

Aspen Next Generation



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Aspen Next

Conversations from Southern Colorado and Northern New Mexico



Conclusions

p. 4



Recommendations and Questions

p. 6



Uncompaghre Plateau

p. 8



San Juan Mountains

p. 10

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Introduction

ASPEN TREES and forests are especially important in the Rocky Mountains. Aspens add beauty to landscapes, foster high diversity and productivity of understory plants, provide for the habitat needs of many species of animals, and moderate fire behavior. There is a perception that aspen trees and stands are not regenerating well in southern Colorado and northern New Mexico; cohorts of trees

eration



Rio Chama Area

p. 12



Jemez Mountains

p. 22



Sangre de Cristo Mountains

p. 26



Credits

p. 30

younger than a few decades are scarce, at least in some areas. The next generation of aspen in the southern Rockies will be influenced by land use decisions, including harvesting, fire policy and management, and browsing by livestock and wildlife.

The Aspen Next Generation (ANG) Project aimed to foster the future of aspen by pulling together insights from land-

owners, agency personnel, and scientists across southern Colorado and northern New Mexico. We compiled insights and concerns about the condition of aspen regeneration from a broad range of people throughout the region. These insights could provide a foundation for a workshop to identify what is known, and what are the key areas of uncertainty, if further

discussion would seem to be warranted. The summaries of conversations include our interpretations of what we heard, and despite our best efforts to draw out the key points, our summaries won't represent the full perspective of anyone we talked with. We hope this report will stimulate further discussion, rather than be relied on as a record of any rock-solid conclusions.

Conclusions



Autumn gold in Colorado. Few things in nature are as stunning as a healthy Aspen forest.

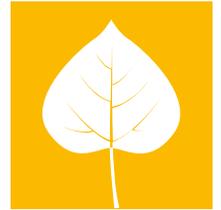
FIRST, we did not hear of any widespread problem with aspen regeneration that would relate directly to weather (such as drought), to increasing dominance of conifers, or to failure of aspen to produce sprouts after fire or harvest. Root sprouts apparently are consistently produced, usually in considerable number (and often in the understory of existing stands, without disturbances).

SECOND, where aspen regeneration is not occurring, the problems appear to be related primarily to browsing on aspen root sprouts by elk (and secondarily perhaps by deer); current levels of livestock grazing were not thought to be a general problem.

THIRD, the severity of browsing impacts is highly variable. In some areas, there is substantial variation at scales of less than a mile to several miles. Patterns are also apparent across regions, with some regions having abundant regeneration and others very little.

FOURTH, browsing impacts appear to be less severe where there is greater human activity and disturbance of wildlife, perhaps especially with hunting. Impacts tend to be more severe where there is little human activity and disturbance.

FIFTH, browsing impacts are also less severe (and likely too low for concern) at elevations where winter snowpacks exclude



Summarizing lessons from landowners

Our conversations covered most of southern Colorado and northern New Mexico. These place-based conversation summaries start on page 8 in southwestern Colorado on the Uncompahgre Plateau, then tracks down through the San Juan Mountains to Chama and the Jemez Mountains of northwestern New Mexico before turning east to Vermejo Park in north central New Mexico and up to the Culebra Range of the Sangre de Cristo Mountains in south central Colorado.

elk during the season when elk are most likely to browse aspen heavily. Warm winters may allow severe browsing impacts to develop at higher elevations than in snowy winters. Snow depths also seem to be generally deeper (and deeper at lower elevation?) in the western part of southern Colorado and northern New Mexico, perhaps accounting for more broadscale regeneration issues to the east.

SIXTH, the most severe failures of aspen regeneration after fire or harvest appear to be occurring mainly in the eastern portion of our study area, including the Culebra Range in Colorado and the northern New Mexico portion of the Sangre de Cristo Range.

- **ASPENS STILL CONSISTENTLY PRODUCE ROOT SPROUTS IN CONSIDERABLE NUMBERS, EVEN IN DROUGHT OR FOLLOWING FIRE OR HARVEST**
- **LANDOWNERS OBSERVE BROWSING BY UNGULATES, ESPECIALLY ELK, AS THE BIGGEST DOWNWARD PRESSURE ON ASPEN REGENERATION**
- **THE SEVERITY OF BROWSING IMPACTS BY UNGULATES IS HIGHLY VARIABLE**
- **HUMAN ACTIVITY, E.G. HUNTING, REDUCES IMPACT ON ASPEN FROM ELK**
- **DEEPER AND LONGER-LASTING WINTER SNOWPACKS WERE ASSOCIATED WITH LESS BROWSING IMPACT FROM UNGULATES**
- **CLIMATE CHANGE-DRIVEN REDUCTIONS IN SNOWPACK MAY MEAN INCREASED IMPACTS ON HIGHER ELEVATION OR WESTERN SLOPE ASPEN**
- **FAILURES OF ASPEN REGENERATION WERE MOST SEVERE IN THE CULEBRA AND SANGRE DE CRISTO MOUNTAINS**

Recommendations



An aspen regeneration enclosure on The High Lonsome Ranch in De Beque, Colo. Photo courtesy of The High Lonsome Ranch.

How might we sustain aspen in the face of continuing heavy browsing? We have two suggestions. Neither may lead to the most desired future conditions, but both would help prevent the most undesirable future conditions.

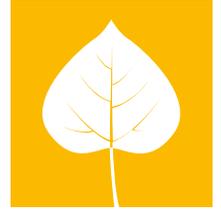
FIRST, land managers should be very selective in choosing places for aspen regeneration/restoration treatments. A case in point was the Sargents Wildlife Area near Chama, New Mexico, where the aspen apparently are in a marginal habitat, are declining, and are subjected to chronic heavy browsing. It seems that any kind of cutting or burning would likely hasten the demise of this aspen population, similar to what we saw at the Blue River Ranch (in north central Colorado) where cutting the remnant mature trees in a stand with high mortality (from sudden aspen decline) led to near complete loss of regenerating aspen from concentrated elk browsing. Situations with aspen stands that are not very vig-

orous, and with moderate or high elk populations, might simply be left alone (unless an investment in fencing is possible). Without any action, a local aspen population might appear to be headed for extirpation within a few decades, but unwise intervention could hasten aspen disappearance. So long as the population persists, even at low density and in poor health, there is the potential for rejuvenation if the climate and browsing pressures ameliorate at some future time.

SECOND, we should recognize that the state of aspen in an area may change substantially over the course of one or a few decades. Lack of aspen regeneration in Yellowstone National Park was a major

concern in the 1980s, but a large decline in elk populations seem to have allowed major improvements in aspen regeneration. Large wildfires may lead to enough aspen regeneration to saturate browsing demand, allowing for successful aspen regeneration, though this has not always occurred (as with the 2002 Tercio and Spring Fires on Vermejo Park and Tercio Ranches). Given that factors favoring aspen regeneration might change in the course of decades, there may be substantial value in stunted, chronically browsed aspen sprouts. Clones seem to persist for decades in this state, and have the potential to convert into tall forests if weather or browsing conditions change.

Questions



Creative brainstorming might develop ideas that could be tested collaboratively among concerned groups of people, increasing knowledge of what tools work for enhancing the future of aspen.

A KEY QUESTION remains on how long clones can persist in situations where intense browsing keeps the shoots from transitioning into tree sizes. We know that persisting for one or more decades is common, but can these stunted aspen clones persist indefinitely? Are there thresholds of browsing intensity that might push clones to complete mortality?

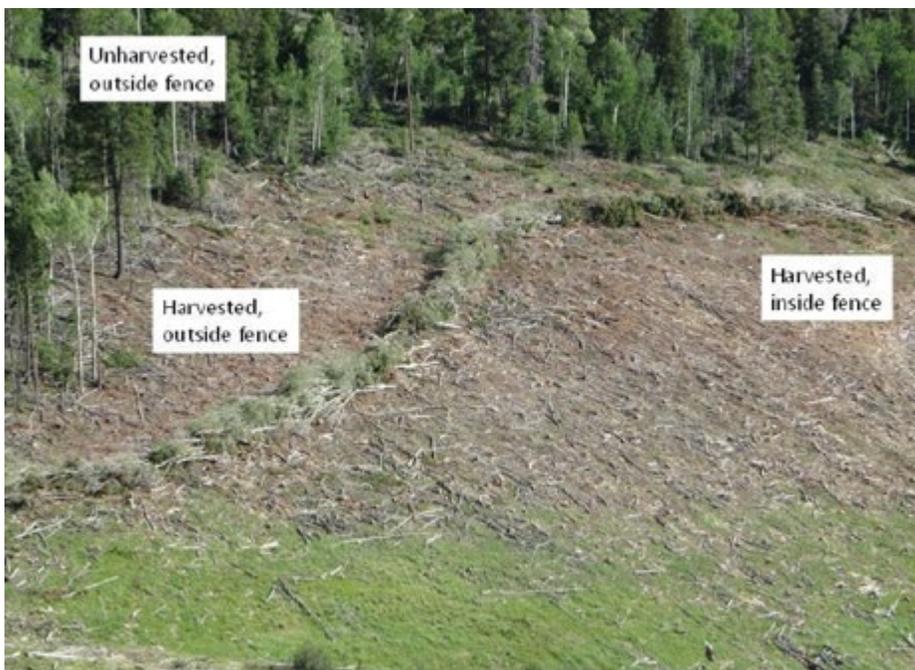
Might there be options to reduce browsing impacts without large or permanent reductions in elk populations? Experience with ex-closures would indicate that a decade with low browsing may be enough

to allow aspen shoots to transition to tree sizes that would regenerate a tall forest. What would be the aspen response to a decade of more intensive hunting (maybe emphasizing cow harvests)? Could hunting intensity be increased for a decade in one unit, and reduced in an adjacent unit such that overall hunting opportunities could remain consistent? Would there be options other than fencing to reduce the time of intense use by elk, such as increased human activity (other than hunting), for a few key points in time? Some creative brainstorming might develop ideas that could be tested collaboratively

among concerned groups of people, increasing knowledge of what tools might work for enhancing the future of aspen.

While managers of public and private lands are managers, not scientists, all managers can (and many do) design landscape operations to include opportunities for learning.

The photo on this page shows an example of where a brush fence was constructed to protect regeneration aspen, and the managers wisely made the fence not follow all the boundaries of the harvest area. This allows for future consideration of how important the fence was for protecting aspen at this time and this location, and case-specific insights are always important in land management. Varying the treatment for a corner of any unit provides opportunities to see if the outcomes developed as expected, and if there were any surprises. Photo points can be established to make sure that any response worth caring about is captured.



A brush fence constructed to allow comparison to evaluate its effectiveness in context. Photo by the authors.

Uncompahgre

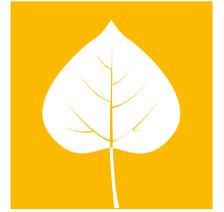


The Uncompahgre Plateau is home to some of Colorado's most striking groves.

BROWSING appeared to be heavy on aspen in some parts of the Plateau in the 1990s, and US Forest Service managers set up some exclosures in clearcuts to get more information. Aspen developed vigorously when protected from browsing by wildlife and livestock (right side of picture above). This concern led the Uncompahgre Partnership to develop a project to assess the age structure of aspen on the Plateau, and the impacts of browsing. Overall, the collaborative work concluded that the Plateau had extensive cohorts of aspens that developed after fires in the late 1800s. Young cohorts

of aspen today are widespread and vigorous, and likely sufficient for sustaining a major presence of aspen on the Plateau in coming decades.

Browsing exclosures showed that some areas had enough browsing pressure to restrict aspen regeneration, but this was a local issue that did not extend across the landscape. Indeed, the regenerating clearcut in the photo above had a moderate stocking of shorter aspens outside the exclosures, so the browsing impacts were not preventing a next generation of aspen (only slowing stand development).



Browsing exclosures showed that some areas had enough browsing pressure to restrict aspen regeneration, but this was a local issue that did not extend across the landscape.



Aspen developed vigorously when protected from browsing by wildlife and livestock.

For more information, see:
Binkley, D, A. Alsanousi, and W.H. Romme.
2014. Age structure of aspen forests on the
Uncompahgre Plateau, Colorado. *Canadian
Journal of Forest Research* 44: 836–841.

San Juan Mountains

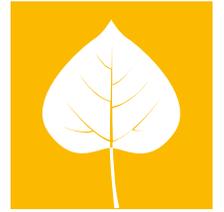
Pagosa District

ASPEN REGENERATION around the San Juan Mountains has lots of variation, and the Pagosa district has not focused much on aspen (as there are no perceived problems). The district mostly encounters aspen as part of mixed conifer stands, and they expect harvesting would lead to proliferation of aspen, but they have done very little harvesting in the past two decades. There was a restoration demonstration harvest in 2006 (Turkey Springs), and aspen regeneration looks great. Heavy browsing has not

been noticed, and it's common to see 5 to 7' tall regenerating aspen. There are no plans to fence the cut units, and elk populations do not seem high enough to have much impact. Perhaps high visitor use of the forest also disperses elk and reduces impacts. There are small patches of aspen at low, hot, dry locations near Pagosa Springs that are not recruiting after fire – but this may be an issue of a tough environment leading to conversion to oaks and meadows without a major effect of browsing.



Mountains



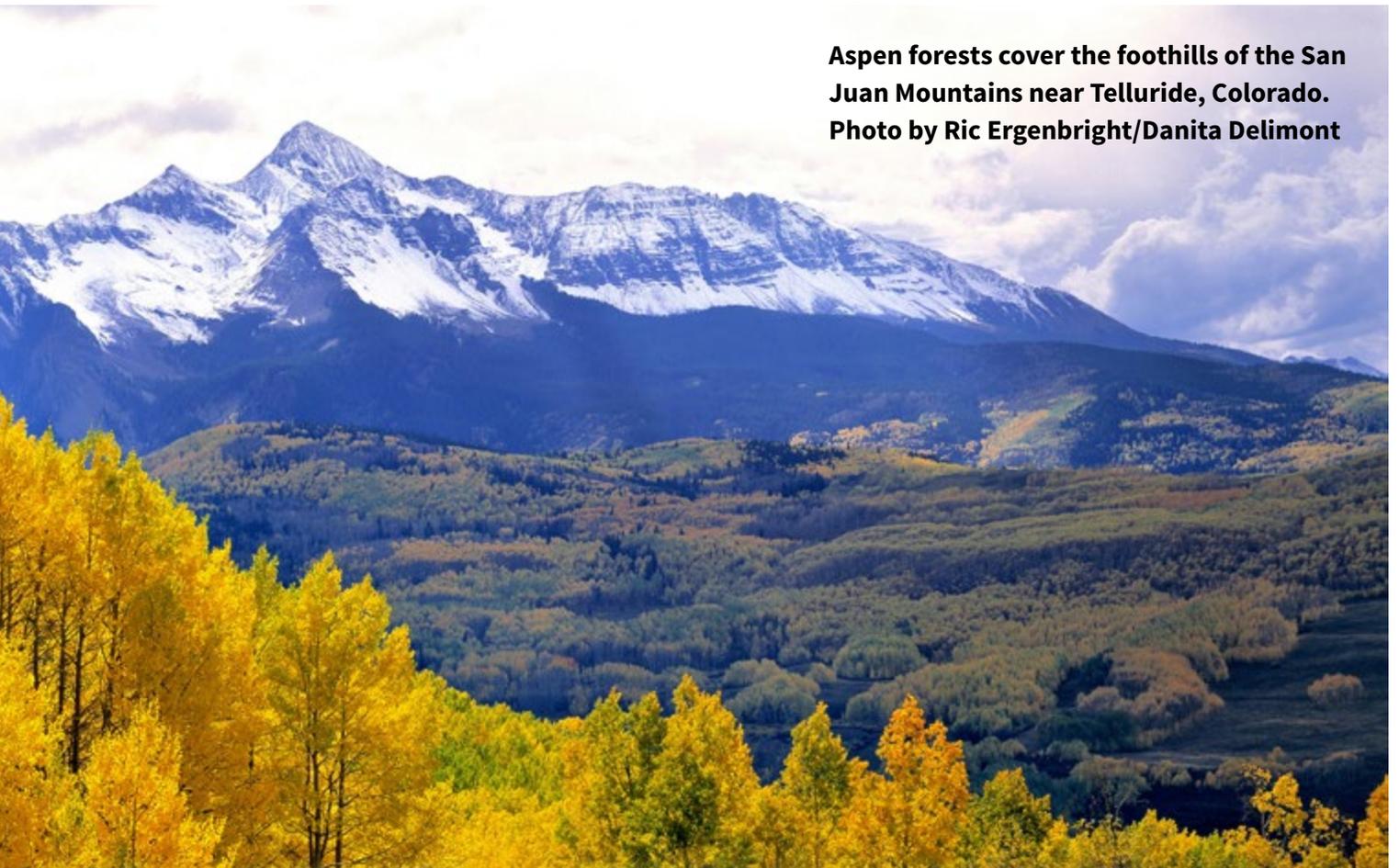
Columbine and Dolores Districts

THE ISSUES with aspen regeneration are not major, and not related to browsing. Clearcutting on the Dolores District had successful aspen regeneration on about 90% of the cases. Some regeneration problems occur where young stands are hit with *Cytospora* and *Armillaria* following 3 years of tent caterpillar defoliation and a wet year with leaf wilt problems (big trees were okay). Some local pockets of deteriorating old trees without regeneration include some places on Middle Mountain where cattle congregate for long periods under aspen. Cutting units (mostly about 80 acres) in size are not showing browsing problems. Some smaller patch cuts in the 1970s did get heavily browsed.

The West Fork Complex Fire in 2013 seems to have abundant successful aspen regeneration.

The lack of elk browsing issues may relate to elevation and snowpack. Most of the aspen are at higher elevations and are used by elk in summers, and there's very little "barking" on the trees. Snowpack may limit the time elk spend in aspen-dominated areas.

Aspen regeneration in the vicinity of Dolores and Mancos is so strong that some ranchers have complained that cattle have difficulty accessing some areas!



**Aspen forests cover the foothills of the San Juan Mountains near Telluride, Colorado.
Photo by Ric Ergenbright/Danita Delimont**

Rio Chama Are

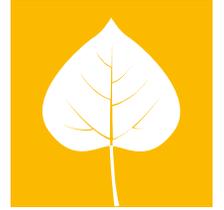


Aspens and conifers compete for space on the slopes above the Rio Chama.

ASPEN REGENERATION is usually very successful after cutting, especially with good ground scarification, but regeneration is variable. Successful regeneration without fencing seems to occur in only special places, such as near a major road. Big cuts seem to work better than small cuts, even if fenced – because brush fences are often penetrated by some animals, and the perimeter-to-area issues give less impact in bigger cuts. In this area, browsing impacts seem to be strongly about elk and not deer or cattle.

In the 20th century, there was a market for aspen and more routine cutting across the landscapes allowed elk browsing to be more dispersed, with good aspen regeneration. The elk population may not have changed, and the higher browsing impacts may reflect the decline in post-logging habitat.

The lack of a market for aspen is a severe limitation for trying to regenerate aging aspen stands – most in the area are old, with over 50% of large stems dead. White fir understories seem to be taking over



The lack of a market for aspen is a severe limitation for trying to regenerate aging aspen stands.



A current fencing approach using alternating strands of barbed and unbarbed wire strung along 6' tall stumps of harvested trees

some sites, except in large stands where the stand-originating fires were large enough to remove nearby seed sources for white fir.

Dispersion of elk (or lack of dispersion) may be more of the issue than total population. Public lands seem to have better aspen regeneration, as elk disperse in response to a wide range of land use (road traffic, ATVs, hikers, cattle management). Private lands have less disturbance for elk, who respond by spending more time in most-preferred locations (and bigger impacts on aspen).

Brush fences cost about \$300/acre protected, and wire fences are down to about \$150/acre. A current approach uses alternating strands of barbed and unbarbed wire (about 1' spacing) strung along 6' tall stumps of harvested trees (picture above). Some portions of harvested units can remain unfenced, providing habitat for elk (and an opportunity to learn about the response to browsing on a case-by-case basis). Fencing protection is important for about 10 years after harvesting. Removal of fences after 5 years has resulted in complete loss of regenerating aspen.



La Jara Reservoir

THE RESERVOIR is on State Trust Land, managed by the Colorado State Forest Service. A variety of harvest units (up to 12 acres or so) have all had good aspen regeneration, whether stand partially cut or intensely cut. The area is used for cattle grazing as well as elk (and some deer). One section south of La Jara Reservoir (section 16, Osier Mountain Section) had great aspen regeneration when the section was open for recreation and hunting.

After fencing removed cattle and the area was leased for low-intensity hunting, reducing human presence, the aspen were browsed suddenly down to knee-height. A low winter snowpack may have contributed to the heavy browsing.

After fencing removed cattle and the area was leased for low-intensity hunting, reducing human presence, the aspen were browsed suddenly down to knee-height.

Previous page: Aspens in New Mexico.

Below: A bull elk browses in an Aspen grove.

Photos from Adobe Stock.



Sargents Wildlife Area



Sargents wildlife area near Chama in July 2015.

SARGENTS IS A STATE GAME refuge northwest of Chama. The refuge has living aspen that are relatively short, and many dead aspen. Many suckers (sprouts) appear to grow each year, but heavy browsing prevents transition in to tree-size classes. The site is located along a major seasonal elk migration route, with a resident elk herd. Numerous stumps (likely ponderosa pine) date from railroad logging early in the 20th century. The site could have been a ponderosa pine forest in 1900, with aspen in the understory that had been suppressed

by frequent fire; with removal of the pine and the fires, the aspen grew to tree-size. If this is correct, the current aspen stand is something of an artifact of past human activity.

Some harvesting might be attempted to regenerate aspen stands, but this site has little potential for a good outcome. The aspen are unhealthy, growing on a marginal site for aspen, and subjected to chronic heavy elk browsing.

Some harvesting might be attempted to regenerate aspen stands, but this site has little potential for a good outcome.

Canjilon Lakes

CANJILON LAKES are located in the Tusas Mountains east of the town of Tierra Amarilla, N.M. The Tusas range is an extension of Colorado's South San Juan Mountains. The landscape around the lakes is gently rolling, underlain apparently by shale substrates, covered with aspen forests, Gambel oak woodlands, and meadows. Almost all of the aspen appeared declining, with conspicuous dead stems in almost every stand. Many cottonwood trees along small streams also had dead tops, likely a result of drought in the 2000s.

As in the surrounding landscape, the aspen forests at the USFS Canjilon Lakes campground has been subjected to severe mortality of mature trees. Falling trees became a safety hazard; in fact, a fisherman was killed by a falling aspen tree. The US Forest Service closed the campground and removed an enormous quantity of wood. Where the dead trees were removed, the aspen has sprouted from the roots and the sprouts are growing well. Despite the relative abundance of elk in the general area, the snow is deep enough to exclude elk in the winter, and elk avoid the campground in the summer because of heavy human activity. It appears that the combination of cutting plus exclusion of elk is producing a favorable regeneration of the aspen forests in and near the campground.



Top: The landscape near Canjilon Lakes in July 2015.

Middle: The Canjilon Lakes campground, where trees were harvested intensively following the death of a fisherman from a falling aspen. 2015.

Bottom: A healthy stand of regenerating aspens in a campground area that had been cleared. 2015.

Red Rabbit Ranch



Above: Landscape of Red Rabbit Ranch looking south from the Ranch Headquarters in July 2015. Bottom right: A healthy-looking aspen stand on the Red Rabbit Ranch in July 2015.

THE RED RABBIT RANCH is located north of Canjilon Lakes, not too far from the Brazos Cliffs & river gorge. The ranch comprises a couple thousand acres and a large elk herd is present in the general area. This landscape view (above) is looking south from the Ranch house, showing extensive areas of declining aspen on the far ridge, much like the area around Canjilon Lakes. This photo was taken at a lower elevation than the photo at right.

Aspen forests appeared generally healthy at higher elevations on the Red Rabbit Ranch, though some less healthy stands were also visible at similar elevations. The photo at right was taken at

the approximate ecotone between aspen-white fir-Douglas-fir forest and Engelmann spruce-corkbark fir forest, on a generally south-facing aspect. The aspen stand contained numerous dead or dying stems, but these were mostly smaller stems that appeared merely to be losing out in competition with the larger dominant stems, while most of the large dominant stems appeared healthy. The understory was a dense cover of *Symphoricarpos* sp. and other shrubs and herbs. Deep winter snow keeps out elk.

Higher up on the Red Rabbit Ranch, in the subalpine zone, the aspen also looked generally healthy (though not the fir and spruce).



Rancho del Oso Pardo

RANCHO DEL OSO PARDO is in Colorado along the New Mexico border north of Chama. The large ranch encompasses forests extending from near the lower forest ecotone into the subalpine zone.

Numerous elk inhabit the Ranch, especially during hunting season when the animals move onto the Ranch from adjacent

national forest lands. A deep snowpack may limit elk access in winter. **A series of experimental aspen treatments have been applied during the past 10-15 years.** Harvest sites spanned a gradient from good regeneration without fencing to poor regeneration with fencing.

TREATMENT

Declining aspen forest clearcut + only partial brush fence

OUTCOME

Good aspen regeneration

They harvested an aspen-mixed conifer forest, and built a slash fence along just the downhill side of the cut, visible in the photo below. However, the side to the left of the unit was left unfenced. The aspen regenerated well and appear to be thriving.



TREATMENT

Mixed forest clearcut + complete slash fence

OUTCOME

Good aspen regeneration

An aspen-mixed conifer stand on the west side of the Ranch was clearcut 5-10 yr ago, and a fence was constructed from the slash. Aspen sprouted on both sides of the fence: now it is heavily browsed and suppressed outside but is thriving inside the fence. Even a well-constructed fence deteriorates over time, and elk were beginning to get into this several-year-old enclosure.



Given that not all of the current stems need to grow to tree-size, some elk browsing may not be a problem. When elk begin to enter a regenerating stand like this, they create trails through the stand where they heavily browse the stems, leaving other portions less browsed. If the fence were removed entirely, larger numbers of elk would be expected to begin browsing on the trees along the margins, then work their way progressively through the stand, effectively destroying the regeneration.

TREATMENT

Mixed forest clearcut + complete slash fence

OUTCOME

Good aspen regeneration except in landing

The site in the photo at right is near the site in the photo at the bottom of page 19, and was treated in the same manner at about the same time. The lack of aspen probably results from soil compaction, as this area was used as a landing for the harvesting operation.



TREATMENT

Declining aspen forest clearcut + only temporary slash fence

OUTCOME

Good aspen regeneration

This site on the east side of the Ranch was clearcut and fenced 5-10 yr before the picture was taken, and the fence was removed a few years after the harvest. Some browsing occurred after the fence was removed, but not enough to impair the successful regeneration of the stand. Interestingly, the harvest extended into the foreground of the photo to about where the large conifer is seen on the left, but the fence followed the edge of what is now the regenerating stand. The aspen sprouted on both sides of the fence, but were heavily browsed and suppressed outside the fence, and remained suppressed.



TREATMENT

Clearcut + slash fence

OUTCOME

Good aspen regeneration inside + dense but suppressed sprouts outside

This is another site where aspen is regenerating well inside the slash fence but is being heavily browsed outside. What is somewhat different here is that the browsed sprouts outside the fence are more abundant, taller, and seemingly more vigorous than the sprouts outside the fences at other sites.



TREATMENT

Clearcut + slash fence

OUTCOME

Good aspen regeneration then decline when fence was breached

Once elk got into the previously fenced area, they browsed the aspen sprouts heavily. The treeless area in the center is a small wet meadow that never had aspen, but the post-harvest aspen sprouts at the far end were almost completely dead.



TREATMENT

Clearcut + slash fence

OUTCOME

Poor regeneration despite browsing protection

Two small clearcuts can be seen on the hillside across this little valley. Both were enclosed by a slash fence, and both failed to regenerate. The forest and the treatment look very much like the other forests on Rancho del Oso Pardo where the same kind of treatment was very effective at regenerating an aspen stand. The difference remains unexplained.



Jemez Mountain



A trail through a meadow in the Jemez mountains. Stock photo.

HIGH ELK POPULATIONS became a concern in the region in the late 1990s, as elk impacts on vegetation were apparent, and increasing numbers of vehicle collisions with elk raised human safety concerns. New Mexico Game and Fish responded to pressure and converted the single elk unit into 3 units, and greatly increased harvests. The elk numbers now are much lower than in the 1990s.

A series of large, severe fires (Dome fire in 1996, Cerro Grande in 2002, and Las Conchas in 2011) created massive open

areas, and aspen regeneration in the region has been very successful.

Browsing limits aspen regeneration in some areas, but typically good regeneration is seen within 100 m or so, with no landscape-scale problems. Elk seem to browse aspen in late winter/spring, when aspen shoots may be the most nutritious food available. Impacts seem higher in winter range; warmer winters have allowed elk to remain higher, essentially spreading out their winter impacts over larger areas (they even over-



A series of large, severe fires created massive open areas, and aspen regeneration in the region has been very successful.

winter sometimes in the Valles Caldera). In the Caldera, aspen browsing seems very heavy, though aspen regeneration may be good in areas burned in the Las Conchas and Pajarito fires.

Aspen may have increased its “footprint” in the 20th century as a result of fire cessation. Aspen occurs in most mixed conifer forests, but aspens dating to the mid-19th century are uncommon. Perhaps pre-1900 aspen may have been shrubby (always recovering from fire), and these shrubs turned into trees with the cessation of fire. But there are also a few locations with old growth aspen stands (at least before the Las Conchas fire), including some more than 250 years old.

Although there are not landscape-scale problems with aspen regeneration, these pictures show some interesting points for small-scale (100 m) regeneration.

The enclosure in the **top photo** (left side) clearly shows a major browse impact –



aspens crowd the fence inside, and are absent outside (to the right). But another corner of the same enclosure, in the **bottom photo**, (up the hill, about 50 m from

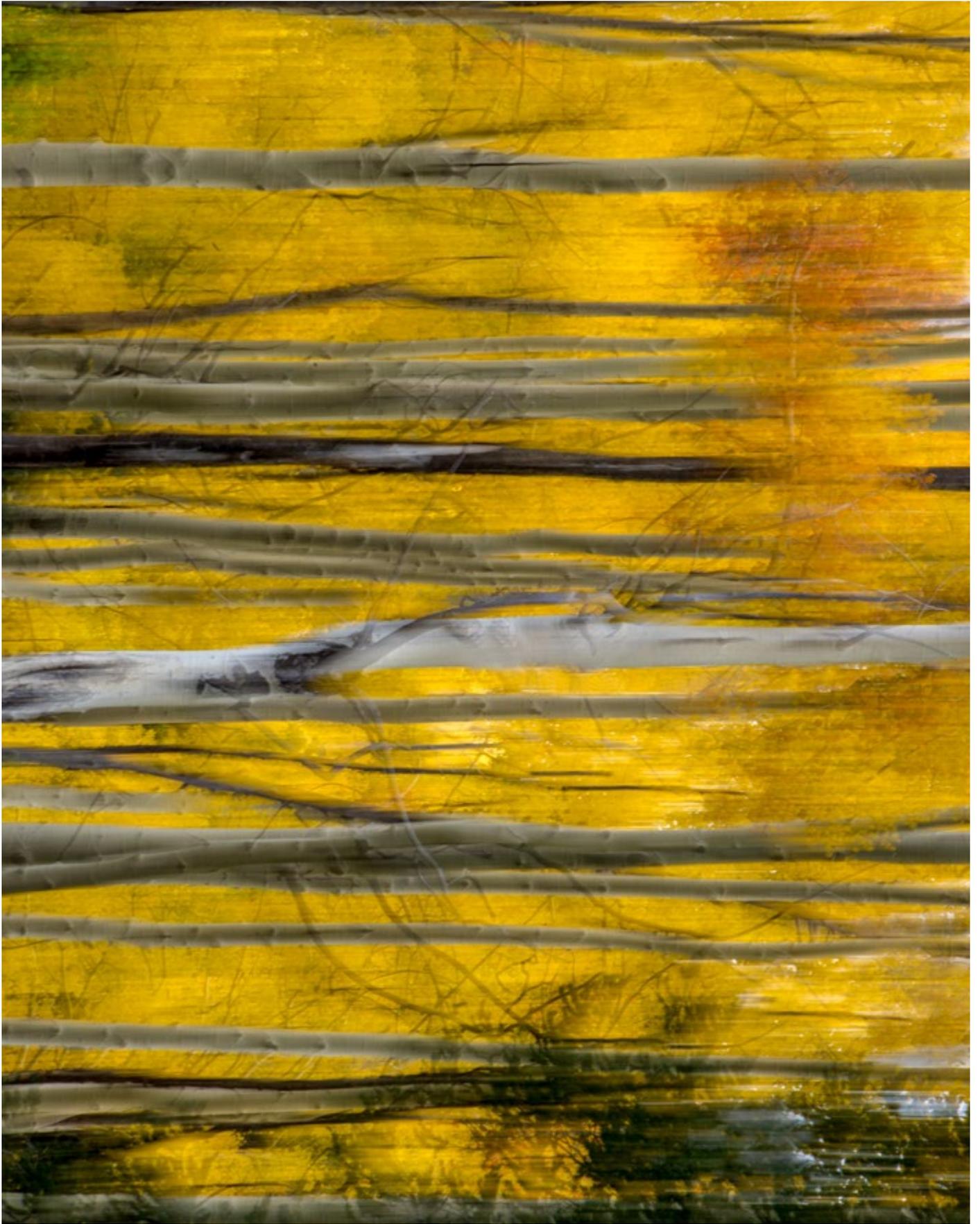
the top photo) shows similar regeneration inside the fence (right side of photo) and outside.

In the enclosure seen in the **top photo**, some of the old generation of aspen survive. The 6-m tall cohort came in after the Cerro Grande fire (2000), but most were killed in the 2011 Las Conchas fire. The youngest cohort (2-4 m tall) are the post-Las Conchas-Fire cohort.

The regenerating cohort in the **middle photo** comes from the 2011 Las Conchas fire. The tree size is smaller moving away from the tall trees, and browsing intensity now seems to prevent the short suckers from becoming trees. It might appear that the age of suckers declines with distance from the tall trees, but close examination showed the suckers were the same age and the height difference reflected elk browsing. Regenerating aspen at the edge of a patch seem to be browsed substantially more than in the center, giving this sort of outcome.

At high elevation in the Valles Caldera (the **bottom photos** are from near the top of South Mountain), the widespread aspen within the mixed conifer forests send up abundant of suckers, but they seem to be uniformly browsed down. The suckers were an impressive 1 m in length (current season growth), with big leaves (esp. in sunnier locations). At right is a picture of a meter-long sucker. The photo at left provides a broader view of the slope where the abundant suckers are all browsed.





Sangre de Cristo



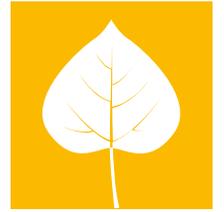
Thick clouds gather on the Sangre de Cristo mountains above Great Sand Dunes National Park.

THE SANGRE DE CRISTO Mountains are the southernmost sub-range of the Rocky Mountains, stretching over 240 miles north to south across the Colorado-New Mexico border.

We did not have a chance for a close look into aspen regeneration for the southernmost areas of the Sangre de Cristo Mountains in New Mexico. Impressions shared with us are that environmental conditions are prime in this area for aspen, and aspen regeneration does not have widespread problems. The Taos

ski area has abundant aspen sprouts in open areas, but very heavy browsing that might limit aspen regeneration. The mountains near the Pecos River seem to have very good regeneration, including the area burned in 2002 in the Viveash Fire. The Sandias Mountains have good aspen regeneration, and no elk.

Our investigations in the northern portions of the Sangres are summarized in the remainder of this section.



Great Sand Dunes and vicinity

Following the 1974 Zapata Falls Fire saw substantial aspen regeneration, as did the 2000 Sand Fire that burned near the park Visitors Center. Aspen regeneration after the Sand Fire was better than cottonwood regeneration, which may have been preferred browse. The Medano Creek Fire in 2010 also was followed by good aspen regeneration; heavy use by the public may have ensured dispersed use by elk.

The Zapata Falls Subdivision has decent aspen regeneration, even with large numbers of deer (and no hunting). Fuel reduction treatments have led to good aspen regeneration (where aspen was present before operations).

In this stock photo of the Medano Pass Road in Great Sand Dunes National Park you can see good aspen regeneration following the Medano Creek Fire, along with evidence of the public use that likely reduced elk browsing pressure.



Vermejo Park Ranch



Aspens and conifers at the edge of an alpine meadow on Vermejo Park Ranch. Photo courtesy of Vermejo Park Ranch.

ASPEN OCCURS at higher elevations of the Ranch, though overall aspen is a small component of the vegetation. The Ranch was historically grazed heavily by cattle (currently moderately grazed by bison), and deer populations have increased with large impacts on riparian vegetation. Aspen regeneration is rare on the Ranch; the best aspen regeneration is in the high country on the edge of mountains where the winter snowpack is more consistent (for example in the 7 Lakes area). Many large aspen in the upper reaches of small streams have died from drought, and suckers were browsed.

Browsing pressure seems to be greatest in areas where elk cows (and calves) congregate, especially in areas of low snowpack – and most of the Ranch is low enough that many elk remain at the Ranch’s upper elevations most of the winter. Years with less than about 10” of snowpack (such as 2017/2018) allow elk to stay high on the Ranch all winter. The season of browsing seems to be mostly in the autumn, when the nutritional value of the aspen may be high and that of herbaceous forage is low. The secondary impact might come in winter/early spring when aspen browse may be the best

available (even if not as good as in the autumn).

The Spring fire (which merged with the Fisher fire into the Trinidad Complex fire) burned 2000-3000 acres on the Ranch in 2002. Abundant resprouting aspen were all browsed, and entire clones may have died. A prescribed fire in 2010 led to prolific aspen sprouting, but all suckers (outside exclosures) were eaten.

Trinchera Blanca and Tercio Ranches

IN THE MID 20th CENTURY, heavy browsing by cattle and sheep suppressed aspen regeneration. Populations of elk and deer increased later in the century, continuing browsing pressure on aspen despite reductions in livestock. Droughts became more pronounced after 2000, and winters have mostly been very mild for a decade or two, lengthening the time elk spend at high elevation. Elk remained at 10,000 to 10,500' all winter in perhaps 10 of the past 12 years.

Almost no aspen regeneration has been occurring on Trinchera Blanca Ranch, outside fenced exclosures (at all elevations). Some aspen regeneration is apparent on the Trinchera side (south of highway 160), including along the outside edges of fenced exclosures. A fire in 2006 on the Blanca side had almost no aspen regeneration, and the heavy browsing might have come from deer rather than elk.

In the 1990s there were two areas cut in wet locations with aspen (winter harvests, Nov-Feb), one (Trinchera Creek) regenerated well but the other one (American Gulch, most likely on the N. Fork side) was all consumed, without a good explanation for the different responses.

Clearcutting generally does not lead to successful aspen regeneration without fencing. Aspen suckers continue to be produced after stands are harvested, but elk browsing prevents them from becoming tree-sized.

A brush fence allowed abundant aspen regeneration. The timing of fence construction is important, however. The regenerating patch of aspen seen in the **bottom photo** is in an exclosure erected within the year following a wildfire. The exclosure was enlarged a few years later, shown in the **top photo**, but the loss of vigor (from several seasons of browsing) severely limited the ability of aspen outside the original exclosure to regenerate even when protected from browsing.

Clearcutting generally does not lead to successful aspen regeneration without fencing. Aspen suckers continue to be produced after stands are harvested, but elk browsing prevents them from becoming tree-sized.



Credits

WE GREATLY APPRECIATE the time people made available for discussions of concerns about aspen across southern Colorado and northern New Mexico. Aspen forests are a high priority for people and communities, and the shared insights helped us pull together a larger story about aspen. Our summary could not fully capture the insights of the people we visited, but we hope the summary might spur more insightful conversations and maybe some new ideas to try. In particular, we'd like to thank the following people:

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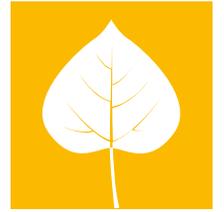
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Aspen leaf icon by parkjisun from the Noun Project

Collaborators



The Uncompahgre Partnership



Participants at the New Mexico Aspen Workshop in July 2015.

Aspen

