Problems with Proposed Monitor-Manage-Mitigate (3M) Plan

Response to Remand Ruling Directive #3

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District Court Remand Ruling

"Several of the Protestants noted that the MMM plan is filled with good intentions but lacks objective standards. This Court agrees. Granting water to SNWA is premature without knowing the impacts to existing water right holders and not having a clear standard to identify impacts, conflicts or unreasonable environmental effects so that mitigation may proceed in a timely manner. Based on the above, this matter must be remanded to the State Engineer until objective standards can be established and stated - as to when mitigation must occur." - *Pg 18*

"3. Define standards, thresholds or triggers so that mitigation of unreasonable effects from pumping of water are neither arbitrary nor capricious in Spring Valley, Cave Valley, Dry Lake Valley and Delamar Valley, and;" - *Pg 23*

Absence of Oversight

Once approved the 3M plan would be carried out by SNWA without oversight, review or input from stakeholders or the State Engineer.

"The 3M plan envisions modifying thresholds, triggers and mitigations in light of new data acquisition. The plan does not provide for stakeholder notification or involvement in such modifications and thus gives SNWA carte blanche when designing and implementing such modifications. This means SNWA may undertake actions in the future that harm stakeholders without stakeholders having the opportunity to protect their interest" (Jones and Mayo, 2017, p 26).

Time Frame for Establishing Thresholds

"The SNWA baseline monitoring period includes 11 years of data starting in 2006. SNWA contends that this is adequate to account for drought periods because it includes data for both wet and dry periods. However, the baseline period is inadequate when viewed in the context of long term climate and the measured water level responses since monitoring began" (Jones and Mayo, 2017, p 22).

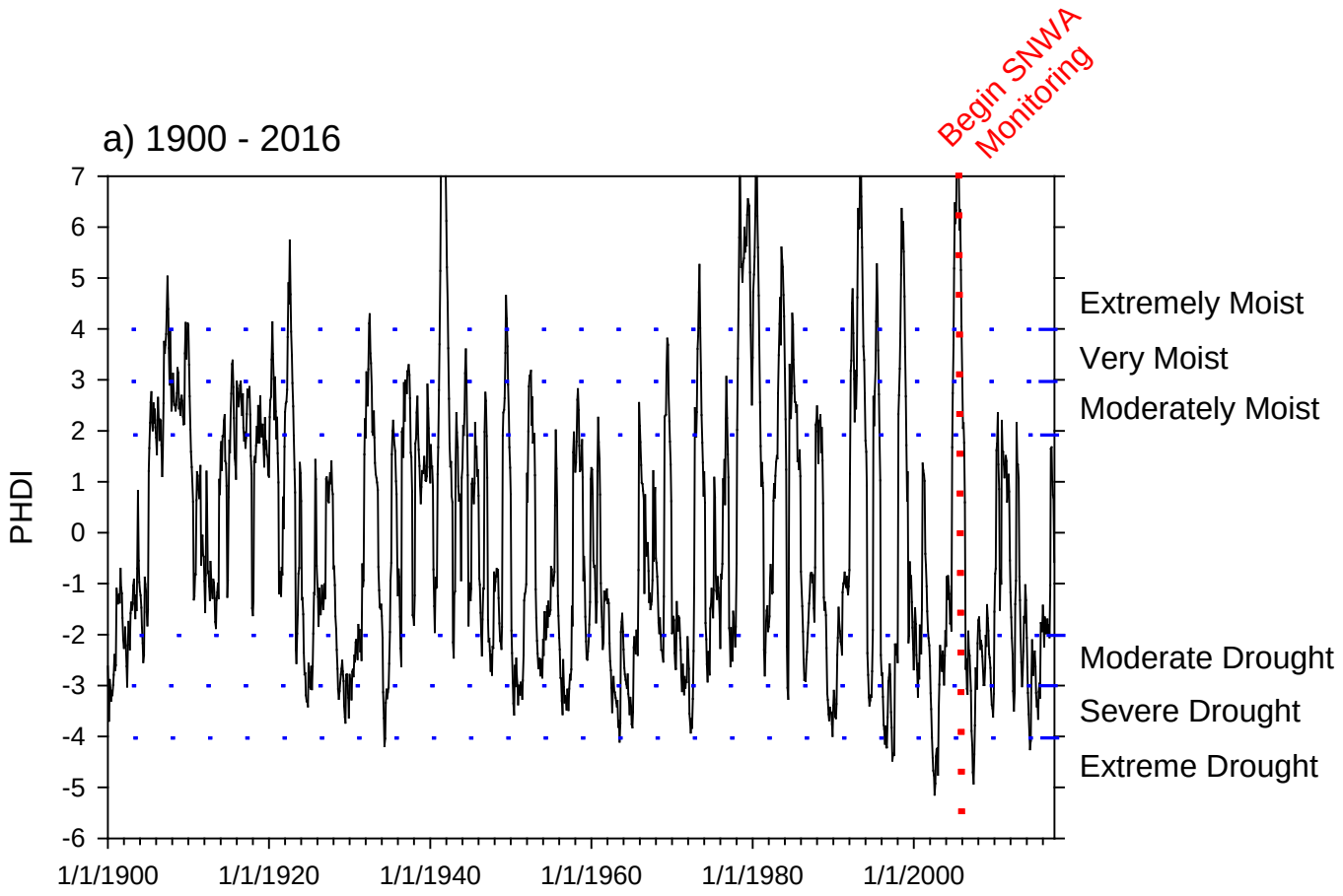
3M plan thresholds may be developed with as little as 3 years of data.

Water Levels and Wet and Dry Conditions
PHDI as a Surrogate

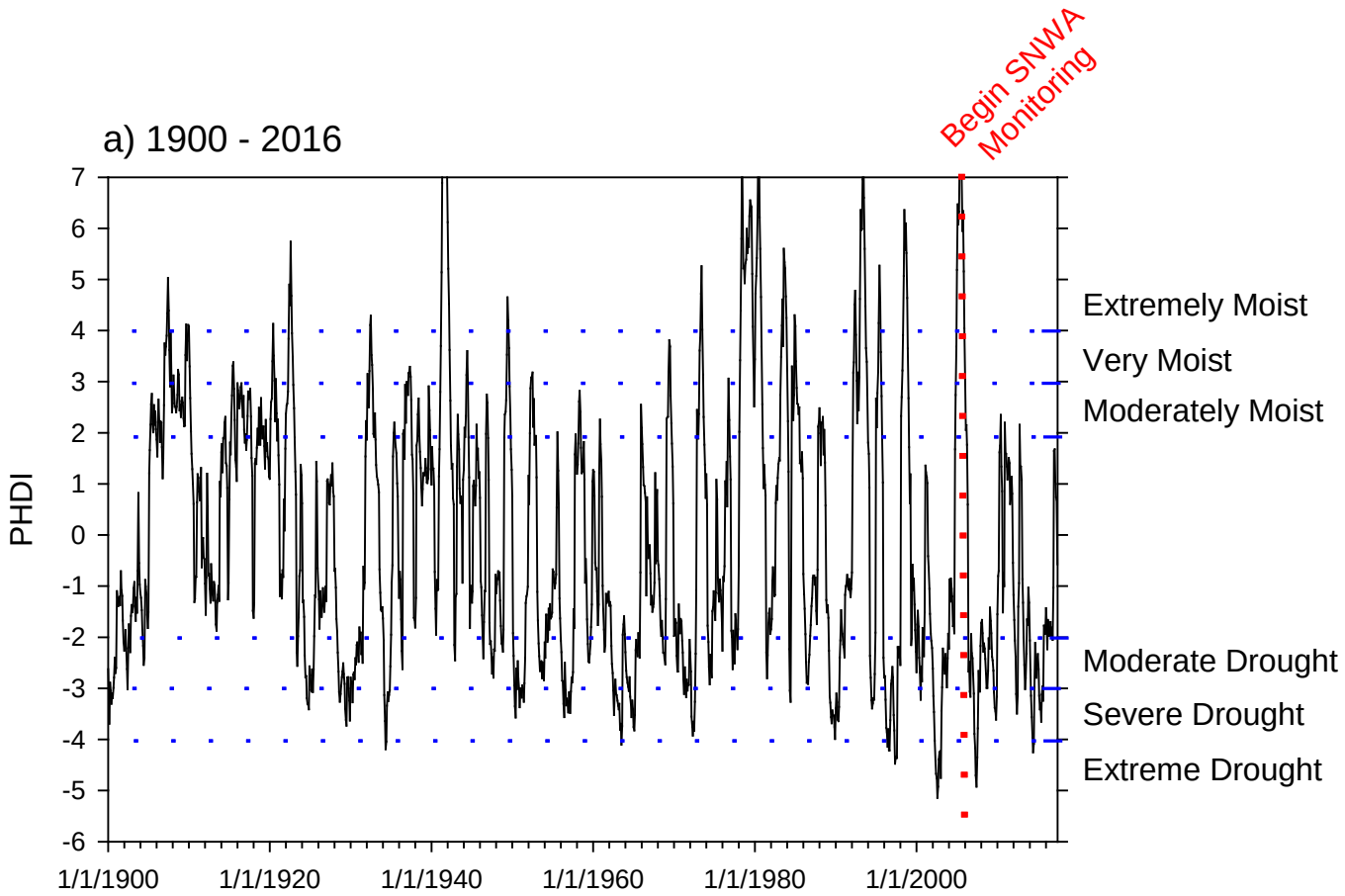
"The Palmer Hydrologic Drought Index (PHDI) is a useful tool for evaluating the meaning of well water level changes and spring discharge hydrographs because it provides a drought and wet cycle framework" (Jones and Mayo, 2017, p 22).

PHDI for Spring Valley Since 1900

Wet and dry cycles are evident in PHDI data

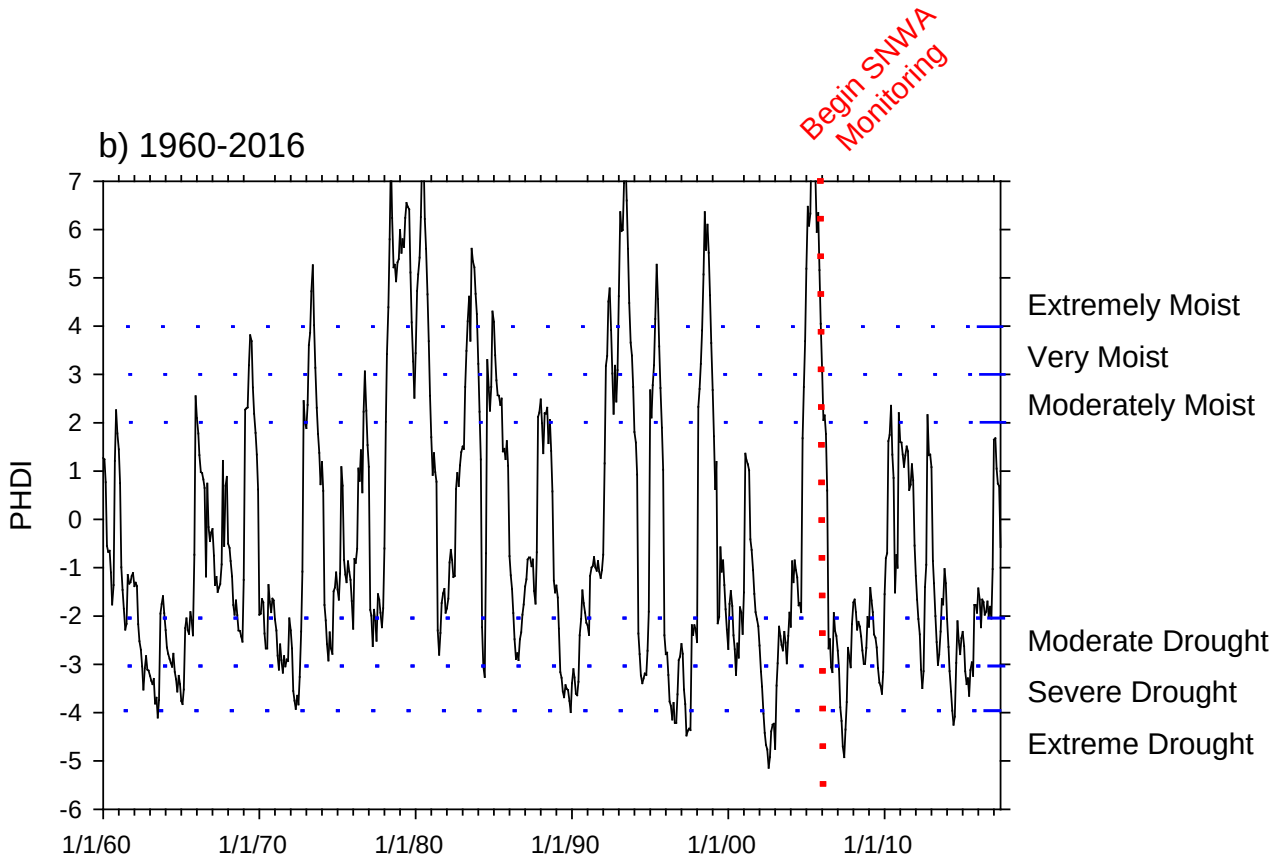


"There are numerous three to ten-year intervals in the PHDI since 1900 that are downward trending and correspond to drought conditions. It is important to keep in mind that the time frame for the SNWA GDP is considerably longer than the 117 years of PHDI data and it is reasonable to expect similar wet and dry episodes" (Jones and Mayo, 2017, p 24).



PHDI Since 1960

The period of record for the establishment of thresholds has been dry relative to the long-term record. The average PHDI since 2006 has been -1.37 which is well below neutral. The PHDI data demonstrate that only using data since 2006 will bias the thresholds to declining waters levels.



Natural climatic cycles bias the triggers and make them unreliable.

"Because of the limited time frame and (sic) data available, when calculating SLAR lower control limits and thresholds it will not be possible to distinguish between natural declines in water levels and spring discharge rates versus declines caused SNWA pumping. SLARs based on what has been an essentially dry episode since 2011 for the Cleveland Ranch monitoring wells and since 2006 for other wells and springs means that the slope of the SLARs will be negative and any natural recovery in water levels or spring discharges associated with wetter times can be easily masked by SNWA pumping induced declines" (Jones and Mayo, 2017, p 24).

Natural climatic cycles bias the triggers and make them unreliable (Con't)

Because a trigger that is biased for a decline in water level the effect of a natural water level increase or a cessation of the decline will be masked by pumping induced drawdown.

In other words the trigger may not see the impact of pumping.

Example of SNWA Trigger

Spring Valley Management Block 3 Monitoring Program

Senior Water Right/ Monitoring Area	Monitor Well or Spring
Monitoring between Cleveland Ranch and SNWA GDP PODS	391224114293601; SPR7016Z; SPR7012Z; Bastian South Well
Sentinel Monitor Wells between Cleveland Ranch and SNWA GDP PODS	SPR7029M; SPR7029M2; SPR7030M; SPR7030M2; SPR7044M (planned well)
Additional Current Monitoring on Cleveland Ranch	Cleveland Ranch Spring South; SPR 7031Z; and Cleveland Ranch Spring North

(After Marshall, 2017)

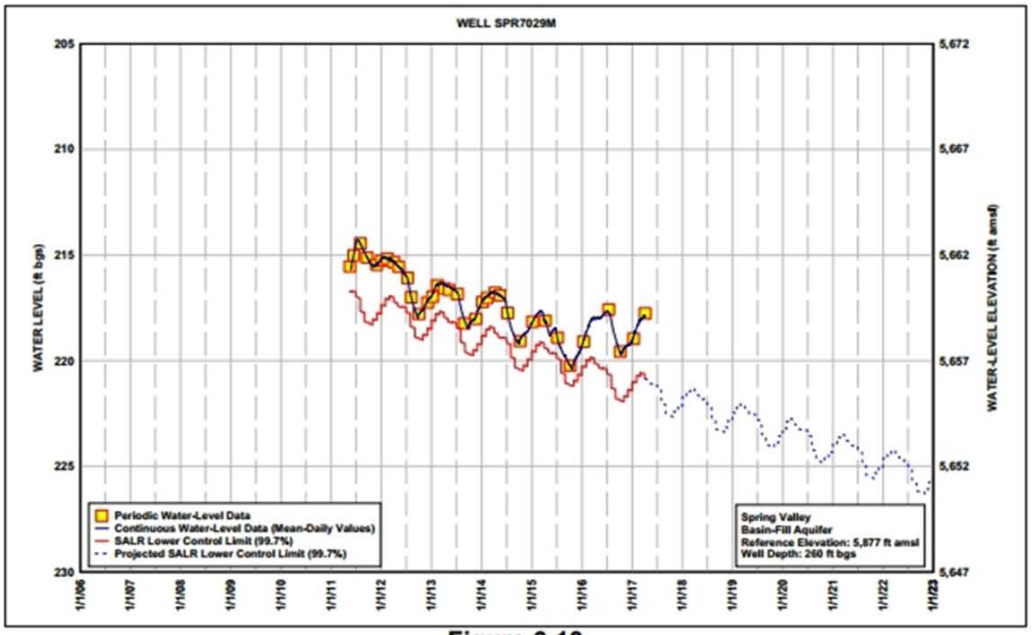


Figure 6-13
SPR7029M - Trigger

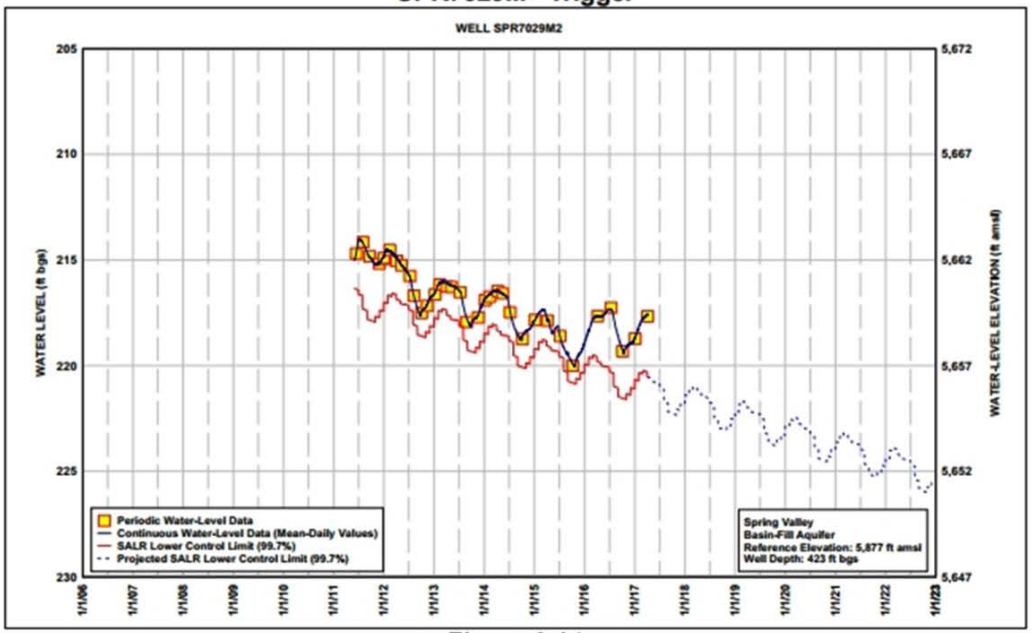


Figure 6-14
SPR7029M2 - Trigger

The projected continual decline in the water level triggers means that wet period natural water level recovery will be masked by SNWA pumping induced water level declines.

Effects of Groundwater Mining

The SNWA project is a groundwater mining project as demonstrated by:

- Computer modeling results demonstrate that SNWA pumping will never reach equilibrium and much of the pumped groundwater will be derived from storage in the carbonate aquifer and from interbasin groundwater flow (Jones and Mayo, 2017).
- The proposed pumping wells will penetrate deep into the carbonate aquifer to obtain water. This water has an ancient origin.

- Groundwater ages corroborate that the deeper water that will be extracted is ancient and only slowly contributes to perennial yield. Pumping the deep groundwater will prematurely remove much of this deep water thus the water will be mined.

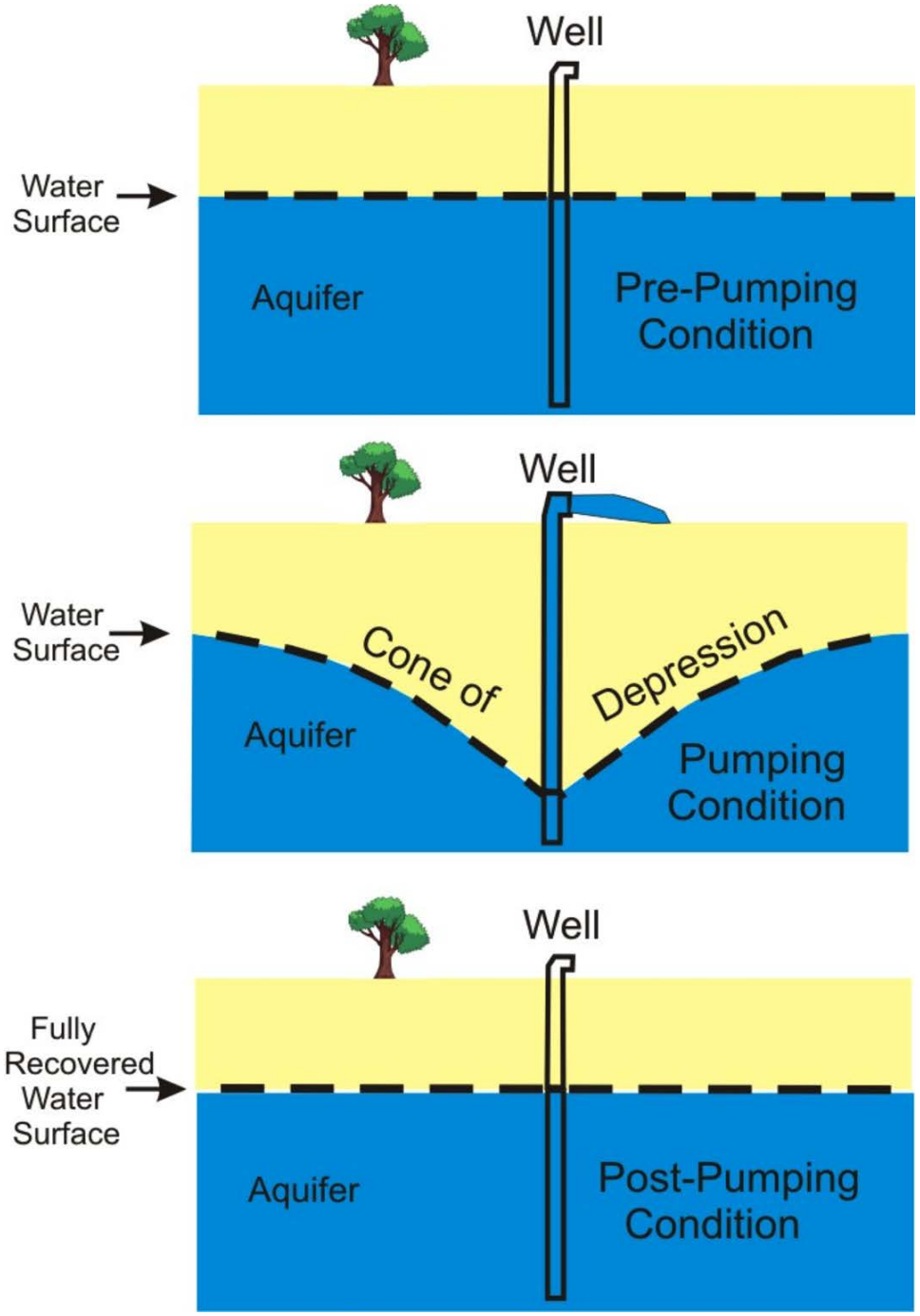
Sample ID	BYU lab #	Sampling Date	pH	^{14}C [pmc]	+/-	$\delta^{13}C$	+/-	^{3}H [TU]	+/-	$HCO3^-$ [mg/L]	Fontes calculated 14C age [years]
Bastian Creek Spring	9232	7/19/11	8.01	44.39	0.15	-7.87	0.04			184	1200
Irrigation Well	9234	7/19/11	8.11	37.56	0.13	-8.22	0.04	3.9	0.2	186	2500
Stephens Creek	9236	7/19/11						11.1	0.4		
Big Resevoir Spring (#1/2)	9237	7/20/11	7.93	77.12	0.22	-13.90	0.04			131	modern
Millick Spring	9238	7/20/11	7.92	44.94	0.14	-8.63	0.04	2.0	0.1	270	1200
Negro Creek Spring	9239	7/19/11						9.1	0.1		

“The carbon-14 ages and tritium contents of the Bastian Creek spring and the Millick spring (Table 4-2) suggest that these spring discharges are also supported by younger shallow and older deep groundwater. The fact that shallow and deep groundwater is found supporting springs on opposite sides of Spring Valley indicates that deep groundwater discharges into shallow groundwater is common in Spring Valley.

Because the SNWA GDP calls for the production wells to be screened in both the alluvial and deeper portion of the groundwater system, the cones of depression from the production wells will impact both the shallow and deep groundwater systems. What this means is that the production wells may quickly impact the spring discharge fluxes that are supported by the shallowest groundwater and will continue to impact the springs as the deeper groundwater system(s) are dewatered” (Jones and Mayo ,2017).

The next series of slides illustrate the general effects of pumping that is based on ET captures vs. groundwater mining.

The slides are not to scale and do not represent a specific location.

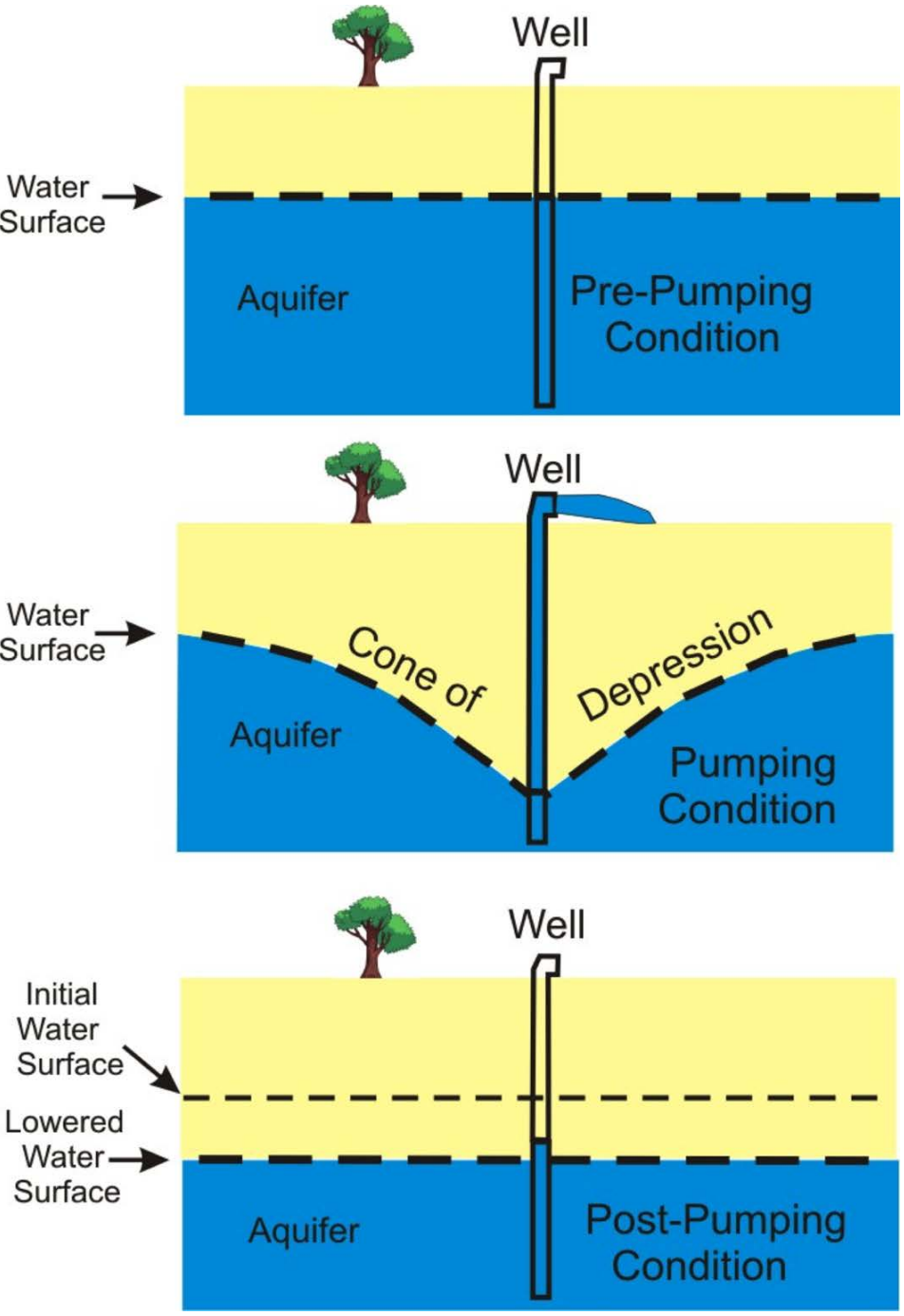


ET Capture

Groundwater extracted from ET capture is replaced when pumping is turned off.

After pumping ceases the water surface will return to near pre-pumping conditions.

This is the condition that the 3M plan envisions.



Groundwater Mining

Groundwater extracted during groundwater mining is permanently lost.

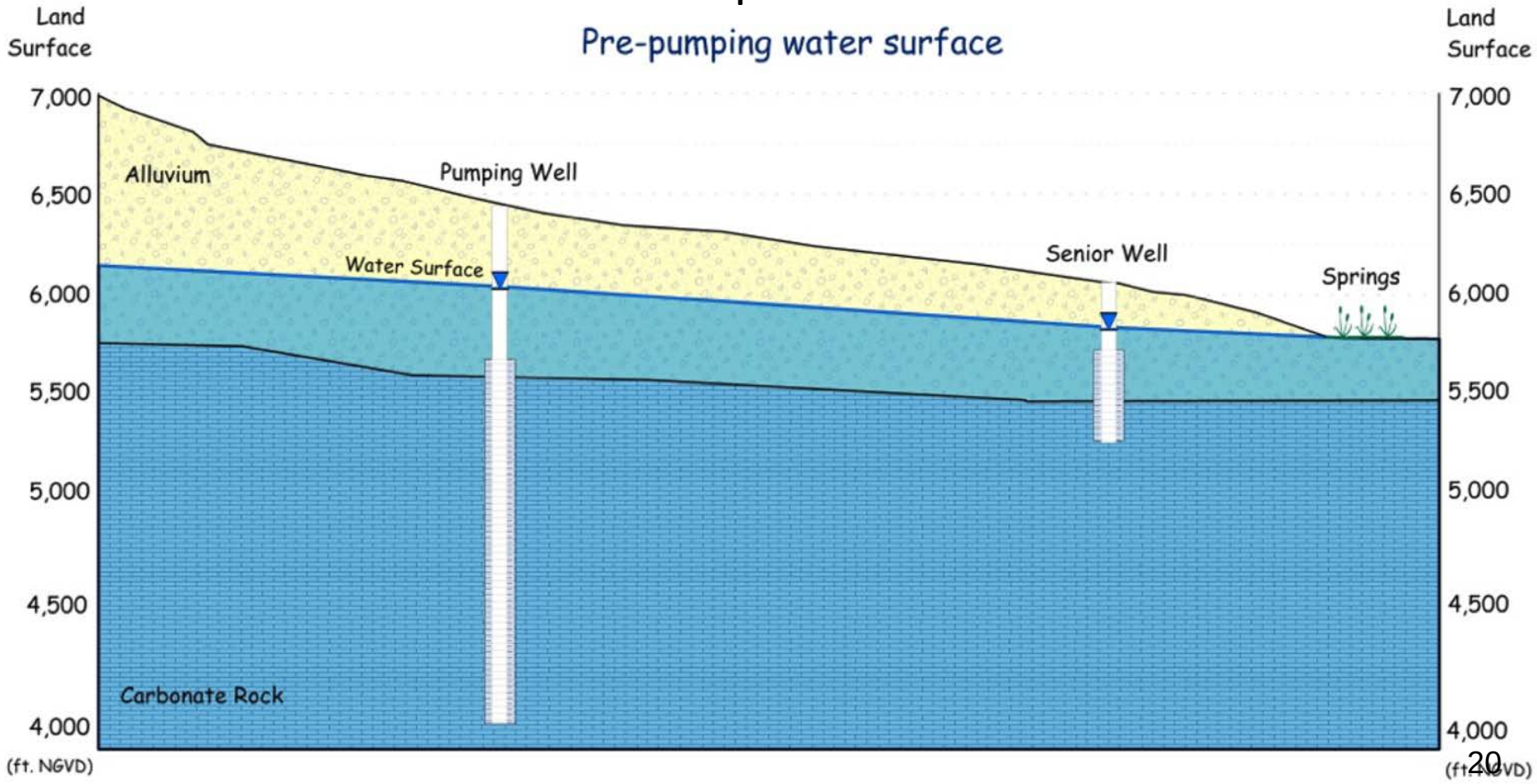
When pumping is turned off the depleted water results in a permanently lowered water surface.

This is the condition that will actually occur as a result of SNWA pumping.

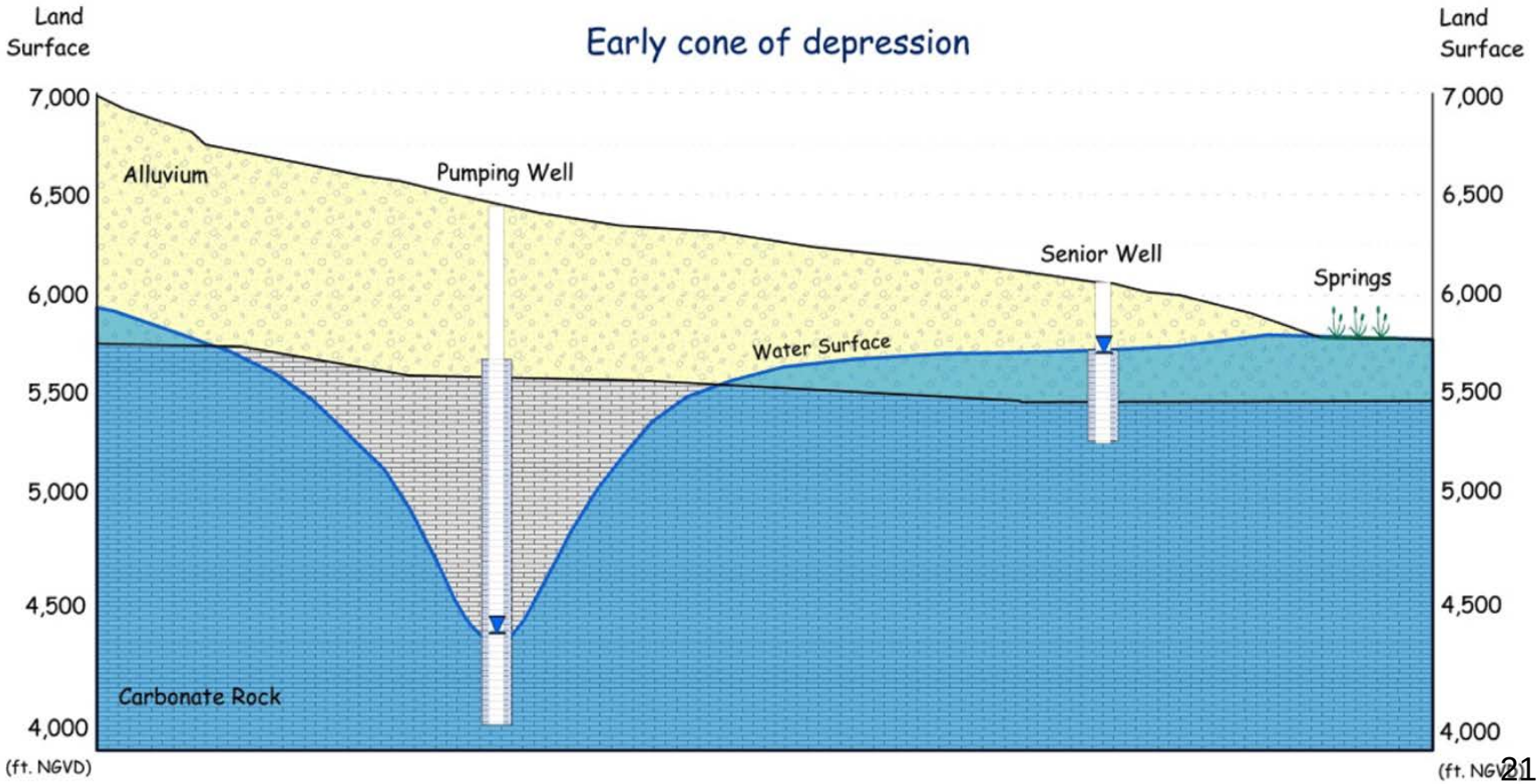
The next series of slides illustrate what will happen in Spring Valley as a result of SNWA groundwater mining.

The slides are not to scale and do not represent a specific location.

During pre-SNWA pumping the water surface slopes from the mountains to the valley floor. Springs and sub-irrigated wetlands occur near the valley floor where the groundwater surface intersects ground surface. Groundwater occurs in both the alluvial and carbonate aquifer.

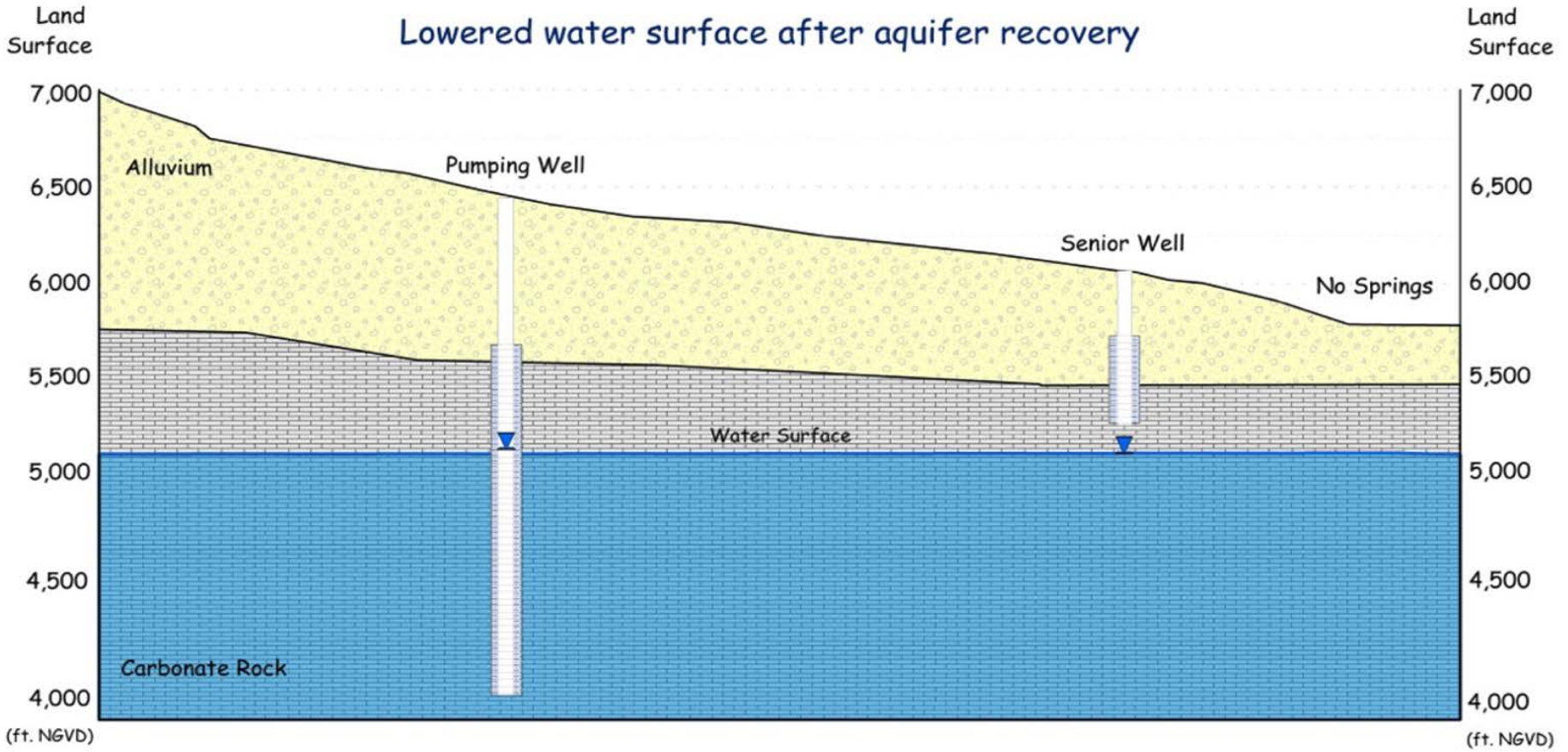


Here the pumping cone of depression has reached a senior water rights well or sentinel well but has not impacted the down gradient spring or sub irrigated wetlands. Because the trigger has been activated the pumping well has been turned off.



After the pumping well is turned off the cone of depression continues to grow and reaches the spring and sub-irrigated wetlands.

After full recovery the water surface is permanently lowered, the spring and wetlands are dry and the senior well has been impacted. Because the SNWA project has mined ancient alluvial and carbonate aquifer water, it will take thousands of years for the water level to recover to pre-pumping conditions.



Groundwater Modeling and the 3M Plan

"SNWA has developed a regional groundwater flow model that includes Spring Valley. Groundwater models are the best way to test various pumping scenarios to predict the potential impacts of groundwater extraction. SNWA experts argue that the existing CCRP model is not suitable for impact testing at specific locations, but there is no technical reason that prevented SNWA from developing such a model during the several years that have passed since the District Court remand ruling. The results of such a model could have been used to develop reasonable threshold and triggers and to determine if the 3M plan would be able to produce water while simultaneously safeguarding senior water rights. This omission puts senior water rights holders at risk" (Jones and Mayo, 2017

Summary

1. The SNWA 3M Plan does not include stakeholder review or oversight. The plan is simply trust us.
2. The proposed data for establishing baseline conditions and action triggers in the SNWA 3M plan is inadequate and does not accommodate well known long-term trends in wet and dry climatic cycles.
3. Implementation of the proposed SNWA GDP and the proposed 3M plan will cause irreparable damage to existing water rights in Spring Valley. The 3M plan does not recognize the fact that the SNWA GDP is partially based on groundwater mining and as such the groundwater levels and spring fluxes will not recover after mitigation measures are enacted.

Summary (Con't)

4. The SNWA 3M plan is not based on an understanding of groundwater flow relationships between shallow and deep groundwater systems or on an understanding of how these systems impact spring discharges. Instead the 3M plan is - Let's pump water, see what happens, and then attempt to fix it.

5. As part of developing the 3M plan, SNWA should have constructed a groundwater flow model that could be used to predict the impact that different pumping schemes will have on senior water rights at specific locations, and then used that model to test the feasibility of a 3M plan and its effectiveness at protecting senior water rights. This omission puts senior water rights holders at risk.