Draft Lava Comments

Submitted by Larry Hicks, Chairmen, Wyoming Senate: Agriculture – Public Lands – and Water Resource Committee.

In General: Overall the document is inadequate in portraying the negative consequences of the no action alternative on the physical environment with regards to fire and lost water yield. Subsequently it lacks depth and sufficiency in addressing the economic consequences of doing nothing! Conversely it also is deficient in documenting both the economic and ecological benefits of implementing the projects. Most problematic is the overall discussion of the issues of water yield and the inappropriate application of the ECA procedure. It can not be understated the vital importance to the State of Wyoming and water users the issue of water yield and how it is negatively portrayed in the LaVA DEIS. Further the LAVA DEIS does not reference nor follows the December 2, 2005 USFS Guidance letter for the Platte River Recovery Implementation Plan (PRRIP) by then Regional Forester "Rick Cables. (See appendix B @ this link) https://www.fws.gov/platteriver/Documents/Fed%20Depletion%20Plan.pdf) (Specifically items # 2, 4, and 5 outlined in the letter are directly affected by the LaVA DEIS and should be include in any discussion on the affects of LaVA on water yield and endangered species in the Platte River Basin.

History of Forest Management & Water Yield in the North Platte Watershed.

Using an ECA threshold ignores the variability among sub-watershed in their natural vegetative disturbance cycles. Thus each sub-watershed has a background level of vegetative disturbance that over time contributes to a background ECA (Ager and Clifton, 2005 USDA-FS Pacific NW Research Sta. General Technical Report PNW-GTR-637)

The LaVA DEIS fails to reveal to the reader the history of the project area with respect to the altered hydrology substantially outside the historic range of variation (HRV) or what the natural background ECA has been. Rather the DEIS presuppose that the conditions on the ground as they exist today are "normal" and therefor are the "baseline" for the management of the forest in the project area with regards to water yield associated with ECA. This is not the case, since the bench mark year of 1860 185,000 – 225,000 acre feet of water per year (20% reduction) has been lost due to increased forest vegetation growth outside the

HRV on the Medicine Bow and Routt National Forest (see link for "Estimating Additional Water Yield from Changes in Management of National Forest in The North Platte River Basin, C.A. Troendel & J.M. Nankervis, May 2000") The report further states that through sustainable management of selective forestry harvest practices in a 120 year rotation that an approximate 50-55,000 acre feet increase of water yield off the forest could be sustained.
https://platteriverprogram.org/sites/default/files/PubsAndData/ProgramLibrary/Troendle%20and%20Nankervis%202000_Estimating%20Additional%20Water%20Yield%20in%20North%20Platte%20Basin.pdf

Leaf (1999) used a combination of long-term USGS stream flow data and NRCS snow course data document diminished stream flow in the North Platte river as a result of the long-term effects of increased vegetation growth and increased forest density.

The historic levels of peak discharge and water yield were certainly much higher then than now. Subsequently the geomorphology of the stream systems evolved with high water flows and any flow increases with disturbance above the 25% are likely well within the HRV or what the natural background ECA would have been in many if not all of the 70 sub-basin in the Lava project area.

Limitation of the ECA Model:

The assumption of the use of the 25% cap on ECA is that increased water yield, particularly increased peak flows, will have deleterious effects on stream geomorphology and subsequently increased impacts to water quality. A thorough review of the literature does not support this assumption. Rather the literature is replete with examples where large variation in observed vs predicted ECA water yield occurred. King 1989 suggested that rather than use the ECA models which puts limits on the maximum monthly steam flow during spring snow melt that limits should be placed on expected increases in instantaneous peak or maximum daily streamflow would be better for protecting potential channel erosion. It is important for the reader to understand that increase water yield and increased peak stream discharge **are not the same and cannot be used synonymously** when evaluating the potential for channel erosion. Channel forming events are referred to as "bank-full discharge" this is the level of flow that forms the normal stream channel on some reoccurring cycle. Work by Troendle and King 1985,

Troendle & Olsen 1994, Troendle et. al. 1998 demonstrated that in the Fool Creek Watershed experiment on the Frazier Experimental Forest, CO where 40% of the trees were harvested there was a corresponding 40% increase in water yield and an increase in peak flow but those peak flows where not significant. Rather the increase in yield came from an extended duration of bank full discharge from an average of 3.5-days pretreatment to 7 days following harvest. King 1989 also recommended that in N. Idaho that a 69% increase factor be used for moderately deep soils in the 5-6000 foot elevation zone in addition to making further adjustment in the model based on the slope and aspect of the treatment areas, thereby demonstrating the large range of variation in the model and the need for local calibration on sub-watersheds.

"Equivalent Clearcut Acres (ECA) is a modeled estimate of water yield associated with both natural and anthropogenic influence on forest canopy cover. It does not model peak discharge, sediment production and transport. To do these calculation hydrologist and forest managers must use additional models, indices, physical measurements, monitoring, site specific data, and professional judgement to model individual watershed variables to analyze the cumulative effects" (Cain and Tincher, 2007)
https://www.bpa.gov/efw/Analysis/NEPADocuments/nepa/Libby/Appendices/AppendixB_WaterYieldModelingFinal.pdf

Ager and Clifton 2005 definitively state "the ECA model is best used in conjunction with other relevant data to further assess potential for changes in water yield and peak flows, and impacts to stream channels and riparian areas". Included among these are "field data on climate and streamflow data from near by stations, including timing and volume, steam survey data should be used to assess channel stability." There is nothing in the LaVA DEIS that a reader can find that shows that this data has been collected for each of the 70 sub-watersheds to which the 25% ECA has been established.

The observed response to timber harvest on peak flows varies widely as demonstrated by the work of MacDonald et.al. (1997) and Austin (1999); Macdonald et al. reviewed over 120 publication that represented over 60 research sites and 120 treated catchments. MacDonald reported no consistent relationship between the percent of a basin that had been harvested and percent

change in peak flows. Austin (1999) further evaluated the literature regarding paired watershed studies and the changes in peak flows associated with timber harvesting. Austins literature search summarized 39 studies that covered 80 study basins. The observed effects of harvesting on peak flows ranged from reduction of -36 to an increase of 563%

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.161.939&rep=rep1&type=pdf

The appropriate use of ECA and where it is most beneficial is for modeling the effect of alternative management actions, Ager and Clifton 2005. The 25% ECA used in LaVA is an arbitrary number that establishes percent of disturbance in a sixth order level watershed that is inconsistent with the natural forest process and normal historic range of variation across the 70 different sub-watershed in the project area, especially in lodge pole pine forest types that have evolved with large stand replacing fire. Review of other forest plans in the western U.S. revealed there is no consistence application or requirement to establish an ECA in the plans and the plans that utilized an ECA ranged from 0 - 30%. There are 70 sixth order watersheds in the LaVA project area that have a wide range of soil type, slope, aspect, vegetation cover type, precipitation, geology, average elevation, size of the watershed all of which effect the hydrology of the watershed. In addition, channel geomorphology and channel stability vary greatly and the ECA model does not allow for differences considering these factors. In addition to the physical aspects of the watershed the pattern or juxtaposition of the disturbance within the watershed may also affect the timing, amount, and distribution of water yield from the watershed. In both the Deadhorse Creek and the Coon Creek (Encampment River Watershed on the MBNF) experimental forest research projects some clear cuts were shown to actual decrease snow pack due to wind scour where they cross ridge lines resulting in an actual decrease on net accumulation in the watershed (Troendle 1998, Troendle and Nankervis, 2000) King in 1989 also noted that on a south aspect watershed in Idaho that the ECA model underestimated pre-harvest water yield stating the results emphasis the need to have reliable local precipitation and streamflow records to calibrate relationships in the ECA procedure. In the LaVA DEIS there is no exhibit that documents that all of the 70 sub-watershed have either adequate precipitation or streamflow records to adequately calibrate the ECA procedure. Troendel, 2000

document significant difference in water yield between tree species and difference in water yield in the same species due to variation in age class on the MBNF. The greatest increase in water yield was in spruce-fir communities and least in limber pine communities. The application of the a 25% ECA across all watershed is a very broad brush establishing a homogeneous application to very divers landscape that is inconsistent with the historic range of variation among the 70 different watersheds. This is especial true given the nature of much of the project area vegetation types have disturbance-based ecology in the aspen and lodgepole pine communities.

Bark beetles, Climate Change, and Watershed Condition

There has been much speculation regarding the impact of bark beetle tree mortality on the Medicine Bow National Forest with regards to the impact on water yield. Recent research (2015) on the Medicine Bow National Forest by the University of Wyoming with regards to Water yield state "Surprisingly we found relatively little impact of the mortality even on watershed response due to the spatial and temporal patchiness of the mortality and the fast recovery of the individual patches. These spatial and temporal scaling issues provides and explanation for why the results are different from many other studies on forested watersheds that have more uniform mortality or simulated mortality as uniform *(i.e timber harvest)*. Our Results suggest that extreme caution should be taken when simulating models assume that the bark beetle removed tree transpiration in the same manner as clearcutting or fires (Ewers et al. 2015, http://www.uwyo.edu/owp/_files/finalrpt41ewers.pdf)

Not only is the MBNF the headwaters of the North Platte River it is also the headwaters of the Colorado River on the west slope of the Continental divide. Research form Colorado State University at the Colorado River Institute found the period from 2000 to 2014 is the worst 15-year drought since 1906, when official flow measurements began. During these years, annual flows in the Colorado River averaged 19 percent below the 20th-century average. During a similar 15-year drought in the 1950s, annual flows declined by 18 percent. But during that drought, the region was drier: rainfall decreased by about 6 percent, compared to 4.5 percent between 2000 and 2014. Why, then, is the recent drought the most severe on record?

The answer is simple: higher temperatures. From 2000 to 2014, temperatures in the Upper Basin, where most of the runoff that feeds the Colorado River is produced, were 1.6 degrees Fahrenheit higher than the 20th-century average. This is why we call this event a hot drought. High temperatures continued in 2015 and 2016, as did less-than-average flows. High temperatures affect river levels in many ways. Coupled with earlier snow melt, they lead to a longer growing season, which means more days of water demand from plants. Higher temperatures also increase daily plant water use and evaporation from water bodies and soils. In sum, as it warms, the atmosphere draws more water, up to 4 percent more per degree Fahrenheit from all available sources, so less water flows into the river.

Knowing the relationship between warming and river flow, we can project how the Colorado will be affected by future climate change. Temperature projections from climate models are robust scientific findings based on well-tested physics. In the Colorado River Basin, temperatures are projected to warm by 5°F, compared to the 20th-century average, by midcentury in scenarios that assume either modest or high greenhouse gas emissions. By the end of this century, the region would be 9.5°F warmer if global greenhouse gas emissions are not reduced.

Using simple but strong relationships derived from hydrology models, which were buttressed by observations, we and our colleagues calculated how river flows are affected by higher temperatures. We found that Colorado River flows decline by about 4 percent per degree Fahrenheit increase, which is roughly the same amount as the increased atmospheric water vapor holding capacity discussed above. Thus, warming could reduce water flow in the Colorado by 20 percent or more below the 20th-century average by midcentury, and by as much as 40 percent by the end of the century. https://source.colostate.edu/climate-change-shrinking-colorado-river/ (2017).

Of the 70 watershed identified in LaVA 14 are listed as have hydrologic impacts associated with reduced quantities of water associated with water diversion or other anthropogenic activities. What is the irony that the FS has indicated negative hydrologic impacts but institutes a limitation in the management (25% ECA) of these watershed that could remediate some of the negative impacts. There is no explanation in the DEIS that address the

issue of using management practices in these watersheds that would offset the current negative impacts. This is inconsistent with the Standard 6 and 8 in the MBNF LRMP.

Summary and Recommendation:

The effects of climate change, the constrains of the 25% ECA cap on watershed that are already at risk as a result of dewatering and the associated declining hydrologic regimes on the aquatic environment and the effects to endangered species downstream were not analyses.

"ECA statistic encapsulates the history of vegetative disturbance within a watershed and can provide a broad indicator of potential for change in water yields…..However, ECA is one of many measures of watershed health and is not directly predictive of increased peak flows or impacts to streams. The ECA procedure has many criticisms owing to the inadequate explanation of the ECA analysis in environmental documentation, lack of standard procedures for its calculation, and lack of interpretation using collateral data. A consistent relationship between the ECA statistic and hydrologic variables (peak flow and water yields) has not been established (Beschta et al. 2000, Scherer 2001). Using one ECA threshold (*in Lava DEIS 25%)* ignores the variability among sub-watersheds in their vegetative disturbance cycles, Ager and Clifton, 2005 (https://www.fs.fed.us/pnw/pubs/pnw_gtr637.pdf). Ewers et al. 2015 was unable to detect increases in water yield of the MBNF and caution against using beetle mortality in calculating water yield with models.

Both MacDonald et al. (1997 and Austin (1999) identified large amounts of variability in the response of peak flows to timber harvesting. Furthermore, few strong relationships between watershed characteristics or management activities were identified. Therefore, no single variable such as the amount of forest cover removed, harvesting method, or silviculture system (e.g. clear-cut, shelter wood, partial cut, etc.) was identified that "quantitatively" described changes in peak flows associated with timber harvesting. This is consistent with Church and Eaton's (2001:33) statement that "Generalization in complex science, such as ecology and environmental science are usually of this nature. Extracted from the particular circumstances of individual sites and the event, conclusions commonly can be offered only in qualitative terms".

Subsequently as this applies to the use of ECA it should not be used as an absolute quantitative limit but rather the 25% should be used as the qualitative measure that it is. Therefore the 25% ECA should be consider as a trigger to initiate adaptive management prescriptions with robust field verification of actual on the ground conditions that would allow management action accordingly.

History of the Legal and Political Issues Associated with Water Yield associated with Forest Management.

Following are excerpt from the book "Implementing the Endangered Species Act on the Platte River Water Commons" by D.M. Freeman, 2010 university Press of Colorado.
(https://books.google.com/books?id=2sG9AwAAQBAJ&pg=PT310&lpg=PT310&dq=coalition+for+sustainable+resource+vs+USFS&source=bl&ots=6uIWJOocgI&sig=D_VKC2jCflQurLP5qyLgt3VCkhA&hl=en&sa=X&ved=2ahUKEwjFqc7u0-LcAhVD7IMKHQreChoQ6AEwBXoECAQQAQ#v=onepage&q=coalition%20for%20sustainable%20resource%20vs%20USFS&f=false)

FORESTS AND WATER

Studies have shown a substantial increase in forest vegetation density relative to the pre-settlement (pre-1850) and European settlement (1850–1900) periods (MacDonald 2002: 6–8; MacDonald, Stednick, and Troendle 2003; Stednick 1996; Troendle and King 1987; Troendle and Nankervis 2000; Troendle, Nankervis, and Porth 2003). In general, the greatest increase in vegetation density tends to occur in lower- to mid-elevation ponderosa pine and mixed conifer forests—those most susceptible to wildfires. In his summary of the literature, Lee MacDonald (2002: 6) noted that logging (without respect to cut patterns, such as clear-cuts of large patches and clumps or removal of single trees scattered across a stand) tends to increase water yields in proportion to the percentage of the forested canopy removed. This relationship holds as long as the cut areas are not exposed to wind scour that produces high rates of evaporation. Therefore, as forest density increases, forest water yields downstream tend to diminish. The potential for increased yields is generally greatest on north-facing slopes, as they exhibit the greatest density and highest rates of snow retention.

The States' Case

> [U.S.] Forest Service staff seem to think that since they have not opened a headgate to divert water, there is no depletion.
>
> —VIEW OF WATER USER, AUGUST 21, 2001

Some kind of federal depletions replacement plan was needed. It was in the context of putting the plan together that debate erupted about the USFS's management of vegetation in Platte Basin watersheds. This mobilized water users to call for the USFS to develop a portfolio of water with which to repay Platte Basin streams (Bucholz 1999; Leaf 1999a, 1999b) and to contribute significantly to replacing the agency's historical depredations to water flows. Later, especially during the years 2004–2006, in the context of piecing together the federal post-1997 future depletions plan, the debates again intensified.

The states were willing to work with federal agents in hammering out proposals for replacing federal agencies' many small depletions—for example, those associated with campgrounds, stock tanks, wetland rehabilitation, and fish hatcheries. But for them, there was an elephant in the room that the federal community wanted to ignore—historical and future depletions to water yields produced by Platte Basin watersheds administered by the USFS, a fraction of which was attributable to agency management practices.

State representatives, pushed hard by their constituents, asserted that the U.S. Forest Service was imposing depletions on Platte River waters by virtue of conscious policy decisions to permit the thickening of forest vegetation, thereby causing diminished water flows downstream. They wanted the USFS to join the negotiations, take responsibility for their evolving balance of accretions and depletions over time, and do what the states were being asked to do: be accountable for replacing net depletions. Most of all, the states sought a way to ensure that future agency management practices would not impose new depletions that would undercut state efforts to meet their target flow requirements. The agency, in turn, consistently resisted involving itself in any such discussion. Further, it did not want to join the states in constructing a water plan to serve listed species in central Nebraska. The states cried foul.

At this same time water user had had enough and filed a lawsuit in the Federal District Court of Wyoming.

(*Coalition for Sustainable Resources v. U.S. Forest Service*, 48 F. Supp. 2d 1303 [D. Wyo. 1999]) (Coalition for Sustainable Resources 1999).

The purpose of the lawsuit was to compel the USFS to improve water yields in Platte Basin watersheds, especially those in the Medicine Bow National Forest, for the benefit of Endangered Species Act (ESA) listed species in Nebraska. Specifically, the lawsuit held that the U.S. Forest Service was knowingly causing an increasing depletion of basin rivers and thereby was unjustly requiring state water users to offset depletions imposed by federal forest management. The U.S. District Court dismissed the lawsuit on the grounds that it was not "ripe." The USFS would presumably work out an accommodation with the actors participating in the habitat recovery program that had not yet been completed. Therefore, it was not appropriate for the court to intervene. The coalition then filed an appeal in the U.S. Tenth Circuit Court of Appeals on August 7, 2001 (Coalition for Sustainable Resources 2001; details at http://colo.washburnlaw.edu/cases/2001/08/99-8060.htm), which affirmed the Wyoming district court's earlier ruling and dismissed the case for lack of ripeness.

Deeply frustrated and having just lived through a severe drought year (2002), members of the coalition used their strong links to the Wyoming State Legislature to formulate and pass a joint resolution on the matter. In the words of one coalition member, the legislature "blasted the U.S. Forest Service" for its position (Joint Resolution 2003). In endorsing the resolution, the two legislative houses noted that over the years the federal government had ignored repeated appeals from Wyoming water users for relief from diminished water flows imposed by USFS policies that led directly to what they viewed as "national forest overgrowth." That "overgrowth" served no legitimate federal or state purpose and was, the resolution asserted, depriving the state of Wyoming of its legal entitlement to waters as promised by the 1897 Organic Administrative Act. The resolution gave the federal government 180 days from the date of its passage to respond appropriately, after which the legislature would direct the governor to ask the Wyoming attorney general to consider preparing, filing, and pursuing a lawsuit on behalf of the state to—among other things—compel the U.S. Department of Agriculture and the USFS to take actions appropriate to the outcome of the possible lawsuit.

Because the development of the MBNF Land Resource Plan was on going and the State of Wyoming was a cooperating agency no lawsuit was filled. However,

subsequent to the Record of Decision (ROD) a coalition of counties and conservation district who were also cooperating agencies appealed the ROD on several issues including the issue of water yield. (See MNBF Chiefs Appeal Decision – Revised Forest Plan Water Resource Management Direction – White Paper).

The dismissal of the lawsuit over the effect of forest management by the 10th circuit of appeals was not based on either the science or feasibility to implement forest management to increase water yield. Rather the case was dismissed because "it was not ripe" in essence no injury had occurred. The question over injury is referenced below.

Current Situation: "Injury and the cost of supplemental Water in the North Platte River Basin as a result of lost water yield from Forest Management Activities".

In the 2003 ROD in the FEIS for the MBNF LRMP estimated that implementation of the plan would result in the reduction of an additional 27,000-acre feet water yield.

Starting in 2004 the State of Wyoming instituted the most rigorous scientific investigation of weather modification in the U.S. through cloud seeding in the Little Snake and Upper North Platte river basin. The program cost the state of Wyoming over $14M to conduct and scientifically validate the effects of weather modification Sierra Madre and Snowy Range Mountains mostly on the MBNF. Starting in 2018-19 the State of Wyoming, municipal and agricultural water users in both Colorado and Wyoming will began an operational program that has an annual cost of $525,000 a year to modify weather for increased water yield.

The cost of complying with the first increment of the Platte River Recovery Implementation Plan (PPRIP) 2005 to the State of Wyoming has been $12.6 for the enlargement of Pathfinder Reservoir to storage 34,000-acre feet of water for delivery to Nebraska for endangered species benefits and $6 M towards the overall program. Total already expended for the PRRIP is $18.6 million Going forward in the next increment the State of Wyoming has already appropriated $3.1 million to the program for land acquisition and an additional 30,000-acre feet of water will have to be acquired and delivered to the critical reaches in Nebraska. Total cost to the State alone from 2005 -2018 to find and deliver more water from

WY in the North Platte Basin has been $36.2 M with an estimated annual reoccurring cost of $525,000 annually plus the economic loss of 64,000 acre feet of water that otherwise would be available to other water users including municipal, agricultural and industrial water users in Wyoming. One can only speculate how the courts would react to this new information!

Other Specific comments:

The LaVA DEIS is negligent in disclosing all the impacts to aquatic management indicator species from a continuation of declining hydrologic regimes and water yields associated with the no action alternative. It also does not include the economic consequences of allowing the forest to get older and denser, under the no action alternative, associated with the reduction in water yield. Cost have already been in the Millions to the State of Wyoming, water and forest resource users.

Pg. 158 The citation of Ager and Clifton (2005) "Equivlent clearcut area is used to access the cumulative effect of vegetation treatment and roads by providing for a broad indicator of changes in peak stream flow" misrepresent the citation and demonstrated bias by the author. The exact language in the article is "Both models assume a direct linkage between vegetation disturbance and the response (i.e., peak flows and water yield) (Brosch and Hwelett1982, Stednick 1996). Despite conflicting literature on the existence of these linkages and other limitation (Bescheta et al. 2000, Menning et el. 1997). The LaVA DEIS does not acknowledge either the limits on the use of ECA or the fact that there is conflicting scientific data on the link between ECA and peak stream flows. It is extremely disturbing when the author "cherry picks" selective pieces of scientific literature to portray a position rather than the facts.

Also, in this same section the LaVA DEIS Specifically states that "the lower the ECA the better the condition of the watershed". This is not supported by the science or any rational interpretation of the science. ECA by its self is not an indicator of Watershed Health and was never indended do so, the statement is an injection of

bias that predispose the reader to question both the objectivity and motive of the author.

Pg. 134 “Water diversion, mining, grazing and timber harvest have impacted aquatic resources. These activities have reduced stream flows ……., and altered channel morphology.” This statement outlines the historic anthropogenic impact to water resource that have resulted in declining water yield, however, it negates to inform the reader of the impact of the USFS management activities which has resulted in the loss of over 185,000-acre feet of water which is greater than all the diversion combined! It also fails to inform the reader that the current MBNF LRMP anticipated a further reduction of 27,000 acre feet as a result of implementation of the plan. Again, we fine that full disclosure of FS activities is not included in the LaVA DEIS and that a selective bias has been interjected into the document.

Literature Cited.

Not all literature citations are included in this section. However, they are included in the literature citation of all of the scientific and technical article referenced in these comments and a link to the original document has been provide.

A. A. Ager and C. Clifton. “Software for Calculating Vegetative Disturbance and Recovery by Using the Equivalent Clearcut Model” USDA-FS Pacific NW Research Sta. General Technical Report PNW-GTR-637, April 2005

Leaf, Charles F. 1999 Cumulative Hydrological Impacts of U.S. Forest Service management practices on the Routt, Arapaho-Roosevelt, Pike and Medicine Bow national Forest: Potential for Water Yield Improvements. Platte River Hydrologic research Center Paper PRHC-3 pg15)

King J.G. 1989 USDA-FS Intermountain Research Station, Research Paper INT-401