

Keeping the way clear for safe, reliable service

July 2016



In 1996 and 2003, massive power outages struck large sections of the country and left millions of people in the dark.

Both blackouts were triggered by similar events. Overgrown trees came in contact with high-voltage transmission lines, causing a protective shutdown that created cascading power outages across the regional power grid.

Power outages like these are much more than an inconvenience to consumers. They can be dangerous and costly, straining vital community services such as hospitals and bringing commerce to a standstill.

Here in the Pacific Northwest, the Bonneville Power Administration operates three-fourths of the region's high-voltage transmission system. BPA's transmission system includes more than 15,000 circuit miles of high-voltage lines that move large amounts of power

from hydroelectric projects and other power plants to urban centers hundreds of miles away. To keep the electricity flowing safely and reliably across this transmission network 24 hours a day, 365 days a year, BPA must keep its power line rights-of-way clear of tall trees and other objects that could disrupt delivery of electricity or threaten public safety.

Trees and power lines: A growing concern

Trees and power lines have never been good neighbors. That's why BPA works hard to keep a safe distance between high-growing vegetation and nearby power lines through a comprehensive vegetation management program.

Vegetation growing near high-voltage lines is hazardous in two respects. First, if trees or tall brush touch a transmission line, they can shut down that line and disrupt the flow of electricity. For example, during storms or high winds, tree limbs can fall on



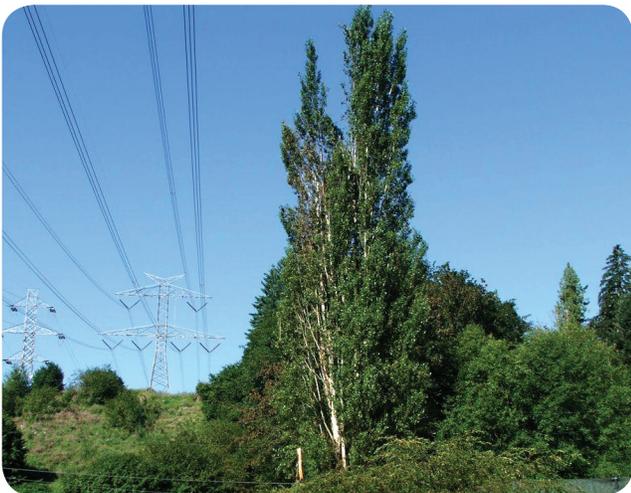
transmission lines, knocking out power to communities. Because a single line in BPA's system serves thousands of homes and businesses, an incident like this could trigger outages that affect the entire West Coast.

And second, electricity can “arc” or “flashover” from wires, through the air, to trees, other vegetation or equipment up to 15 feet away, where it can cause fires, injuries or even fatalities to anyone nearby. Another danger is that electricity from the line can make a tree branch so hot it catches fire, which can threaten homes in residential neighborhoods and spark wildfires in rural areas.

Preventive maintenance: A new national requirement

After the big 2003 Northeast blackout — that left over 50 million people without power and cost billions of dollars in lost productivity — investigators determined that it was trees coming in contact with high-voltage lines that initiated the outage.

As a result, the North American Electric Reliability Corporation, or NERC — a national regulatory body that oversees reliability of the U.S. power grids — issued new, more stringent, vegetation management standards for electric transmission lines. BPA and



Trees that grow too close to high-voltage power lines are a hazard. In certain circumstances, electricity can jump or arc from the lines to the trees, which can cause power outages, fires and serious injuries to anyone near the trees.

Why keep rights-of-way clear?

BPA manages vegetation in our transmission line rights-of-way to:

- Maintain a high level of power reliability
- Ensure public safety
- Prevent damage to land and property

other utilities must comply or face the possibility of fines of up to \$1 million a day. If BPA had to pay such fines, that would raise its costs, increasing rates.

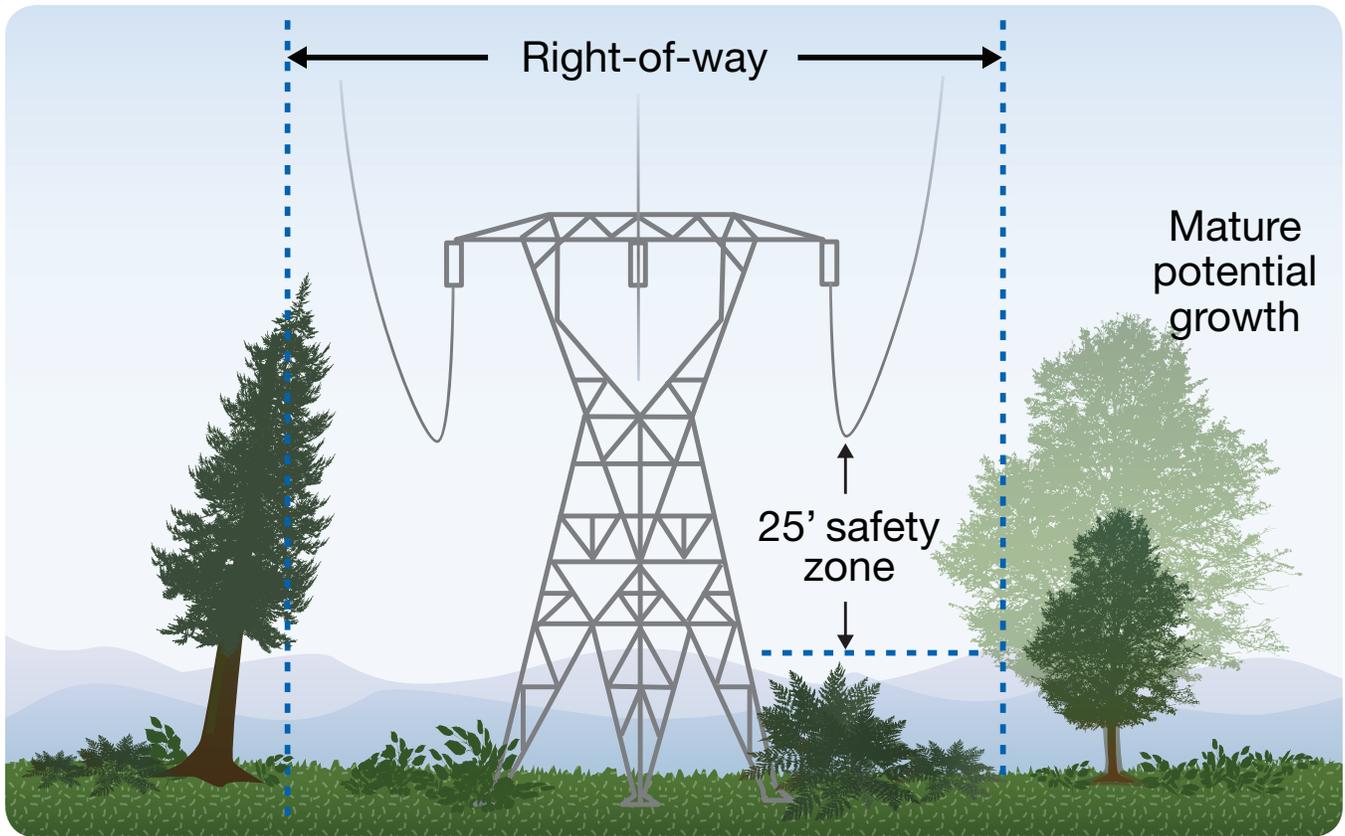
Under the new standards, BPA's crews will manage vegetation to keep a safety zone between high-voltage transmission lines and the trees and brush beneath and around them.

The safety zone considers two key factors. One is the potential mature height of the tree, and the second is the maximum distance the power line will sag under periods of high use. When power lines carry more electric load, they normally heat up, which causes the wire to expand and sag. In summer, for example, when the air is hot and customers demand lots of electricity, lines can sag up to 14 feet.

This means that with BPA's new clearance standards, if a tree can grow close enough for a power line to sag into the range where it can cause an outage, the tree must be removed.

Maintaining a safe distance

The electricity carried by BPA's high-voltage transmission lines ranges from 69,000 volts to 500,000 volts. That's about 50 to more than 100 times the amount of electricity that flows through the distribution lines bringing power to your home. Higher voltage lines require greater clearances than power lines in your neighborhood. That's why BPA's power lines are supported by taller towers and why BPA must maintain



BPA crews will maintain a 25-foot safety zone between the highest point the vegetation will potentially grow and the lowest point the power line will sag under extreme conditions. Sometimes, even though a tree is outside the right-of-way boundary, BPA crews will remove any growth that comes within the 25-foot clearance zone or remove the tree if it's unstable and likely to topple over on the power line.

a greater distance between the lines and objects on the ground.

To manage the 50,000 acres of right-of-way across BPA's service territory in the most cost-efficient way, BPA has established regular maintenance cycles to remove vegetation before it gets close enough to the lines to threaten system reliability and public safety. Depending on topography, climate and vegetation in a particular area, these maintenance cycles range between three and 15 years.

By keeping a safety zone around the power lines, BPA can be sure the rights-of-way will have a safe clearance until the next maintenance cycle.

For additional assurance, BPA conducts ground and aerial patrols on every mile of every transmission line every year, looking for vegetation trouble spots. BPA

also routinely surveys areas bordering its transmission corridors to watch for "danger trees," large trees that may fall over on power lines or grow close enough to swing into them with the help of a little wind.

Managing vegetation

BPA natural resource specialists, who have extensive education and training in forestry practices and electrical safety, direct our experienced contract crews. When they determine that trees in or adjacent to the right-of-way are a current or future hazard to the transmission line, those trees will be removed.

The combination of fast-growing trees and BPA's cyclical maintenance program means that removal, rather than trimming, of tall trees is the best way to ensure the new safety standards are met.

For example, if BPA discover a 10-foot Douglas fir tree growing under the line, we don't just trim it to the proper clearance. Instead, we remove it because the tree's mature height will eventually violate the clearance limit. In many cases removing trees is the more cost-effective approach, conserving resources that can be used to strengthen the transmission system elsewhere.

In addition to maintaining the appropriate safety clearance between vegetation and power lines, BPA crews also work to establish low-growing native plant communities along the rights-of-way.

Keeping communities informed

Before starting vegetation management activities, BPA makes every effort to contact landowners and residents near the project area to inform them about the work to be done. BPA also listens to their concerns and lets the local community know when its crews will be in the area.

Why does BPA have the right to manage vegetation near power lines?

Generally, before a power line is built, BPA purchases an easement or right-of-way from the landowner. As the easement holder, BPA has the legal right to maintain and protect its transmission equipment and facilities. This includes keeping the right-of-way clear of trees and other obstructions that could interfere with the safe and reliable operation of the line.

When it's necessary to remove trees near power lines, BPA's crews work with landowners to minimize the impact. Generally, cut logs are left for the landowner's use.

How you can help

Even though BPA regularly inspects its transmission lines, you can help by notifying BPA if you see trees or vegetation that might be growing too close to the lines.

For your own safety, it's important that you never attempt to trim or remove a tree that's near a transmission line, because working around energized power lines is very hazardous. Instead, call BPA and its specially trained crews will take care of it.

If you live next to a BPA transmission line, you can also help stop potential problems before they start: Don't plant trees in transmission corridors. Low-growing native plants or ornamental shrubs, ferns and grasses may be allowable options in a right-of-way.

Before you plant any vegetation on BPA rights-of-way, be sure to fill out a land use application. This will enable BPA to maintain a safe distance between the vegetation and power lines and ensure that the vegetation will not block access to the lines, towers or poles.

For more information

If you have any questions about BPA's vegetation management program please call, 800-836-6619.

For more details on BPA rights-of-way and how to stay safe around high-voltage power lines, visit BPA online at www.bpa.gov/corporate/pubs.

www.bpa.gov