

Integrated Management of Water

interrelation of internal and external interests for common benefit possible through the functioning of public districts

Stephen C. Smith

The following is the second and final article on the junction of the public district in the integrated management of ground and surface water.

The organizational structure of a public district makes it possible for the relevant issues with respect to the integrated management of ground and surface water to be considered within one decision making framework rather than as independent resources.

In northern Santa Clara County some interests have been so integrated—for example the construction and operation of detention dams with spreading areas. On the other hand, internal representation within one organization has not existed for other interests. Each of these interests has been represented by its own organization.

Two public agencies—the Santa Clara Valley Water Conservation District and the Santa Clara County Flood Control and Water Conservation District—emphasize a major interest in integrated management in the use of conservation dams for downstream flood protection. These districts are complementary in such operations as capturing flood water in the forefront of the rainy season and at other times when reservoir levels are low. The general policy of the Conservation District is to drop these levels as soon as percolation conditions are favorable. This element of complementarity was demonstrated in 1955. Between December 21 and December 25, Lexington Dam held back 13,400 acre-feet of water, and Coyote Dam and Anderson Dam stored 30,250 acre-feet and a disaster of major proportions in Los Gatos and San Jose was averted.

Competition between the two interests exists, however, for reservoir use. Storm water frequently must be held in storage. Release may be delayed due to debris, silt, or the need to build up a reserve. Water may be held into the irrigation season to combat seasonal overdraft, for recreational use, or because of lack of percolating facilities. Thus, less storage space is available to capture succeeding rainfall for flood protection.

The fact that these two interests were represented by separate organizations has not facilitated the integrated management of ground and surface water, although some integration has taken

place because of external criticism of publicly proposed plans. One reason for the restudy of the Water Conservation District's 1956 plan was the lack of support for some of the stated flood control benefits. In this situation external representation forced some integration and the plan was changed. Also, a strong third-party pressure—from the westside cities that would benefit from water conservation in terms of their water supply and from flood control—has urged that integrated management be organized.

It might be suggested that, if interests such as these were represented internally within one organization, major elements of the conflicts might have been settled through staff study and debate with the board of directors bearing the responsibility for representing all of the interests. Such integration would not eliminate public conflict nor the benefits from public discussion and from a strong third-party pressure. But it could add continued management pressure for integration. The extent of complementarity between flood control and conservation could be examined without limiting the possible solutions to the responsibility of an organization concerned with only a partial phase of the problem.

External Interests

By representing internal interests so they may be integrated with external interests, a district may relate itself to sources of water beyond the bounds of the local watershed. For example, the Orange County Water District purchases water for spreading which is transported from the Colorado River. The Los Angeles County Flood Control District purchases Colorado River water and stores it in ground-water reservoirs for security from cyclical variations in rainfall, combating salt water intrusion, and to provide an element of security to the area's defense.

In the San Joaquin Valley, surface importation, ground-water draft and drainage have presented an acute management and organizational problem. Irrigation districts currently overlie the underground reservoirs, and district boundaries are not consistent with ground-water flow nor with the necessities of some management techniques. There-

fore, the existing irrigation districts may have difficulties in organizing management activity depending—in part—on the character of the management plan.

In addition, proprietary rights under the correlative rights doctrine are of long standing and are quite firm. The holders of these rights might have an interest in basin management different from that of a regional operating agency. One possible source of a difference might be in the proposed management variations in the depth to water. For example, in the southern San Joaquin Valley, storage would take place in aquifers lying from 10' to 200' below the surface. Intentional variability in depth to water within this range might well cause an operating agency to be confronted with legal demands for compensation. On the other hand, such additions might mean a reduction in the depth to water coupled with a regional desire to restrict draft in the wet years. To accomplish this purpose, basin management would require the control of draft in relationship to surface water importation in order to maintain the desired storage volume. For large ground-water basins, complicating factors would be numerous and complex.

One method for reaching an operating agreement among the many interests might be for the state to operate the basins in the interests of region-wide

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CALIFORNIA AGRICULTURE

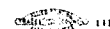
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WATER

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planning. The state's ability to exercise eminent domain and police power might be sufficient if proper legislation authorized such action.

Another possibility might be for the interests internal to basin operation to organize a new district or association which would represent their internal interests with respect to the broader external interests. Precedent for such action has been cited.

A principal role of the public district in the integrated management of ground and surface water is to provide the organizational structure for integration. Integration is achieved by having the internal interests to the management plan represented within the district structure, to provide a means for reaching common interests. And these interests can in turn be represented to external interests by the district form of organization.

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FLOW

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These studies indicate that where the spring water is dependent on the local watershed, some increase in flow can be expected as a result of manipulation of the plant cover.

During these studies, roots of grasses, shrubs, and trees were excavated in the field to determine rooting depth. Soft chess was found to penetrate the soil to a depth of 39", and foxtail fescue to 23". Both of these annual grasses are important components of the resident vegetation. Ryegrass, an annual commonly planted in the study area on burned over brushlands, extended its roots to 42". In other studies this species penetrated to 54". Tarweed is deeper rooted than the grasses and during those years when abundant it depletes the soil moisture to a greater depth than the grasses.

Roots of three 5-year-old wedgeleaf ceanothus plants were excavated and all were found to extend to a depth greater than 10'. The roots of 11-year-old ponderosa pine were traced down 12' but—by the size of the root at the 12' depth—they went much further.

Another factor in plant cover manipulation and spring flow involves plants that have their roots in free water. When the tops of such plants are removed, more water may become available immediately for spring or creek flow.

The excavations of wedgeleaf ceanothus may give some indication of how

upland plants tap free water. The roots of three plants excavated on April 29, 1952 extended to 10' where they reached granite and were beginning to grow horizontally. At this level they were in water flowing over bed rock. Thus, in addition to the water removed from the soil it seems that these deeply rooted plants can sometimes tap underground flows of water. This may be important as far as increase in spring flow immediately after brush removal is concerned. When the tops—transpiration surface—are removed by burning or cutting, this water is then permitted to enter spring flow. This principle probably accounts for the quick increase in flow in Finegold Creek, Willow Spring, Grapevine Spring, and possibly the others except for Rock Spring.

A third factor that might possibly apply in plant cover manipulation and spring flow concerns infiltration capacity. If the infiltration should be lowered to the point where most of the rainfall is dissipated through surface runoff and is not permitted to enter the soil, then spring flow might decrease or even stop. This could result from creation of bare soil that becomes sealed, a situation not encountered in these studies.

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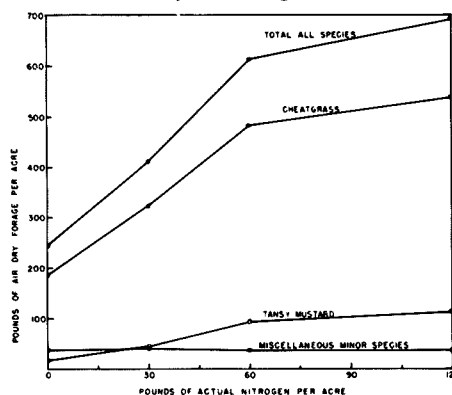
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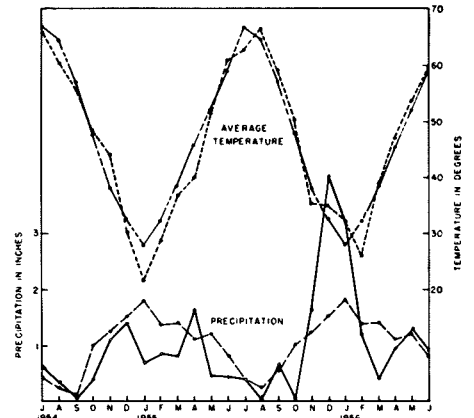
served or measured indication that there was a quantity or quality response by native forage plants to applications of sulfur.

Total seasonal precipitation was 8.73" in the 1954-55 growing season and 14.61" in the 1955-56 growing season compared to the 41 year average of 12.53". Thus on a year when rainfall was

Second year responses of native range species to carryover nitrogen.



3.62" below normal the native forage failed to respond to applications of nitrogen or sulfur. However, these same plots were able to respond to the initial application of nitrogen when they received an extra 5.88" of rain or 2.26" above normal during the second growing season. The 1955-56 growing season also had unusually warm months of December and January.



Monthly precipitation and mean temperatures. Solid line indicates monthly precipitation and mean temperatures for the 1954-55 and 1955-56 growing seasons. Broken line shows 38 year average. Data from U. S. Forest Service, Alturas.

The third year observations—made in May 1957—indicated there was a response from the higher rates of the initial application of nitrogen.

Nitrogen carryover has also been noted on barley in Modoc County. Nitrogen, in the form of ammonium sulfate at the rate of 40 pounds per acre, was applied to a dryland barley planting six miles east of Alturas in March of 1955. The 1955 harvest on three acres of check yielded 1,400 pounds of barley per acre. The same yields were harvested on the three acres receiving the 40 pounds of nitrogen. During the next growing season—1956—the barley receiving the nitrogen started growing earlier, grew an extra 6" in height, and yielded 400 pounds more grain than the check.

These tests indicate that nitrogen fertilizers applied one year may produce increased feed on a range the following year or—in areas of low rainfall—even two years later, where initial application of nitrogen was high.

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