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OBJECTIVE: Determine Seepage Losses from HC&S Irrigation System Reservoirs and Canals

Problem Description:

HC&S estimated irrigation system conveyance losses to be greater than 30% of inflows.
Research goal was to verify the historic estimate.

Technical/conceptual approach:

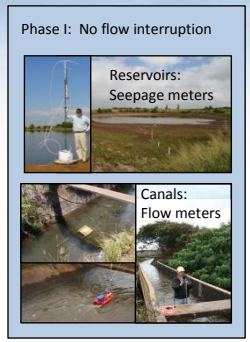
Reservoir & canal seepage measured in 2 phases:

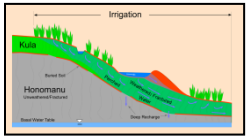
Phase I - *No flow interruption permitted*
Reservoirs - Point tests with seepage meters
Canals - Inflow/outflow tests with flow meters

Phase II – *Limited flow interruption permitted*
Reservoirs – Ponding tests with level loggers
Canals – Ponding tests with level logger

Deep seepage measurement, no flow limitations:

Irrigated and non-irrigated fields adjacent to reservoirs and canals with sting resistivity meter





Key Accomplishments and Findings:

Phase I - Seepage meter tests and inflow/outflow tests, attempted under flowing conditions, were inconclusive as measurement uncertainty overwhelmed seepage signal in most cases.

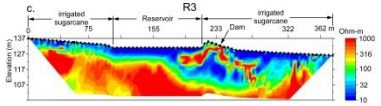
Phase II - Ponding tests conducted on reservoirs and canals yielded reasonable values compared to literature and similar studies.

Reservoir mean seepage 0.13 ft/day; 10.3 mgd for all reservoirs.

Canal seepage range (variable condition) 0.26 ft/day to 0.62 ft/day; 17.2 to 41.1 mgd for all primary and secondary canals.

Total system seepage ranges from 27.5 to 51.39 mgd or 12.7% to 23.7% of inflow, based on 217 mgd average inflow.

Resistivity - Percolation under ponds, canals, and irrigated fields moves preferentially downslope recharging aquifer through valley bottom.



Methods:

Point tests: 8 reservoirs, modified seepage meters (BGS).

Inflow/outflow tests: >15 canal reaches, >75 tests, 4 representative canal conditions, 3 flow meters, single & paired (Teledyne, OTT, SonTek).

Ponding tests: 4 reservoirs, 2 canal reaches, 2 loggers (Solinst, ISCO).

Deep seepage tests: 4 sting resistivity (AGI) 2-D profiles, representative topo-sequence across plantation conditions to assess deep losses.

Project Management:

Reservoir seepage and resistivity measurements (Allen, Dunbar, White):
Phases I & II - $200,000; Baylor University cost share $18,200

Canal seepage measurements (Wolfe):
Phases I & II - $79,500

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