American River Watershed Institute

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PROTEST – (Applications & Petitions)

BASED ON ENVIRONMENTAL, PUBLIC INTEREST, or LAW CONSIDERATIONS
APPLICATION: 5634X01
PETITION FOR ASSIGNMENT OF STATE-FILED APPLICATION: 5634
PETITION TO CHANGE STATE-FILED APPLICATION: 5634

American River Watershed Institute (ARWI) has read carefully the August 26, 2016 notice (Notice), Application 5634X01, Petition for Assignment of State Filed Application 5634, Petition to Change State Filed Application 5634 (collectively "Application") and supporting documents of Nevada Irrigation District (NID or Applicant) to divert water from the Bear River for storage at various points in the Bear River watershed within Placer and Nevada County, as given in the Notice.

ARWI protests the Application on environmental and public interest grounds because to the best of our information and belief the Application for water will not best serve the public interest, and will have adverse environmental impact.

ARWI is a nonprofit, educational organization that grew out of the American River Watershed Group a quarter of a century ago. Its mission is to support the health of the American and adjacent watersheds through educational programs. In 2003, ARWI through a grant from the USEPA developed the Sierra Climate Change Watershed Yield Calculator (http://arwi.us/calc/index.php), and has tracked climate change through its California Extreme Precipitation Symposium (www.cepsym.com) as well as the effects of climate change on forestry symposium (http://firesymposium.arwi.us/). ARWI is sponsor of the Bear River Awakening Project and Save Bear River (www.bearriver.us and www.savebearriver.com). The American and Bear Rivers are intertwined through water diversions from the American to the Drum Spaulding Project on the Yuba River at the top of the watershed and diversions from the Yuba and Bear to the American at Folsom Reservoir. ARWI's education and environmental advocacy encompasses both rivers and their full watershed.

Facts Supporting the Foregoing Allegation.

Climate change is the defining issue of our times. It is critical that the SWRCB address climate change in a thorough way. The effects of climate change are beginning to be understood well enough to conclude that climate change will significantly affect watershed yield. While there is still a great deal of uncertainty about the effects of global warming, we now know enough to have great concern about the viability of our existing water supplies, which goes to the heart of the viability of our system of water rights. Certainly, any application for assignments of water rights or application for new water rights must be analyzed for its sensitivity to the effects of global warming, mindful of the explosion of knowledge in recent decades about historical hydrologic cycles as well as future condition predictions.

Specifically, NID's application for assignment of water rights should be subject to close scrutiny for its sensitivity to changed conditions caused by global warming. ARWI understands that the State Board is currently reviewing its criteria for analyzing climate change. It is essential that the most current knowledge be brought to bear on this water rights application. From our perspective, the State Board runs a very high risk of assigning rights to water that will not be there due to the effects of climate change. Paper water due to over allocation is already a serious problem in California water management. ARWI is concerned that this problem will become far worse in the future due to global warming.

NID has proposed Centennial Dam and Reservoir as a remedy to climate change. In our view, their analysis leading to this claim is simplistic and mistaken. It is in the public interest to develop genuine remedies to the effects of climate change, and not proceed with projects that are misguided in their response to the greatest challenge of our times. NID asserts that Centennial Dam is a climate change proposal for one stated reason: snowpack will be seriously diminished, and precipitation will be falling as rain rather than snow. NID has claimed that the District relies on 120,000 AF of snowpack storage (though the District has not clarified what year types and conditions this applies), and thus needs a new physical reservoir of that size to capture the water necessary to meet its needs. However, snowpack loss is only one element of climate change effect. ARWI looks at a complex of changes in order to assess viability: *potential reduction of precipitation, shifting storm tracks, "hot" droughts, and megadroughts.*

Sierra Climate Change Watershed Yield Calculator. The Calculator is a practical tool for evaluating the influence of climatic change on watershed yield for the west slope Sierra Nevada. The HSPF mass balance modeling program used fifty years of weather data and fifty years of stream runoff data, calibrated for three regions of the Sierra from the Feather River to the Kern River. The Hydrologic Response Units (HRU) were designed to include elevation in 500 feet bands, aspect (North, South, and East/West/Flat), and vegetation cover (forest, shrub, bare). The intention was to produce an early assessment planning tool that can provide sophisticated information about the effects of climate change. The scenario options include choice of temperature increase from 1 to 4 degrees Centigrade, and choice of increase or decrease in precipitation from 5, 10, 15, 20 and 25 percent steps. ARWI chose at that time to provide increase or decrease in precipitation because the climate models were not in agreement over whether there will be an increase or decrease in precipitation from climate change. It is most important to demonstrate sensitivity of a project to change, and to see how well a project functions over a wide range of variable conditions.

A representative example of results from the Climate Change Calculator is shown below. The results are stated in percentage reduction of annual runoff with a range spanning all three water year types. The low percentage loss represents the wet year loss, and the higher percentage represents the low water year. In all three scenarios, the percentage loss for the average year fell between the wet year and dry year percentages of runoff reduction. All three of these scenarios use a 4 degree C increase in temperature. The three scenarios chosen were 5%, 15% and 25% reduction in precipitation. The results of the three scenarios are as follows:

For plus 4 degrees C and 5% precipitation reduction,
watershed yield is reduced from 21% to 23%.
For plus 4 degrees C and 15% precipitation reduction,
watershed yield is reduced from 39% to 43%
For plus 4 degrees C and 15% precipitation reduction,
watershed yield is reduced from 56% to

The calculator shows a catchment yield sufficient to fill Centennial Reservoir in only 2 of the 9 scenarios for these reduced precipitation scenarios: wet years with -5% and -15% precipitation. The reservoir will not fill in either wet years with -25% precipitation, or in any average years or dry years. Results show the relatively small Bear River watershed does not perform well under reduced precipitation conditions, failing to fill the proposed reservoir. The consequences are even more dire downstream, as there will be no spill at Centennial to fill Camp Far West Reservoir (CFW); if CFW does not fill, farmers unable to receive inexpensive surface water for irrigation will pumping groundwater, and the American River Sub-basin returns to overdraft conditions that preceded the construction of DFW (and were the justification for construction of CFW. Farmers in the irrigation districts have wells and currently pump groundwater only as a supplement to surface water from CFW). See Appendix for detail of the Sierra Climate Change Watershed Yield scenarios.

Climate modeling continues to disagree on whether precipitation will increase, decrease, or remain the same. IPPC models for 2100 show 25% or the models indicate a decrease in precipitation, 50% indicate no change, and 25% indicate increased precipitation. The point of the calculator exercise is to demonstrate if the project performs well under diverse conditions; it does not perform well. Use of the tool can evaluate the level of risk decision-makers take. In this three chosen scenarios, the Centennial Dam project is shown not to perform well in 25% of the IPPC scenarios for climate change. (More discussion of precipitation reduction below.)

Changes in storm tracks. Some of the reduced precipitation scenarios predict that storm tracks are shifting toward the poles, which would create greater drought conditions for our Southwestern region. A 2008 article in Science Magazine entitled "Stationarity Is Dead: Whither Water Management?" states "climate change undermines a basic assumption that historically has facilitated management of water supplies, demands, and risks." (http://science.sciencemag.org/content/319/5863/573) This article is based on an ensemble of climate scenarios that show storm tracks shifting toward the poles. The consequence of this shift is a 25-40% reduction of precipitation for the West Coast. The findings from this ensemble differs from the IPPC assessment that there is only a 25% chance of precipitation reduction. Further study is needed to reconcile these differences, as scientific models and ensembles do not agree on one future.

Further, regarding the consistency of emerging observation and data, on July 11 of this year, NASA satellite data showed storm tracks and cloud cover shifting toward the poles over the past three decades. This is the actual condition we are facing, specifically for the West Coast storm track. This

is not a model or scenario. (http://www.sciencemag.org/news/2016/07/cloud-patterns-are-shifting-skyward-and-poleward-adding-global-warming).

Not surprisingly, since the past three decades in the Southwest including California have reduced cloud cover, we have also experienced actual reduced precipitation averaging 6% per decade according to NCAR data. (http://www.techtimes.com/articles/131282/20160206/us-southwest-may-be-drying-up-as-wet-weather-systems-become-more-rare.htm)

Scenarios need to be complemented with observational information. We are still in an early stage of understanding climate change, which is thrust upon us real time. These observations and scientific scenario ensembles point toward reduced precipitation. Uncertainty is the salient characteristic of climate change. Investing in large projects or granting water rights in these circumstances is fraught with undue risk.

A more regional version of potential storm track shift has also emerged. A persistent region of atmospheric high pressure is anomalously re-occurring over the far northeastern Pacific Ocean, and during the winter months acts to "block" the prevailing mid-latitude Westerlies, shifting the storm track northward and suppressing the winter storm activity along the West Coast of the United States. Daniel Swain on the California Weather Blog nicknamed this high pressure zone the "Ridiculously Resilient Ridge" in 2013. Swain has noted that this ridge corresponds in space and time with anomalously warm ocean temperatures to the far northeastern Pacific Ocean which seem to be a result of global warming, nicknamed "The Blob". While there is a strong correlation, cause and effect have not yet been firmly identified, nor has a possible feedback loop that reinforces the persistence of the high pressure ridge. Some evidence shows The Blob may be a result of weakened Westerlies, which may in turn be affected by weakened Jet Stream due to reduced temperature differential between the poles and the equator, another result of global warming. See http://www.weatherwest.com/page/2 . The strong correlation, however, may indicate that we are witnessing a the emergence of a regional pattern due to multiple elements of global warming that could be a permanent feature causing permanent drought in California. The point, here, is that we are at an early stage of observing a phenomenon that may be arising as a crucial determinant of precipitation patterns, forcing a shift to the north of historic storm tracks. The effects of global warming are transforming our planetary systems in radically uncertain ways. Wagering our resources (whether financial or water/land resources, i.e. water rights) on one particular outcome scenario is, simply put, premature and unwise.

Hot droughts. Researchers at University of Arizona have identified climate change effect which they have named "hot drought." The condition got its name because the Colorado River basin is experiencing runoff and storage characteristics similar to "dry droughts" of the past, except the current "hot drought" is occurring in spite of near normal precipitation levels. This Colorado Basin research has not been done for California and the Sierra. The research focuses on the matrix of effects due to the rise in temperature alone which cause the watershed yield to mimic dry conditions. These factors are: snow sublimation, increased surface water evaporation, evapotranspiration from plants, evapotranspiration from soils, longer growing season for vegetation, more rain and less snowpack, rain melts snow, and positive feedbacks that amplify these impacts. These studies, published in the Bulletin of the American Meteorological Society January 2014 conclude that "warming alone will drive Colorado River flow declines of 6.5% +/- 3.5% per degree Centigrade", or 3-10 percent per degree. Of the 19% reduction in flow on the Colorado River, the research allots 10% to "hot drought" and 9% to reduced precipitation.

(http://www.nature.com/nature/journal/v503/n7476/full/503350a.html
https://www.youtube.com/watch?v=SGRgmdSJNng
http://journals.ametsoc.org/doi/full/10.1175/BAMS-D-12-00228.1)
This research would indicate, if the same principles apply in the Sierra, that the results calculated by ARWI's Watershed Yield Calculator seriously understate the magnitude of reduction in watershed yield. The Calculator relies on past conditions that mimic the chosen future scenario; none of the synergistic effects of these "hot drought" conditions are included in ARWI's Watershed Calculator. In order to accommodate this new information on "hot drought", the calculator would have to add an additional 3-10% reduction in runoff for each degree C temperature increase.

Some work has begun on these dry drought elements in California. Roger Bales at UC Merced has been leading a research team in the study of evapotranspiration in the Sierra that indicates significantly higher rates of transpiration can be anticipated when snowpack conditions are reduced and dormant seasons shortened. The same drying condition will occur in the Sierra, but do not as yet have the integrated research to quantify these effects. This is likely the most serious influence on watershed yield in the Sierra. As an example, the difference in evapotranspiration in the Sierra between 2500 feet elevation and 9000 feet elevation is over 50%. Increased biomass and canopy cover conditions in lower elevations will be migrating to upper elevations, causing significant increase in evapotranspiration with attendant decrease in runoff in upper elevations. Bales's research is finding an average drop in runoff of 7% per degree C. This is just from one element of "hot drought". https://eng.ucmerced.edu/people/rbales/CV/Talks/1510.1 Again in this case, it is unwise to commit resources, either money or land resources or water rights, to large projects that do function well in in a broad range of conditions.

Megadroughts and decadal droughts. The history of California decadal droughts and megadroughts has been definitively reconstructed through tree rings for the last 1200 years.
http://www.water.ca.gov/waterconditions/docs/tree_ring_report_for_web.pdf
http://water.columbia.edu/files/2011/11/Seager2009Megadroughts.pdf
The past century is a period of relative abundance relative to the past 1200 years. Decadal droughts occur on almost a centennial cycle. Just these centennial cycles of wet and dry periods indicate a variation of over 25% in precipitation from the past sixty years, which is a time period typically used to project hydrologic yield. This alone is cause for concern.

Additionally, there have been two "Stine" megadroughts, the first from 822-1074 and the second from 1122 to 1299. University of Arizona researchers Overpeck and Udall have predicted the chances for megadrought return under normal conditions is 15%, but under climate change conditions the chances of megadrought rise to 80%, substantiated by other studies.
Univ. of Arizona (http://journals.ametsoc.org/doi/full/10.1175/BAMS-D-12-00228.1)
(http://www.riversimulator.org/Resources/ClimateDocs/Unprecedented21stCenturyDroughtRiskAmericanSouthwestCentralPlains2015Cook.pdf)
Cornell University (http://advances.sciencemag.org/content/2/10/e1600873.full)
The spectre of megadrought has not been digested by managers of California water. The Centennial Dam project would be a completely useless addition to the storage capacities of the Yuba and Bear River systems in the circumstance of megadrought. The reservoir would simply not fill, and remain empty for years and even decades.

In concluding this section on climate change, ARWI makes this point. Whether global warming manifests as reduction of precipitation, shifting storm tracks, "hot" droughts, or megadroughts, our

collective response needs to be comprehensive and at the same time flexible. A proposed project to remedy climate change must be able to accommodate any of these possible future conditions, or any combination thereof. Centennial Dam and Reservoir cannot fulfill its stated climate change purpose, because it fails to accommodate any one of these four global warming scenarios. The stated climate change purpose of Centennial Dam can only succeed in one future scenario: increased abundance of rainfall and runoff in a small watershed that is already built out and over-allocated (noting that the application for assignments is exclusively for Bear River water, not for additional diversions from either the Yuba or American Rivers). NID Board and staff have stated that their proposed project (and assignment of water rights) is primarily for climate change; the Board and staff have stated on many occasions that because NID already serves its future urban growth areas with "agricultural" water, that conversion from ag to urban can occur without additional water demand, thus avoiding any growth inducement--- the purpose is not to serve the needs of growth. Because climate change is the sole purpose of the project, and because the project fails to address or remedy global warming scenarios in a legitimate and rational way, ARWI urges the State Board to deny the request for assignment of water rights.

The SWRCB has a formidable task in formulating a criteria for project evaluation that can comprehensively embrace the broad spectrum of climate change effects. ARWI has made a small contribution to this work through its Watershed Yield Calculator, and a more significant contribution through the extreme precipitation symposium project. This provides ARWI with an appreciation of the awesome challenge before the State Board with regard to climate considerations. ARWI urges the SWRCB to be rigorous in its development and application of climate change criteria. ARWI is confident that any rigorous and comprehensive climate change criteria developed by the State Board will likewise reveal the inviability of this proposed project and its attendant water rights application, and will ultimately provide grounds to deny this application.

Environmental harm. ARWI has reviewed two documents from the Foothills Water Network (FWN), the comments during the Notice of Preparation of the Draft Environmental Impact Statement and the current letter of protest to the water rights application before the State Water Resources Control Board. ARWI supports and endorses all of the comments made in these two documents, and references these documents here as a surrogate for our comments.

One area of environmental harm may have been understated in these documents. There is new research on the amount of methane released from reservoirs. Methane is a potent greenhouse gas, and it is entirely appropriate that any project purporting to be a remedy for climate change address these emissions in detail. A new study from Washington State University has revisited the issue of methane release from reservoirs, and discovered the emissions are higher than previously estimated.

> "The WSU researchers are the first to consider methane bubbling in models of reservoir greenhouse gas emissions. Also, while previous papers have found that young, tropical reservoirs emit more methane than older, more northern systems, this study finds that the total global warming effect of a reservoir is best predicted by how biologically productive it is, with more algae and nutrient rich systems producing more methane. The authors also report higher per-area rates of methane emission from reservoirs than have been reported previously. This means that acre-for-acre the net effect of new reservoirs on atmospheric greenhouse gases will be greater than previously thought."
> http://phys.org/news/2016-09-reservoirs-substantial-role-global.html

> "WSU researchers have also discovered that reservoirs with extreme fluctuations and drawdown produce significantly more methane than reservoirs with a stable water level. Washington State University researchers have documented an underappreciated suite of players in global warming: dams, the water reservoirs behind them, and surges of greenhouse gases as water levels go up and down. Bridget Deemer, a doctoral student at Washington State University-Vancouver, measured dissolved gases in the water column of Lacamas Lake in Clark County and found methane emissions jumped 20-fold when the water level was drawn down. A fellow WSU-Vancouver student, Maria Glavin, sampled bubbles rising from the lake mud and measured a 36-fold increase in methane during a drawdown. http://phys.org/news/2012-08-global-culprit-drawdowns.html

NID has been spectacularly unclear in its description of proposed Centennial Dam operations, and its purpose. At various times and before varying stakeholders, NID Board and staff and claimed that: 1) Centennial Reservoir would fluctuate little and provide full lake recreation to the area and likened the operations of Clementine Dam on the North Fork American River, a single purpose debris dam with no outlet for drawdown (which would eliminate water sales or hydro generation), 2) Centennial Reservoir would be paid for by hydroelectric revenues, implying the reservoir level would drop over a foot a day during peak power generation summer months, 3) Centennial Reservoir is needed to capture the 120,000 AF of snowpack storage loss, implying it would draw down the full 115,000 AF to 130+ feet of drawdown annually to recapture the water lost to global warming effects, 4) Centennial Reservoir would be paid for by water sales, implying again that the reservoir would draw down to its minimum pool, 5) Centennial Reservoir would be used to provide flood control services to the Delta, which implies full draw down to minimum pool, and 6) Centennial Reservoir would draw down an operational average of 65,000 AF per year, which would draw down the reservoir 60-70 feet annually. NID must clarify the purpose of this reservoir without contradictions, and propose succinct rule curves on operations, so that environmental harm, aesthetic considerations, recreation, public interest issues, as well as financial viability, can evaluated with accuracy. Neither NOP project description, nor public presentations, nor SWRCB project water right applications, offer a dependable project description.

Because of the extensive environmental damage that would result from construction of this project, ARWI recommends the SWRCB deny this application for water rights.

Public interest. ARWI references the FWN protest to the SWRCB and endorses all of the issues put forth in the Public Interest section of that document. Understated in the document is the continued use of this specific reach of the Bear River by the local Native American tribes and families, particularly on the issue of "traditional cultural properties." AWRI quotes here from our comment letter in the NOP process on that topic:

> **Traditional cultural properties**
>
> ARWI sponsored an event April 3, 2016 at the Bear River Group Campground, which included a ceremony by members of four local Maidu tribes: Colfax, Todds Valley, Nevada City Rancheria, and Tsi Akim. The group campground is a traditional site for the tribes. As part of the event, tribal members were interviewed in both audio and video formats. Extended comments were offered by Grayson Coney, Cultural Director for the Tsi Akim. His remarks are notable for the NIP NOP process for the Centennial Dam EIR assessment. As part of the narrative on Native American history and practices on the Bear River Campground site, he made a distinction between Native American Heritage Sites and Traditional Cultural Properties. Grayson's comments follow:

"There is a distinction between cultural heritage sites and Traditional Cultural Properties (or TCPs). With TCPs, a member of the lineage has to be documented actually saying they continue the practice or have practiced that traditionally.

"At the Bear River Awakening ceremony April 3, because of the conversations and recording, severals example of documenting a TCP occurred. One was described by Richard Johnson (Tribal Chairman of the Nevada City Rancheria) of locating cooking stones in the Bear River and side creeks of this area. These cooking stones had the unique quality of being able to be heated red hot, and then when put in cold water would not explode. These stones are unique to this area are highly valued as cooking stones in the traditional cooking baskets, were sought over millennia uniquely here, and that practice continues today. Members of the traditional cultures would travel great distances to collect these stones, because they had this quality.

"Another example is the harvesting of plants. Since 1974, I have been collecting the ceremonial and cultural materials from the Bear River at these sites: e.g. Calycanthus Occidentalis, (Western Spice Bush) there is only one plant on this site remaining. Calycanthus Occidentalis root was used by the men. The shafts were used by the men and highly valued as arrow shafts. The wood was used as perfume by the women when combed through the hair. The plant is now very rare on the river, and even rare on this site.

"I also collect Wild Iris: This was used for rope. I've made my fishing line from Iris off this Bear River Campground property."

"Another TCP are the cobbles, the stones. At that gravel bar, the stones come out of the ancient Yuba channels that ran north/south at higher elevations. These ancient Yuba channel rocks get mixed with the other natural rocks in the Bear River, and get "re-cobbled' as they move downstream from the higher elevations where they were spawned. They get ground down to the right shape and size to be worked into utility shapes like bowls, net weights, metate, pestles, and many other material cultural implements. This was the practice of pecking stones, using one stone to 'peck' or chip away at the softer stone to make the utility shape needed. That gravel bar is one of the perfect locations. As the cobbles roll, the lighter cobbles come to the top as the heavier stones roll to the bottom of the gravel bar. It is the lighter stones that have the quality of being ideally worked with 'pecking stones'. At lower elevations, even a few miles below Dog Bar, the lighter stones have been ground down and are too small in size to be used for material cultural implements. At higher elevations, the cobbles aren't rounded and shaped fully yet. Below Hwy 49 these perfect cobbles are absent. This is the "Goldilocks" zone for cobbles; this middle elevation area spawns the right tools for our cultural practices. This is the gravel bar we pick them up from, not below, and not above in the ancient river zone. This is site specific. There is no replacement for this. You can't dive for these stones when the reservoir is created. The stones will no longer tumble and spawn. These stones come from here on the Bear, not the Yuba, not the American. The Bear is a perched river; after the Yuba captured its high elevation watershed area, water no longer incised the canyon. These conditions were created by a geologic time period. It is not a replaceable condition.

"The Prout family told the story of them bringing their babies to the river to dip in the water. You notice that Sunday they brought their medicine with them, they just didn't have a baby with them. But they dipped themselves in the river that Sunday. Elders passed on that baby dipping practice to their children who continue it today.

"A traditional cultural property (TCP) needs to be tied to a story and a person, and documented in just the way we have done with these practices, by documenting with film, or many of us hearing the practice described directly from the person in the lineage. For

example, I made a grinding bowl on the morning of our ceremony and gave it to Stan Padilla. That is an example of documenting a traditional cultural property. It is factual, and documented.

"NID must send tribes a letter, must do pedestrian surveys, must work through the heritage sites and put it in the EIR for review. Four tribes need to be contacted directly for this project: Colfax, Todds Valley, Nevada City and Tsi Akim tribes."

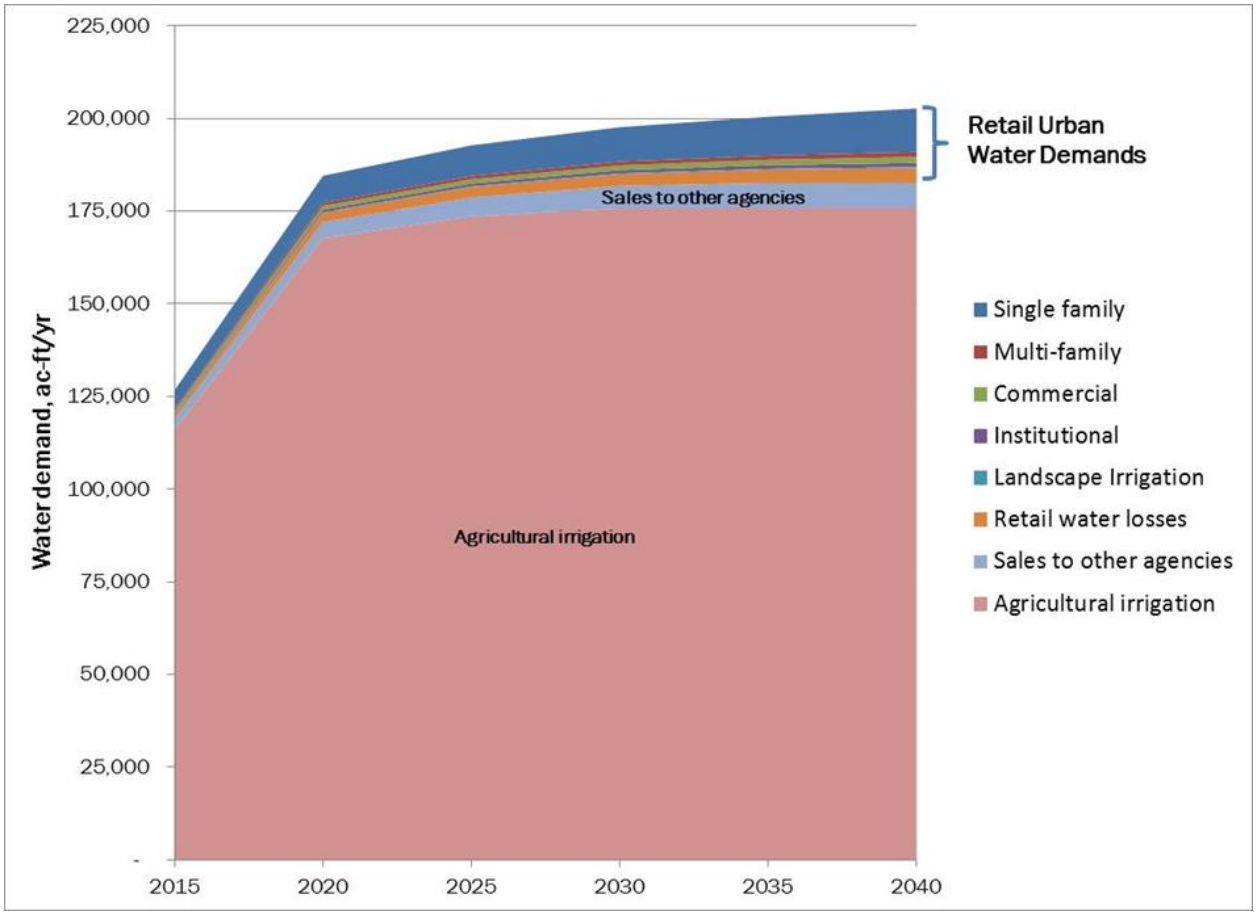
ARWI, working with contacts for each of the tribes, is continuing its process of video recording the voices of the people who have stories about this reach of the Bear River. Among these interviews will be more documented TCPs from the Maidu community members. However, the EIR must investigate the many ongoing Traditional Cultural Property practices that are continuing today. As a nonprofit, ARWI cannot do a complete and thorough survey; that is the task NID. The EIR must interview current tribal members in each of the four tribes, and document these practices. The recommended methodology is to hire a trusted consultant from within the Native American community to conduct the interviews, and to compensate the interviewees. These interviews are necessary, are caused directly by the EIR process of the proposed project, and are a burden and intrusion in the lives of the living members of these tribes. It is appropriate to compensate the tribal members for their contribution to the collected history that must be part of the EIR.

Loss of these last ceremonial areas used continuously by the Native American community, local and specific to this area is not in the public interest.

Alternatives. Facing the daunting specter and broad range of climate change uncertainty, a rational approach is to implement a portfolio of incremental improvements in the areas of water use efficiency, groundwater management and conjunctive use, and optimization of existing resources and facilities. The Bear River Watershed and the various water agencies managing its waters, including NID, have a plethora of opportunities in this regard. While this is clearly good news, the reason there are so many good options at this point in time is that to date these agencies have addressed these three areas minimally. Primarily, this may be due to the relative abundance of water resources where there is no need to implement cost effective efficiency options, or even options that more than pay for themselves. This condition of plenty begs the question: are these water districts, and NID in particular, putting their existing water resources to beneficial use? This question deserves some attention in this matter of application for assignment of additional water rights.

NID currently delivers approximately 130,000 AF of water to its customers. Approximately 15,000 AF is allocated to urban customers, and approximately 115,000 AF is delivered to rural customers of "agricultural" water. NID is not using the current best management practices for either its urban or rural water deliveries.

NID is currently projecting a nearly 50% increase in the demand for water within the next decade. ARWI doubts the validity of this projection, which seems out of alignment with any other demand project for population or water use in adjoining water agencies.



From NID staff presentations

Urban water use is among the highest per capita use in the State. NID never signed the California Urban Water Conservation Council MOU, and has not to this day implemented any of the active best management practices named in the MOU.

Rural raw water deliveries constitute the bulk of NID water, serving approximately 3000 customers. On the supply side, this water is delivered in open, unlined ditches in the same manner that was originally built in the mining era. Few improvements have been made over the century since NID purchased the water system from the water companies of the mining era.
Canal leakage is estimated at almost 20,000 AF, or nearly 15% of volume. On the demand side, virtually no water use efficiency programs have been implemented. Users of a miner's inch receive the water continuously, often by gravity flow, regardless of need or time of actual use--- 16,000 gallons a day, 18 AF per year per miner's inch.

But there may be a more significant element to the question of whether this water is being put to beneficial use. NID categorizes this water as "agricultural" water. ARWI's definition of agriculture is the engagement in an activity that brings into the broader culture either food or fiber products grown on the land, or contribute directly to that enterprise, e.g. draft horses (and there are a handful of draft horse teams now working again in forest management in our area). Interestingly, the vast majority of NID's rural customers are not engaged in agriculture, according to this definition. What has succeeded the tree and vine culture of the 19th century and the sheep and cattle grazing culture of the early 20th century is, in fact, a real estate culture in the late 20th and 21st centuries. Precious few of the rural raw water customers are farmers who produce food or fiber commercially. Million dollar

homes and retirement "ranchettes" of 5, 10 and 20 acres have by-and-large replaced the commercial farming culture of the foothills.

NID does not differentiate true agricultural uses from "rural estate" or "supra-suburban" homes. No legitimate profiling mechanism is in place. Instead, a self-filled out customer survey only allows the distinction between tree crops, vines, berries, or "irrigated pasture." Customers simply indicate "irrigated pasture" as there is no other category that fits. In actuality, these customers most often have suburban lifestyles, and the raw water is used for landscape irrigation, or for maintaining horses for recreation and the like, and not commercial agriculture using irrigated pasture for livestock. These rural estates are required by county zoning to have wells for potable water, which supply all the urban needs of the homes, guest houses ("granny flats"), and studios. The question has to be raised: is this very high consumption of water being used in a beneficial way? There is no clear answer to this question until such time as there can be a clear profiling of customers and an accurate survey of their water use efficiency practices. The entire method of delivery and valuation of water may need to be reinvented and transformed; there is no public information on what extent NID has evaluated the existing delivery system for major restructuring, if that exercise has happened at all. None of this information is available. It does not seem rational, just, or equitable to assign additional water rights to a petitioner agency that cannot provide the most elementary information about its water users, its water use efficiency status, or a justification for the valuation of water for its urban users as distinguished from its genuine agricultural customers.

Supply side alternatives. NID is located high in the Sierra, with a wealth of not just water, but of options to use the water efficiently, a path not yet taken. Here is a short list of supply side alternatives, some of which may require partnerships.

Optimizing existing facilities, raising dams:

- Rollins dam, already studied, in NID ownership, 10-25,000 AF
- Fordyce dam, already studied, in PG&E ownership, 15-25,000 AF
- Silver Lake dam, already studied, NID ownership, unknown AF
- Camp Far West, owned by South Sutter Water District (SSWD), under FEMA orders to reconstruct spillway for flood safety concerns. Project already submitted to California Water Commission by SSWD. Could be expanded in partnership with NID and used conjunctively for groundwater basin enhancement. 15-30,000 AF

Meadow restoration options: Bear Valley, Lake Norden

Forest management for water yield and fire safety, can increase watershed yield by 10-30%, and hedge against future losses from evapotranspiration, with biomass utilization for power generation and carbon sequestration.

Groundwater recharge ponds using Mehrten Formation to increase storage of the North American River Groundwater Sub-basin, eliminating evaporation and increasing supplies for emergencies and drought.

Reinvent delivery system for open ditch water delivery systems, including lining, piping, pressurizing, and the like.

Demand side alternatives. The following is by no means an exhaustive list.

Establish true market values for historic legacy of ditch "agricultural" water, which is now being used as landscape water for "rural estates." Ramp into true market value for water.

Raw water conservation measures should be evaluated together with reinvented means of delivery and conservation pricing.

Urban water conservation and BMP implementation, lowering NID's high 250 gpcd to be more in alignment with State expectations for urban water consumption. Rollout would include programs yet undelivered to customers, for example: toilet replacement rebates, high efficiency washing machine rebates, turf reduction buyouts, landscape irrigation incentives, leak detection programs, customer audits, sophisticated advanced metering technologies, conservation rate structures, etc.

An agency applying for the assignment of new water rights should have to demonstrate that their current use of water is efficient, and that the complete suite of alternatives to meeting the needs of their customers has been analyzed and evaluated for implementation, including the cost benefit analysis for each management practice or expansion facility. NID has clearly not done this work. ARWI urges the State Board deny the NID water rights application until such time as NID can demonstrate need, and that alternatives have been thoroughly studied.

For the reasons mentioned above, ARWI recommends that NID withdraw the Application. If NID does not withdraw the application, the Board should deny the Application.

Respectfully submitted,

Otis Wollan
American River Watershed Institute, President of the Board
Email: otiswollan@gmail.com
Cell: 530-320-6841

A duplicate copy of this protest has been emailed to NID at tassone@nidwater.com

Appendix:

The Sierra Climate Change Watershed Yield Calculator.
Complete instructions on how to use the calculator are found on the ARWI website: www.arwi.us
http://arwi.us/calc/Part5-HowToUseTheCalculator.pdf
A discussion of the limitations of the Calculator can be found here:
http://arwi.us/calc/4-2_UsesForCalculator.pdf

Hydrologic Response Units (HRUs). The HRUs developed for the Calculator had the following characteristics:

- elevation in 500 feet elevation bands,
- aspect delineated by North, South, and East/West/Flat (there was little difference in hydrologic yield difference between East, West and Flat and so these three aspects were combined)
- Vegetation delineated by forest, shrub/grass, and bare/developed/open water

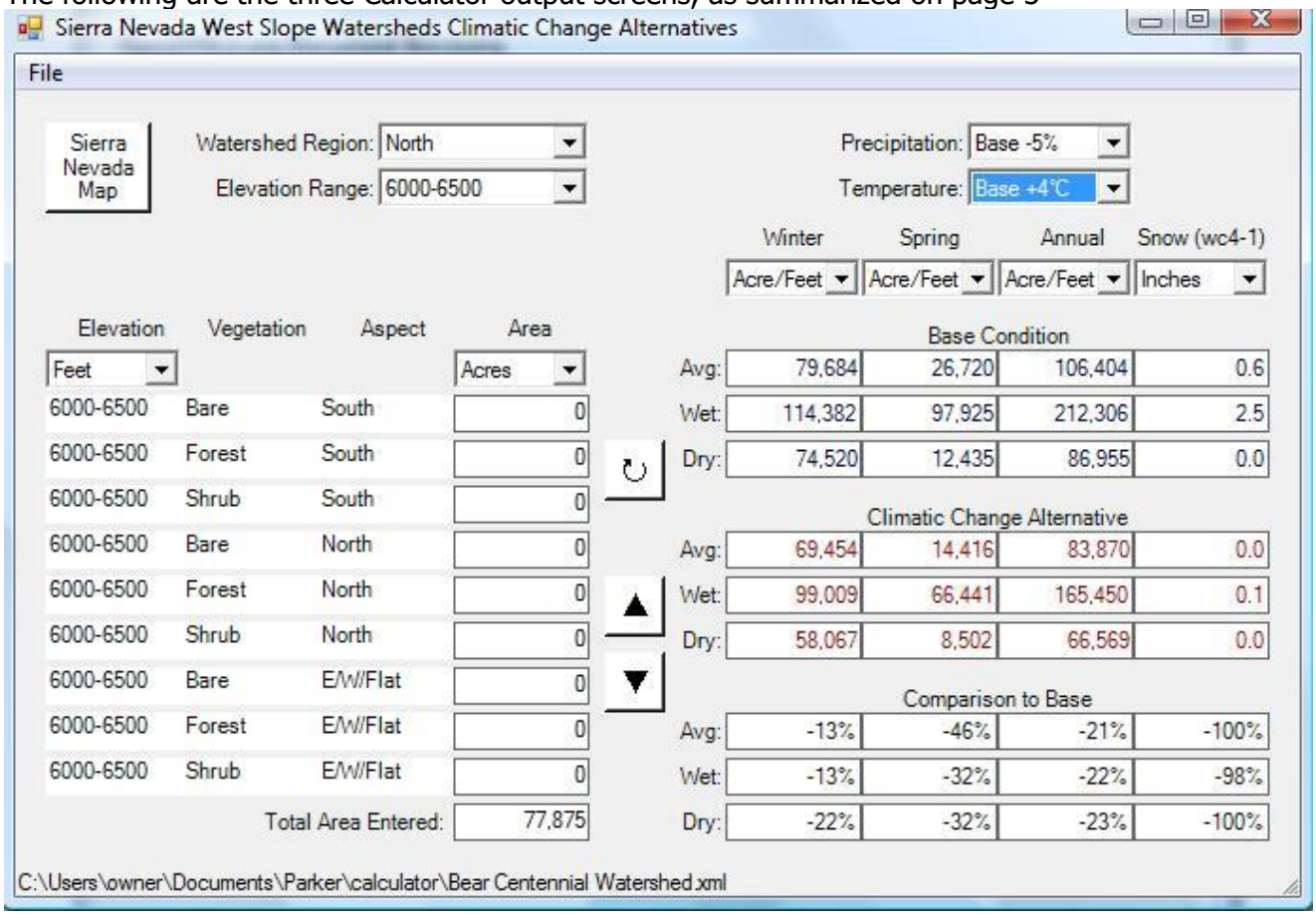
Min Elevation	MaxElevation	Veg	Aspect	Acres	bare	forest	shrub/grass
1500	2000	Forest	N	691.441357	160.91845	2853.559638	448.675853
1500	2000	Forest	S	757.513966			
1500	2000	Forest	E/W/Flat	1404.604315	Aspect combined for 1500-2000 elevation band		
1500	2000	Shrub/Grass	N	50.864941			
1500	2000	Shrub/Grass	S	106.849738			
1500	2000	Shrub/Grass	E/W/Flat	290.961174			
1500	2000	Bare/Developed	N	37.845822	open water category added to Bare		
1500	2000	Bare/Developed	S	25.473165			
1500	2000	Bare/Developed	E/W/Flat	94.064951			
1500	2000	Open Water	N	1.578994			
1500	2000	Open Water	S	0.000557			
1500	2000	Open Water	E/W/Flat	1.954961			
2000	2500	Forest	N	3041.273762	bare	forest	shrub/grass
2000	2500	Forest	S	3031.830775	1799.443906	11624.83071	2036.393922
2000	2500	Forest	E/W/Flat	5551.726173			
2000	2500	Shrub/Grass	N	201.03636			

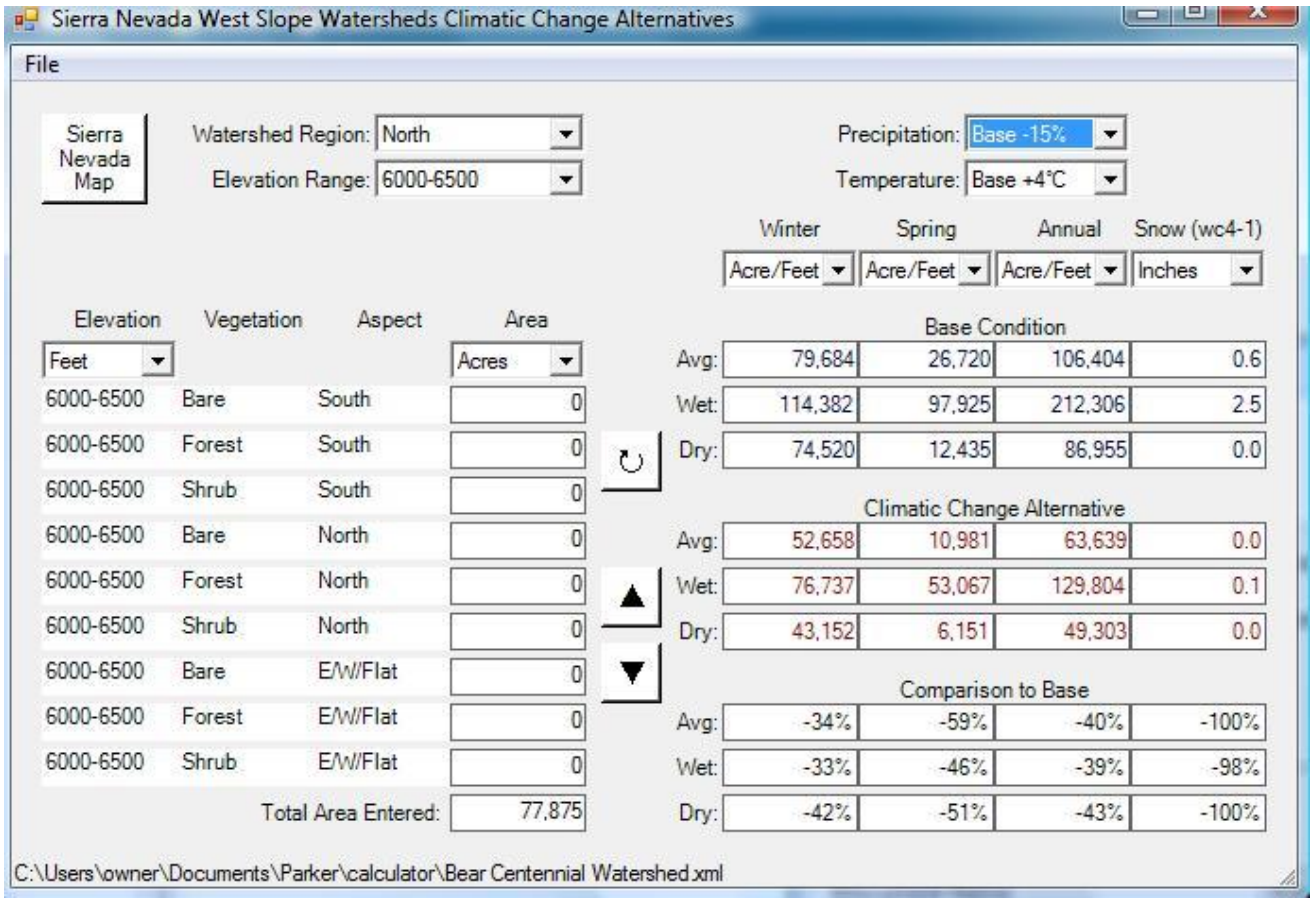
				8			
2000	2500	Shrub/Grass	S	577.237025			
2000	2500	Shrub/Grass	E/W/Flat	1258.120529	Aspect combined for 2000-2500 elevation band		
2000	2500	Bare/Developed	N	213.870736			
2000	2500	Bare/Developed	S	256.640906			
2000	2500	Bare/Developed	E/W/Flat	649.036598			
2000	2500	Open Water	N	48.283188			
2000	2500	Open Water	S	8.308531			
2000	2500	Open Water	E/W/Flat	623.303947			
2500	3000	Forest	N	3927.790944	bare	forest	shrub/grass
2500	3000	Forest	S	4676.657056	1086.999914	15914.01592	1640.058753
2500	3000	Forest	E/W/Flat	7309.567915			
2500	3000	Shrub/Grass	N	179.00441			
2500	3000	Shrub/Grass	S	569.173277			
2500	3000	Shrub/Grass	E/W/Flat	891.881066			
2500	3000	Bare/Developed	N	237.247843	Aspect combined for 2500-3000 elevation band		
2500	3000	Bare/Developed	S	259.400929			
2500	3000	Bare/Developed	E/W/Flat	541.461886			
2500	3000	Open Water	N	12.465268			
2500	3000	Open Water	S	2.571876			
2500	3000	Open Water	E/W/Flat	33.852112			
3000	3500	Forest	N	2346.357565			
3000	3500	Forest	S	3491.197287			
3000	3500	Forest	E/W/Flat	4747.629793			
3000	3500	Shrub/Grass	N	166.197825			
3000	3500	Shrub/Grass	S	608.476259			

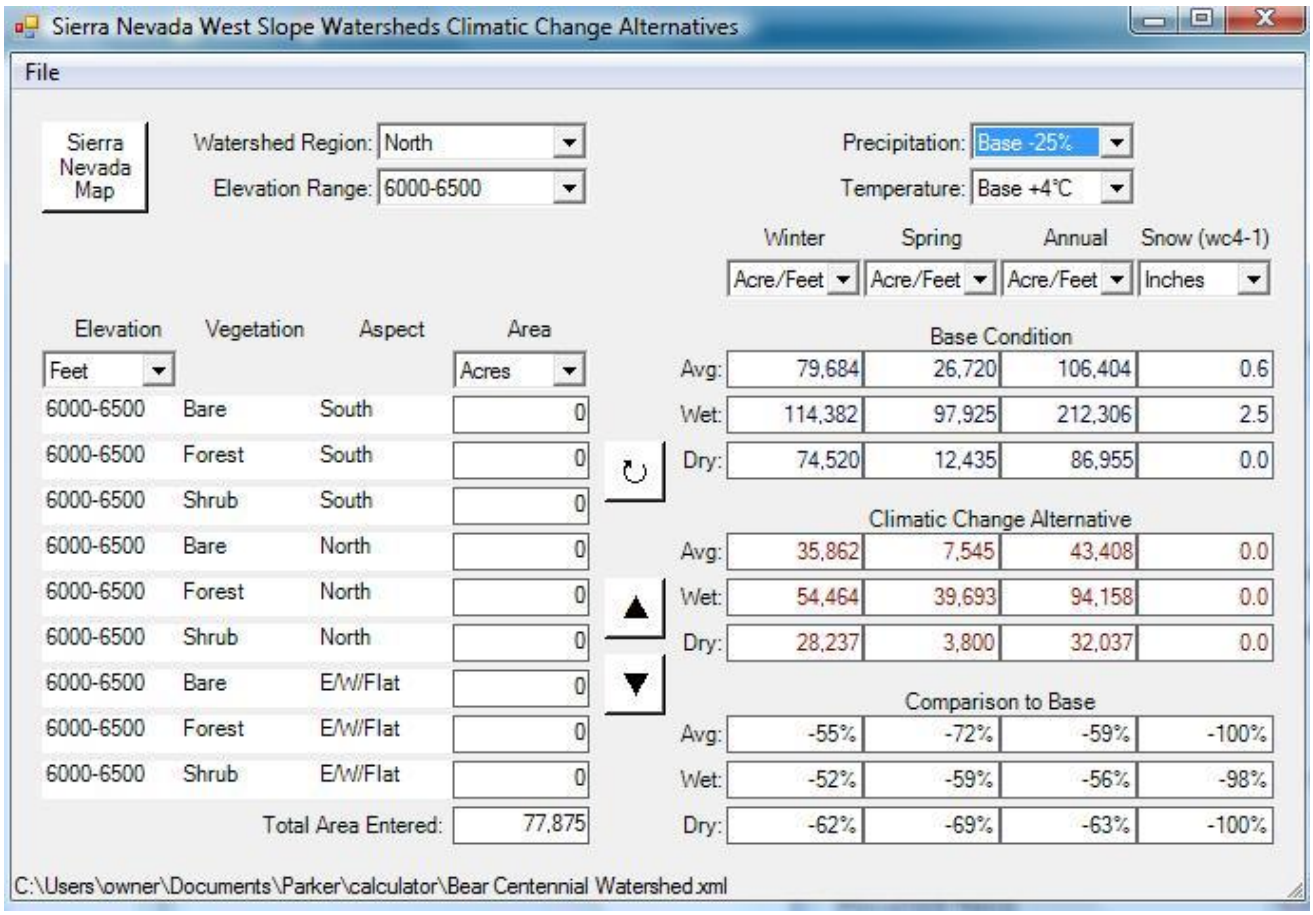
3000	3500	Shrub/Grass	E/W/Flat	972.04534			
3000	3500	Bare/Developed	N	100.175784	105.46084	adds open water	
3000	3500	Bare/Developed	S	132.896353	136.013462		
3000	3500	Bare/Developed	E/W/Flat	269.176655	301.284145		
3000	3500	Open Water	N	5.285056			
3000	3500	Open Water	S	3.117109			
3000	3500	Open Water	E/W/Flat	32.10749			
3500	4000	Forest	N	2084.434481			
3500	4000	Forest	S	2646.858943			
3500	4000	Forest	E/W/Flat	3646.704932			
3500	4000	Shrub/Grass	N	108.961035			
3500	4000	Shrub/Grass	S	775.232328			
3500	4000	Shrub/Grass	E/W/Flat	585.343448			
3500	4000	Bare/Developed	N	21.670116			
3500	4000	Bare/Developed	S	39.029488			
3500	4000	Bare/Developed	E/W/Flat	90.930743			
4000	4500	Forest	N	1955.672259			
4000	4500	Forest	S	2468.876343			
4000	4500	Forest	E/W/Flat	3592.149987			
4000	4500	Shrub/Grass	N	122.250712			
4000	4500	Shrub/Grass	S	471.145647			
4000	4500	Shrub/Grass	E/W/Flat	397.805887			
4000	4500	Bare/Developed	N	3.203031	3.231782		
4000	4500	Bare/Developed	S	0.859928		adds open water	
4000	4500	Bare/Developed	E/W/Flat	5.180276	6.864227		
4000	4500	Open Water	N	0.028751			
4000	4500	Open Water	E/W/Flat	1.683951			

4500	5000	Forest	N	1245.118642			
4500	5000	Forest	S	1239.775795			
4500	5000	Forest	E/W/Flat	1463.49302			
4500	5000	Shrub/Grass	N	165.616784			
4500	5000	Shrub/Grass	S	396.016114			
4500	5000	Shrub/Grass	E/W/Flat	570.392094			
4500	5000	Bare/Developed	N	70.098047			
4500	5000	Bare/Developed	S	45.691093			
4500	5000	Bare/Developed	E/W/Flat	56.411981			
5000	5500	Forest	N	538.671114			
5000	5500	Forest	S	624.84142			
5000	5500	Forest	E/W/Flat	747.613106			
5000	5500	Shrub/Grass	N	75.596187			
5000	5500	Shrub/Grass	S	278.254929			
5000	5500	Shrub/Grass	E/W/Flat	247.342576			
5000	5500	Bare/Developed	N	69.135884			
5000	5500	Bare/Developed	S	77.023953			
5000	5500	Bare/Developed	E/W/Flat	165.781258			
5500	6000	Forest	N	43.20203			
5500	6000	Forest	S	109.644631			
5500	6000	Forest	E/W/Flat	101.71251			
5500	6000	Shrub/Grass	N	8.892607			
5500	6000	Shrub/Grass	S	53.569458			
5500	6000	Shrub/Grass	E/W/Flat	24.309259			
		Total catchment acreage		77875.78636			

The following are the three Calculator output screens, as summarized on page 3




Sierra Nevada West Slope Watersheds Climatic Change Alternatives
File
Sierra Nevada Map
Watershed Region: North
Elevation Range: 6000-6500
Precipitation: Base -15%
Temperature: Base +4°C
Winter
Spring
Annual
Snow (wc4-1)
Acre/Feet
Acre/Feet
Acre/Feet
Inches
Elevation
Vegetation
Aspect
Area
Feet
Acres
6000-6500 Bare South 0
6000-6500 Forest South 0
6000-6500 Shrub South 0
6000-6500 Bare North 0
6000-6500 Forest North 0
6000-6500 Shrub North 0
6000-6500 Bare E/W/Flat 0
6000-6500 Forest E/W/Flat 0
6000-6500 Shrub E/W/Flat 0
Total Area Entered: 77,875
Base Condition
Avg: 79,684 26,720 106,404 0.6
Wet: 114,382 97,925 212,306 2.5
Dry: 74,520 12,435 86,955 0.0
Climatic Change Alternative
Avg: 52,658 10,981 63,639 0.0
Wet: 76,737 53,067 129,804 0.1
Dry: 43,152 6,151 49,303 0.0
Comparison to Base
Avg: -34% -59% -40% -100%
Wet: -33% -46% -39% -98%
Dry: -42% -51% -43% -100%
C:\Users\owner\Documents\Parker\calculator\Bear Centennial Watershed.xml


Sierra Nevada West Slope Watersheds Climatic Change Alternatives
File
Sierra Nevada Map
Watershed Region: North
Elevation Range: 6000-6500
Precipitation: Base -25%
Temperature: Base +4°C
Winter
Spring
Annual
Snow (wc4-1)
Acre/Feet
Acre/Feet
Acre/Feet
Inches
Elevation
Vegetation
Aspect
Area
Feet
Acres
6000-6500 Bare South 0
6000-6500 Forest South 0
6000-6500 Shrub South 0
6000-6500 Bare North 0
6000-6500 Forest North 0
6000-6500 Shrub North 0
6000-6500 Bare E/W/Flat 0
6000-6500 Forest E/W/Flat 0
6000-6500 Shrub E/W/Flat 0
Total Area Entered: 77,875
Base Condition
Avg: 79,684 26,720 106,404 0.6
Wet: 114,382 97,925 212,306 2.5
Dry: 74,520 12,435 86,955 0.0
Climatic Change Alternative
Avg: 35,862 7,545 43,408 0.0
Wet: 54,464 39,693 94,158 0.0
Dry: 28,237 3,800 32,037 0.0
Comparison to Base
Avg: -55% -72% -59% -100%
Wet: -52% -59% -56% -98%
Dry: -62% -69% -63% -100%
C:\Users\owner\Documents\Parker\calculator\Bear Centennial Watershed.xml