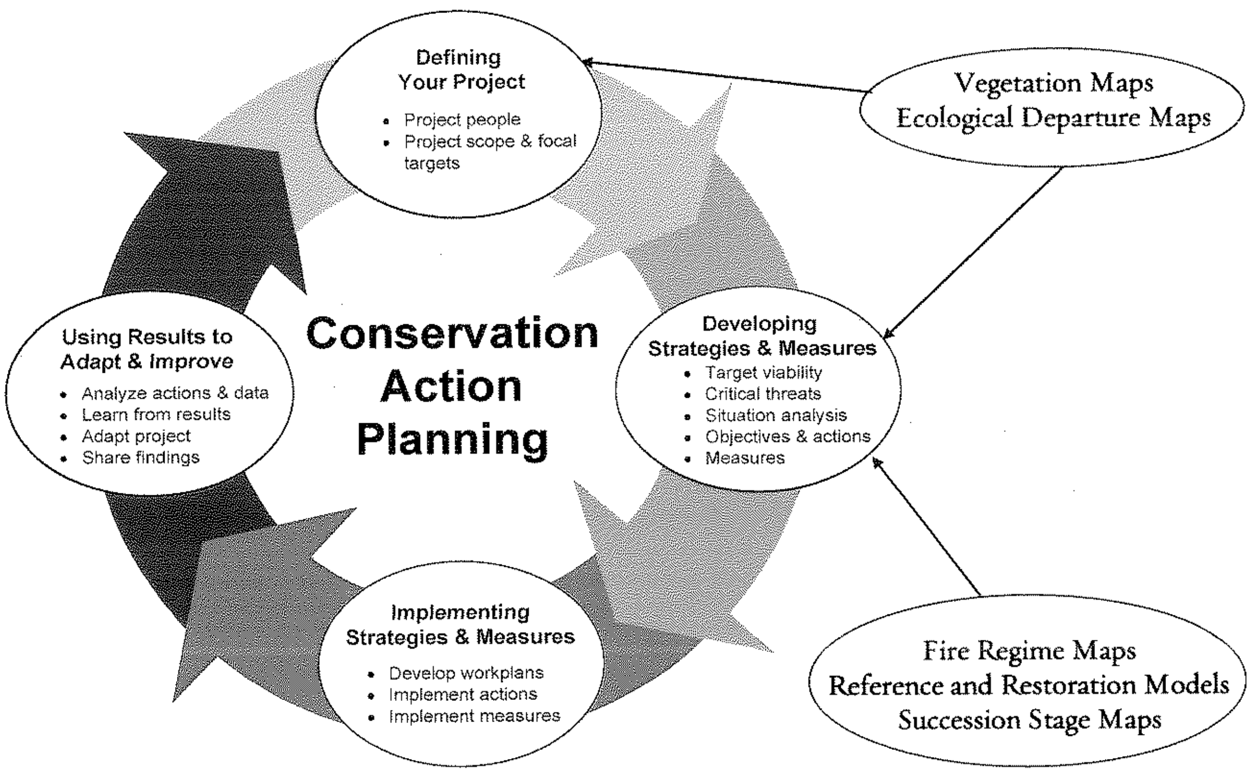
Use of LANDFIRE Products in Conservation Action Planning



Introduction

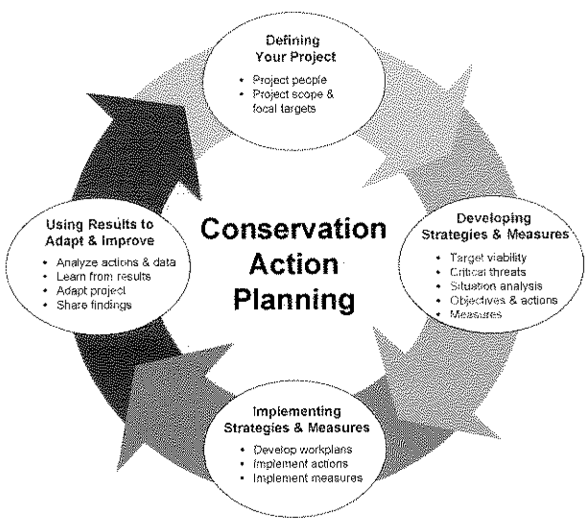
The LANDIFRE project generated a variety of products that may be useful in conservation action planning (CAP). The following is a brief overview of how some of these products may be used in the CAP process. For more information on these or other LANDFIRE products, visit www.landfire.gov and www.tncfire.org.

LANDFIRE products provide a number of tools and datasets useful to the conservation planner but because they were designed for national and regional level applications, decision making and strategic planning they may not be appropriate to use on small landscapes. As with any data product, it is recommended that users review the data carefully and understand its content before using it. In general, local data should be used whenever possible, but in the absence of usable local data, LANDFIRE products may prove useful even for smaller geographies after careful review and adjustment.

Conservation Action Planning Steps

The CAP planning steps will be referred to throughout this document. This document focuses on the utility of LANDFIRE products in Steps 1 and 2 of the process, although users may find other uses as they become familiar with the products.

Conservation Action Planning Steps



1. Defining your project.
2. Developing strategies and measures.
3. Implementing strategies and measures.
4. Using results to adapt and improve.

Using LANDFIRE Products in Conservation Planning

Vegetation Maps

LANDFIRE produces several maps using Nature Serve's Ecological Systems classification (Comer et al. 2003) which may be useful in Step 1 or 2 of the CAP process. The Existing Vegetation Type (EVT) map depicts the vegetation available at a site today. The Environmental Site Potential (ESP) map represents the vegetation that could be supported at a given site based on the biophysical environment. It is similar in concept to a "climax" community that would occupy a site in the absence of disturbance. The Biophysical Settings

(BpS) map represents the vegetation that may have been dominant on the landscape prior to Euro-American settlement and is based on both the current biophysical environment and an approximation of the historical disturbance regime. It differs from the ESP map in that disturbance is explicitly included in the concept.

LANDFIRE's vegetation maps may help *identify focal targets*, display their spatial distribution and quantify their extent. Some potential uses of these datasets include:

- EVT: The EVT map includes information that can be used to help *identify critical threats*. For example, the EVT map includes the following map classes which may indicate potential threats: introduced vegetation (annual, perennial and wetland), modified or managed vegetation, tree plantations, recently logged, ruderal vegetation (wetland, upland, forest), agriculture (General, Pasture/Hay, Cultivated Crops and Irrigated Agriculture, small Grains, Fallow, Urban/Recreational Grasses), developed (General, Open Space, Low Intensity, Medium Intensity, High Intensity) and Quarries/Strip Mines/Gravel Pits. Overlaying the EVT map with an ownership map as part of a *situation analysis* could help *link key stakeholders with opportunities or threats*.
- ESP: The ESP map can help identify potential restoration opportunities, especially for late seral communities, or for communities where disturbance is not considered to be a key process. Additionally, this layer may help indicate were late seral stages of a particular ecological system may be restored due to the physical properties of the site.
- BpS: The BpS map can be useful in determining a historic view of the landscape. Often historical maps are developed for a "snap-shot," but the BpS concept by definition includes the suite of seral stages or community types that may occur on a given biophysical setting over time. This map may help establish the historical importance of proposed targets to support *focal target* selection.

Ecological Departure Maps

LANDFIRE produces maps of ecological departure, called Fire Regime Condition Class (FRCC) and FRCC Departure Index, which may be useful in Steps 1 and 2 of the CAP process. These maps provides a measure of the departure of the vegetation composition and structure from a reference condition (see Reference and Restoration Models and Succession Stage Maps below for more information on reference and current conditions). The FRCC Departure Index map quantifies the amount of departure between the current landscape and the reference condition on a scale from 0 to 100 percent. The FRCC map is then derived from the FRCC Departure Index map by dividing the index into three discrete classes based on the level of departure. The three condition classes are defined as follows:

- FRCC 1: (0-33% departed) vegetation is within or has a low level of departure from the historic range of variability,
- FRCC 2: (34-66% departed) vegetation is moderately departed from the historic range of variability, and
- FRCC 3: (67-100% departed) vegetation is highly departed from the historic range of variability (more information on FRCC can be found at www.frcc.gov).

In *defining your project area* or project scope, the FRCC or FRCC Departure Index maps can serve as one of many datasets that will inform the CAP team about an area's ecological condition. This may help the team to focus on areas in good ecological condition or to consider possible needs for restoration work in areas that are in poor ecological condition. In addition, the FRCC maps may help assess individual *target viability* for targets that are Ecological Systems or that nest within an Ecological System. In particular, the FRCC Departure Index map can be used to help determine the level of effort needed to move a system from one condition class to another. For example, a system with an FRCC index of 34% would likely take less time, energy and resources to move into condition class 1 compared to a system with an FRCC index value of 65%.

FRCC could be adopted as a measure of progress for a conservation area (if it can be remeasured in the future).

Reference and Restoration Models[1]

LANDFIRE produces models of reference conditions, called vegetation dynamics models, that define the percent of the landscape in different successional stages prior to Euro-American settlement for each BpS (see Vegetation Maps above), which may be helpful in Step 2 of the CAP process. The models are comprised of two parts: 1) a quantitative model showing the rates and pathways for succession and the probabilities for disturbance and 2) a comprehensive description document describing the indicator species, disturbance regime, successional stages, geographic location, and much more detailed information for a BpS (see diagram on p.5).

When *assessing target viability* the reference condition models can provide a quantitative estimate of the landscape in different successional stages that may assist in *determining the acceptable range of variation* for an Ecological System or *setting measurable indicators for key ecological attributes*. The reference condition models may also prove useful in determining the *desired status* of an Ecological System. While reference conditions are not necessarily synonymous with desired future conditions, they provide valuable information about the ecological envelop that an Ecological System occupies that will constrain a Systems' desired status.

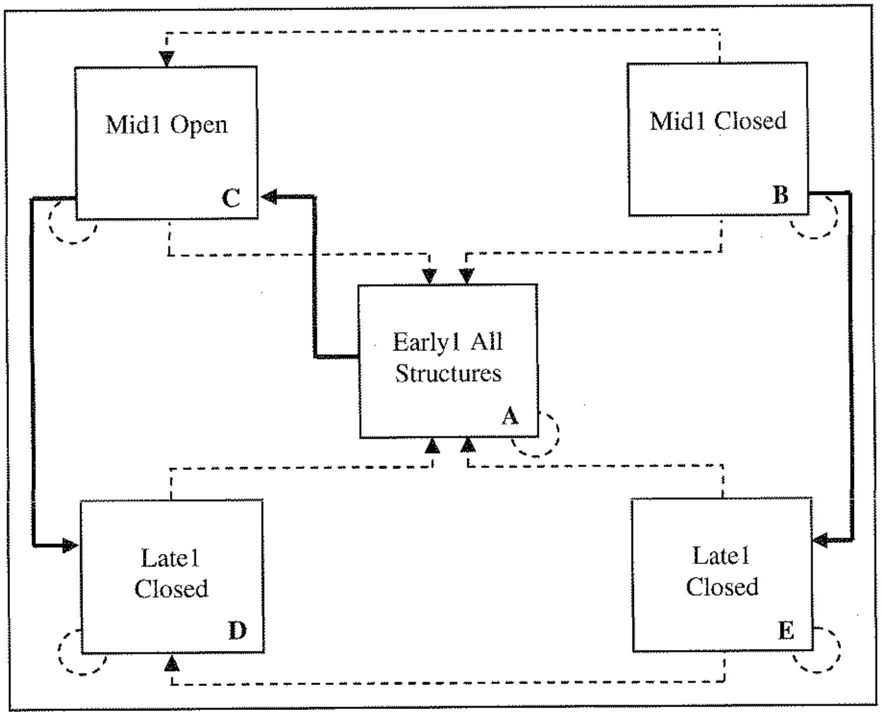
The quantitative state and transition models can be used to help *develop objectives and actions*. The quantitative information in the reference models about rates of succession and probabilities of disturbance may help inform the setting of *measureable objectives*. With minor modifications, the reference models can be used to create restoration or scenario testing models. These adapted models could be used to *test strategic actions* to determine their potential effectiveness or to help prioritize actions based on available resources or other constraints.

Hypothetical Questions to Test with Restoration Models

- How often does a landscape need to burn to achieve the desired future condition?
- How much will it cost to implement the timber stand improvement cuts needed for a landscape?
- What combination of weeding, spraying and monitoring will minimize weed invasion on the preserve given our annual restoration budget?
- If we continue to use prescribed fire and thinning at current levels, what will our landscape look like in 10 years?
- What possible interactions could occur if we introduce prescribed fire and bison grazing simultaneously on the prairie preserve, which hasn't experienced either in 50 years?

---

[1] Reference Models and accompanying descriptions were created by LANDFIRE; Restoration Models are user-built, based on Reference Models.



State Name	Landscape Percent*	Description
A: Early1 All Structures	10	Openings with grass, shrub and forbs created after replacement fire. Post replacement vegetation is patchy and episodic. Ponderosa pine seedlings can be very limited and variable. Gambel Oak and ceanothus fendleri are vigorous, rapid resprouters. Succession to class C after 50yrs.
B: Mid1 Closed	2	Forest canopy closure is >=30%. Closed pole- sapling/grass and shrubs. Replacement fire occurs every 80yrs on average. Mixed severity fire (MFRI of 25yrs) will open stand structure, thus causing a transition to class C. Surface fire is considered unlikely in dense stands. Without fire, the stand will grow into a late successional closed state (class E) after 70yrs.
C: Mid1 Open	10	Forest canopy closure is <30%. Open pole-sapling/grass and shrubs. Replacement fire every 300yrs causes a transition back to class A, whereas surface fire and mixed severity fire maintain the open structure of the class. Without fire, the stand will transition to the open condition (class D) after 25yrs. With fire, the stand grows into class D after 60yrs.
D: Late1 Open	75	Forest canopy closure is <30%. Open large trees/grass and shrubs. Rare transition to class A is caused by replacement fire every 400yrs. Surface fire (MFRI of 10yrs) and mixed severity fire (MFRI of 50-100yrs; Moir & Dieterich 1988) maintain vegetation in class D indefinitely. Without fire vegetation will close and transition to class E.
E: Late1 Closed	3	Forest canopy closure is >=30%. Closed large, trees, poles, saplings and shrubs. Replacement and surface fires occur every 250yrs on average. Mixed severity fire (MFRI of 50- 100yrs; Moir & Dieterich 1988) and mountain pine beetle outbreaks (every 50yrs on average) will return vegetation to class D.

*The landscape percent represents the central tendency calculated by the model for the reference condition.

Graphic and tabular representation of the Southern Rocky Mountain Ponderosa Pine Woodland vegetation dynamics model (LANDFIRE National VDM 2007). Solid lines represent succession pathways and dashed lines represent fire disturbance pathways (non-fire disturbances were modeled but are not included in the graphic).

Succession Stage Maps

LANDFIRE produces maps of vegetation successional stages, called succession classes (similar in concept to a seral stage), that may provide information to support Step 2 of the CAP process. Successional stage maps show the successional stages defined in the reference condition model (see Reference Condition Models above) as they appear on the landscape today. They are mapped based on vegetation species composition, vegetation height and vegetation cover.

Succession stage maps can be used in conjunction with the reference condition models in *assessing target viability* to determine which stages are over or underrepresented on the landscape today compared to their reference condition and/or their desired condition. This comparison could help you *identify objectives and strategic actions* to achieve those objectives. For example, in a fire-adapted ponderosa pine system a comparison of current and reference conditions might indicate that mid-seral, dense pine stands are overrepresented on the landscape today. This threatens the viability of these stands because it increases their fire risk. An objective that would improve viability could be to reduce fire risk through the strategic action of thinning mid-seral, dense pine stands. Similarly, Kirtland's Warbler requires large areas of young (5-7 years old) Jack Pine forest which are declining on the landscape today due to fire suppression. Increasing fire use in mid and later seral Jack Pine stands to create more early seral stands could increase suitable warbler habitat.

Fire Regime Maps

LANDIFRE produces maps of fire regime groups (FRG) that may be helpful in Step 2 of the CAP process. LANDFIRE's FRG maps classify the landscape based on the presumed fire frequency and severity that it would have experienced prior to Euro-American settlement. This map has five classes:

- FRG I: 0–35 year frequency, low and mixed severity,
- FRG II: 0–35 year frequency, replacement severity,
- FRG III: 35–200 year frequency, low and mixed severity,
- FRG IV: 35–200 year frequency, replacement severity, and
- FRG V: 200+ year frequency, replacement severity.

The FRG map can help *identify critical threats*. The FRG map can be used to asses the historic frequency and severity of fires and to help determine if there is too much, too little or the wrong kind of fire on the landscape today.

Conclusion

This paper introduces a few ways that LANDFIRE products may be used in the CAP process. Undoubtedly, CAP coaches and teams will come up with additional uses in the future. As with all datasets, users need to understand the limitations of the LANDFIRE data to apply them appropriately.

All LANDFIRE products can be obtained free of charge on the internet. Reference condition models can be downloaded from http://www.landfire.gov/NationalProductDescriptions24.php and http://www.landfire.gov/reference_models.php.
Spatial data is available for download from http://landfire.cr.usgs.gov/viewer/.

References

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003. Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems. NatureServe, Arlington, VA. 75 p.

LANDFIRE: LANDFIRE National Vegetation Dynamics Models. (2007, January - last update). [Homepage of the LANDFIRE Project, U.S. Department of Agriculture, Forest Service; U.S. Department of Interior], [Online]. Available: <http://www.landfire.gov/index.php> [2008, July 18].