned each year.

EPA Liaison: IDNR is in the best position to be liaison between the prescribed fire community and the Environmental Protection Agency as the EPA works to implement clean air standards.

Outreach: Agencies should use this assessment to educate and motivate their staff to close the fire gap. A companion slide presentation of this report is available. The assessment offers an opportunity for agencies to reach out to the general public through local media to advocate for prescribed fire. An example press release will be made available by the Fire Council.

Fire Action Plan: Agencies/organizations are encouraged to report back to the Illinois Prescribed Fire Council by October 2016 with a fire action plan to close the gap within respective agencies and organizations. The plan should include an annual assessment component.

Statewide Assessment: In 2019 the IPFC will update the statewide fire needs assessment. To improve the scale, scope and vision of the assessment, future needs include:

- Greater representation of counties/agencies/organizations state wide, including private lands which are effectively unrepresented currently
- Include budgets for prescribed fire programs
- Report fire data including number of burn days, largest single burn unit and crew size, etc.
- Breakdown of reported acres by INAI habitat types and restoration or maintenance phase
- Select random points in INAI sites and determine fire frequency at INAI sites
- Develop a mobile app or database to report fire operations including GIS data
- Assemble a bibliography of citations on fire ecology
- Work with the Midwest Fire Science Consortium