



FUNDACION PARA LA
INNOVACION AGRARIA
MINISTERIO DE AGRICULTURA

PROPUESTA "ESTUDIO CONCEPTUAL DE CARACTERIZACIÓN DE
AGUAS SUBTERRÁNEAS EN EL VALLE DE ACONCAGUA E
INCIDENCIA DE Y HACIA OTRAS CUENCAS"

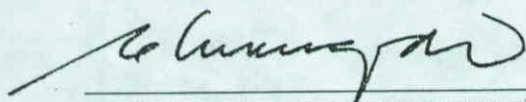
CÓDIGO FIA B-015

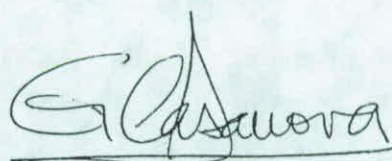
ENTIDAD
PATROCINANTE FACULTAD DE AGRONOMÍA. UCV

SUPERVISOR
PROPUESTA SRTA. GABRIELA CASANOVA A.

CONTRAPARTE
NACIONAL SR. LEVI MANSUR

MODIFICACIONES


FACULTAD DE AGRONOMÍA
UCV


SUPERVISOR
FIA



FUNDACION PARA LA
INNOVACION AGRARIA
MINISTERIO DE AGRICULTURA

Santiago, 14 OCT. 1997
CT 932/

Fecha de Recepción en
Secretaría Facultad Agronomía
U. C. V.

17 OCT 1997

Señor
Eduardo Salgado
Decano
Facultad de Agronomía
Universidad Católica de Valparaíso
Quillota

De mi consideración:

Junto con saludarle tengo el agrado de hacer llegar a Ud. cuatro ejemplares, del Contrato de Financiamiento Código B-015, más la Propuesta, denominada: "Estudio conceptual de caracterización de aguas subterráneas en el valle de Aconcagua e incidencia de y hacia otras cuencas".

Me permito recordar a usted que la emisión y envío del pasaje al Consultor, se hace contra firma de estos documentos, por lo que le agradeceré firmarlos y remitirlos a la brevedad.

Se despide atentamente,

Margarita d'Etigny
Margarita d'Etigny
Directora Ejecutiva



maa
1009-01
c.c.: Direcc.
C.T.

FUNDACION PARA LA INNOVACION AGRARIA
Programa Capturas Tecnológicas - Subprograma Consultores Calificados
INSTITUTO DE CIENCIAS APLICADAS

FORMULARIO DE PRESENTACION DE PROYECTOS
SUBPROGRAMA CONSULTORES CALIFICADOS.

1.- TÍTULO DE LA PROPUESTA :

ESTUDIO CONCEPTUAL DE CARACTERIZACION DE AGUAS SUBTERRANEAS EN EL VALLE DE ACONCAGUA E INCIDENCIA DE Y HACIA OTRAS CUENCAS.

2.- ESPECIALIDAD

Recursos hidrológicos; meteorología; climatología; análisis, medición, y manejo de aguas de deshielos; geomorfología fluvial; estudios de sistemas de cuencas hídricas; erosión y formación de suelos; Recuperación de esteros y vegas.

3.- IDENTIFICACION DEL CONSULTOR

Nombre: ROBERT CURRY
Institución / Empresa UNIVERSITY OF CALIFORNIA, SANTA CRUZ
Dirección postal SANTA CRUZ, CALIFORNIA 95064
Teléfono (408) 4594061 (or), 4269604 (lab), 4266131 (res),
E Mail CURRY@CATS.UCSC.EDU
Nota: Curriculum Vitae en anexo.

4.- PATROCINANTE

Universidad Católica de Valparaíso a través de su Facultad de Agronomía.
La Palma, Quillota.

5.- CONTRAPARTE NACIONAL

Decano Facultad Agronomía de la Universidad Católica de Valparaíso
Profesor Eduardo Salgado.

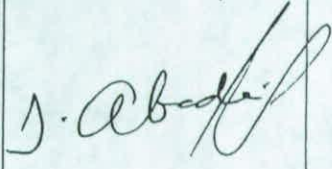


NOMBRE	RUT	DIRECCION	ACTIVIDAD	FIRMA
1. Sr. Eduardo Salgado	[REDACTED]	Casilla 4-D Quillota	Decano Facultad de Agronomía Doctor en Genética Prof. Titular.	[Signature]
2. Sr. Levi Mansur	[REDACTED]	Casilla 520 Los Andes		[Signature]

28 JUL. 1997
FIA

FONDO DE INVESTIGACION AGROPECUARIA
Programa Capturas Tecnológicas - Subprograma Giras Tecnológicas
SOLICITUD DE FONDOS - INSTITUTO DE CIENCIAS APLICADAS

♦ Instituto de Ciencias Aplicadas

Nombre	RUT	Dirección postal	Actividad principal	Firma
1. Sr. Blas Mardones		Las Heras 563 Fono 428822	Presidente Instituto	
2. Sra. María Helena Moreira		Las Heras 563 Fono 428822	Secretaria Instituto	
3. Sr. José Abadie		Las Heras 563 Fono 428822	Director Ejecutivo Instituto	

de

♦ Ilustre Municipalidad de Los Andes

Nombre	RUT	Dirección postal	Actividad principal	Firma
1. Sr. Octavio Arellano		Esmeralda 536	Alcalde	
2. Sr. Luis Rojas		Esmeralda 536	Secretario Municipal	
3. Sr. Mario Méndez		San Rafael 1001	Director Depto. Medio Ambiente	

♦ Asociación de Agricultores de Los Andes

Nombre	RUT	Dirección postal	Actividad principal	Firma
1. Sr. Rodrigo Echeverría		Casilla 328 Los Andes	Presidente Asociación	
3. Sr. Carlos Rivacova		Casilla 4C Los Andes	Director Asociación	

♦ Asociación de Canalistas Primera Sección Río Aconcagua

Nombre	RUT	Dirección postal	Actividad principal	Firma
1. Sr. Francisco Perinetti		Casilla 8-A Los Andes	Presidente Asociación	



- ♦ Realizar entrevistas con especialistas nacionales y Focus Group, para detallar la información hídrica existentes en Chile.
- ♦ En base al conocimiento del Valle definir a nivel conceptual un proyecto sobre el aprovechamiento de los recursos hídricos subterráneos que contemple además la planificación de actividades para el manejo de información en un grupo de trabajo permanente que esté relacionado con el Watershed Institute de California. Dicho Grupo podrá estar formado por el Instituto de Ciencias Aplicadas y por los encargados del uso y distribución de agua subterránea y usuarios locales de dicho recurso (Agricultores, empresas mineras, etc).

de

7.2.- Justificación de la necesidad y oportunidad de realizar la propuesta.

Esta consultoria se hace necesaria por la severa crisis de escasez del recurso vital de agua que se vive en la cuenca del Aconcagua y la provincia de Los Andes en particular. En especial estimamos que se hace crítica la necesidad de preparar y desarrollar proyectos locales con la finalidad de conservación y uso optimizado del agua subterránea en riego y usos potables en tiempos de sequía

Además, se tiene el contacto con el Profesor Robert Curry quien manifestó su disponibilidad para realizar esta consultoria y en producir el Anteproyecto Objetivo, así como a canalizar los contactos para requerir el financiamiento desde USA a las actividades de estudio desde 1998 en adelante.

Por último, se está en la fecha oportuna para realizar la propuesta puesto que el viaje del profesor Curry se puede programar para la primavera del hemisferio Sur, fecha en que se tendrá ya caracterizado el tipo de año hidrológico 1997, desde el punto de vista de su tipificación de recursos precipitados.

7.3.- Antecedentes técnicos y viabilidad de incorporación de la tecnología involucrada al Valle de Aconcagua y a Chile

El Profesor Robert Curry es un experto en recursos hidrológicos subterráneos y manejo de aguas de deshielo. El Sr. Curry tiene diferentes especialidades de investigación científicas que pueden ser de extrema utilidad para la región del Valle de Aconcagua y para Chile. Entre ellas, específicamente, se destaca la especialización en Geomorfología Fluvial; Recuperación de esteros y vegas; Estudios de Sistemas de Cuencas Hídricas; Geología Ambiental; Erosión y Formación de Suelos; Polución Hídrica; Política de Conservación y Uso de agua y Energía; Climatología.



Es de especial interés la experiencia acumulada por el Prof. Curry en los estudios realizados en las cuencas hídricas de la Sierra Nevada y el trabajo de planificación y conservación de aguas de deshielo para la utilización en verano y tiempos de sequía. El Prof. Robert Curry es responsable por un proyecto de trabajo permanente con agricultores de Nuevo México para aprovechamiento de alto potencial y bajo costo de las aguas provenientes del deshielo de la región de Sangre de Cristo.

En particular, el trabajo se enfocará a las aguas subterráneas del Valle de Aconcagua, su cuantificación y caracterización desde el punto de vista de su aprovechamiento técnicamente optimizado, sus vulnerabilidades y los cuidados para su preservación, su balance con los recursos de escorrentía superficial, las proyecciones de su demanda y la dependencia de su extracción con finalidades fuera de la cuenca.

de

7.4.- Coherencia de la propuesta con las actividades innovadoras que los participantes desean promover en el mediano plazo, y resultados o productos esperados con la realización de la propuesta

La consultoría del Profesor Robert Curry permitirá dar inicio a un proyecto más amplio de trabajo, con la formación de un equipo técnico local, vinculado directamente con centros científicos norteamericanos, para intercambio permanente de información climatológica e hídrica entre ambos países. Igualmente, el contacto directo con los agricultores de la región que serán parte integral del programa de optimización, manejo y utilización de aguas de reservorios naturales (glaciares, acuíferos) para uso y conservación en tiempos de sequía.

Dicho Proyecto, que debe ser realizado entre los años 1998 y 2000, será presentado a la USAID (United States Agency for International Development) u otras agencias del exterior, para captar el financiamiento necesario para su realización.

Con esto se pretende transferir directamente la experiencia del experto que preparará los alcances, metodologías y programa del proyecto a nivel conceptual.

Más importante aún, la gira permitirá que la elaboración del Proyecto se haga en conjunto, entre el experto y los usuarios responsables de su implementación y ejecución futura, a saber, las autoridades encargadas de recursos hídricos y los agricultores.



8.- COMPROMISO DE TRANSFERENCIA

La transferencia será realizada a través de sesiones de trabajo y Focus Group con:

- a) con técnicos y especialistas².
- b) con agricultores, canalistas y empresas mineras.

Se pretende también dar continuidad a esta transferencia a través de trabajos con especialistas locales que formarán un equipo estable de trabajo en la zona, integrando una red internacional de información con el Hemisferio Norte, a través de un contacto permanente con el Watershed Institute de California. Las actividades comprenden: Charlas, estudios y reuniones con este equipo, visitas a terreno en el Valle de Aconcagua, cuencas adyacentes y glaciares y, en general, todos aquellos sectores más fuertemente afectados por la sequía.

Finalmente, la transferencia será realizada a través de la difusión del proyecto a nivel conceptual de "CARACTERIZACION DE AGUAS SUBTERRANEAS EN EL VALLE DE ACONCAGUA E INCIDENCIA DE Y HACIA OTRAS CUENCAS" y de la planificación de proyectos específicos con agricultores locales utilizando la experiencia adquirida en California y en especial, en Nuevo México.

9.- BENEFICIARIOS

Se estima que los beneficiarios de un estudio de esta naturaleza serían:

- * Usuarios del Servicio de Agua Potable de la Quinta Región del país (aproximadamente 600.000 habitantes)
- * Usuarios del sistema de canalización de riego de las Provincias de Los Andes, San Felipe y Quillota.

10.- IMPACTOS ESPERADOS

- ♦ Materialización de un Estudio científico completo y moderno sobre el recurso de Aguas Subterráneas, sus potencialidades y limitaciones para su mejor aprovechamiento. Obtención de información y generación de un sistema de información para su manejo y toma de decisiones.
- ♦ Adquisición de conocimientos sobre tecnologías y métodos de manejo y administración del recurso agua, a nivel de usuarios y autoridades de la región.

² No se descarta en este caso la organización de seminarios que se autofinancien a través de instituciones como CIDES u otras relacionadas al SENCE



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- ♦ Adquisición de equipos y canales de comunicación , intercambio de información hidrometeorológica a nivel internacional. Integración a una red internacional de información.
- ♦ Ahorro de costos y disminución de la vulnerabilidad en las labores agrícolas por la introducción de métodos modernos de aprovechamiento del agua y por prácticas de reserva en materia de aguas subterráneas.
- ♦ Mayores beneficios en las producciones agrícola por mejoras de rendimiento y eficiencia de las nuevas técnicas de riego, y la utilización del riego como un método de mejora de las productividades.
- ♦ Incorporación futura de Sistemas y Tecnologías de Medición y Caracterización de recursos hídricos subterráneos y sensibilización de sus potencialidades frente a la variabilidad de los ciclos hidrológicos.
- ♦ Factibilidad de estudios de post-grado para ingenieros nacionales.

Finalmente, el principal impacto esperado es la búsqueda y definición de fuentes y recursos hídricos alternativos, recuperación de cuencas, planificación de sistemas de recuperación, conservación y almacenamiento de agua de deshielo para la utilización racional en temporada de riego y especialmente para tiempo de sequía.



ITINERARIO PROPUESTO

Septiembre 22 a octubre 15 1997

- * Reunión de coordinación del comité en el Salón del Concejo de la Ilustre Municipalidad de Los Andes (martes 30/9)
- * Compilación de material científico, literatura y datos relativos a meteorología y recursos hídricos existentes en Chile
- * Invitación a expertos nacionales para integrar el equipo permanente local
- Preparación de entrevistas y reuniones entre los expertos chilenos y el Profesor Robert Curry
- * Preparación de una agenda detallada de entrevistas y reuniones Planificación del Focus Group.

Viernes 17 octubre Llegada del Profesor Robert Curry

Sábado 18 a lunes 20 Estudio por parte del Prof. Robert Curry de los materiales científicos recopilados Ubicación de antecedentes adicionales que el Prof. Curry estime necesarios

Martes 21 octubre. Entrevista con:

- Profesor Guillermo Cabrera Fajardo, Departamento de Ingeniería e Hidrología de la Universidad de Chile, especializado en aguas subterráneas
- Héctor Jeria, jefe de Unidad Asesora de Riego, Ministerio de Agricultura

Miércoles 22 octubre

- Entrevista y reunión con Juan Carlos Cuchacovich, jefe del Departamento de Protección de Recursos Naturales del Servicio Agrícola y Ganadero
- Entrevista y reunión con Mario Lagos, jefe del Subdepartamento Conservación de Suelos y Aguas, Servicio Agrícola y Ganadero

Jueves 23 octubre

- Realización de entrevistas y reuniones con miembros de las Asociaciones de productores agrícolas y canalistas de Los Andes y San Felipe

Viernes 24 octubre

- Visita a Facultad de Agronomía de la Universidad Católica de Valparaíso y reunión con profesores y científicos interesados en el tema de riego
- Entrevista con Ludwig Stowas, ingeniero hidráulico, profesor de la Universidad Federico Santa María, Valparaíso



Sábado 25 y domingo 26 octubre.

- Visita a terreno con científicos del equipo local y dirigentes de las Asociaciones de productores agrícolas y canalistas de Los Andes y San Felipe.

Lunes 27 a miércoles 29 octubre:

- Visita a terreno con científicos del equipo local a las estaciones de medición de CODELCO Chile - División Andina; Visitas a terreno (vuelo) en los glaciares con medición y estudio de los deshielos 1997
- Coordinación de la visita a CODELCO Chile, División Andina, ingeniero hidráulico Ricardo Bensen, jefe del Departamento de Recursos Ambientales

Jueves 30 octubre:

- Día libre para recopilación de datos adquiridos en la visita y/o otras entrevistas con científicos

Viernes 31 octubre, Sábado 1º y domingo 2 noviembre:

- Días libres para preparación del borrador del proyecto a ser presentado en exterior.

Lunes 3 noviembre:

- Realización de **Focus Group** con científicos que formarán parte del proyecto a ser elaborado con posterioridad al estudio conceptual, y que participarán del intercambio internacional permanente

Martes 4 noviembre:

- * Seminario final, en el Salón de Honor de la Ilustre Municipalidad de Los Andes, con invitación extensiva a todos los integrantes de asociaciones de productores agrícolas y canalistas del Valle de Aconcagua, así como científicos locales interesados, juntamente con los medios de difusión

Los temas del seminario incluirán:

- a) Las observaciones y primeras conclusiones científicas del consultor después de sus visitas a terreno.
- b) Los principales puntos del anteproyecto elaborado durante la visita
- c) Discusión del itinerario de la gira tecnológica de chilenos para conocer los sistemas de riego de los Estados norteamericanos de California y Nuevo México.

Miércoles 5 noviembre: Regreso del consultor Mr Robert Curry



Los Andes, 10 septiembre 1997

Sra. Gabriela Casanova
Encargada Programa Capturas Tecnológicas
Fundación para la Innovación Agraria
Atención Sra. Paulina Erdmann
Presente

Ref. Propuesta B-015

De nuestra consideración:

En referencia al fax 5/9/97, CT N° 768 sobre propuesta "Estudio conceptual de caracterización de aguas subterráneas en el Valle de Aconcagua e Incidencia de y Hacia Otras Cuencas", debemos aclararle lo siguiente:

1) Los científicos chilenos que participarán en las visitas a terreno serán los mismos científicos que participarán en el Focus Group y en entrevistas personales con el consultor. Ellos son:

- Juan Carlos Cuchacovich, ingeniero civil especializado en hidrología y medio ambiente, jefe del Departamento de Protección de Recursos Naturales del Servicio Agrícola y Ganadero (SAG);
- Ricardo Bensan, ingeniero hidráulico, jefe del Departamento de Recursos Ambientales, Codelco Chile; División Andina;
- Guillermo Cabrera Fajardo, profesor del Departamento de Ingeniería e Hidrología de la Universidad de Chile, especializado en aguas subterráneas;
- Héctor Jeria, jefe de Unidad Asesora de Riego, Ministerio de Agricultura;
- Mario Lagos, jefe Subdepartamento Conservación de Suelos y Aguas, Servicio Agrícola y Ganadero (SAG);
- Ludwig Stowas, ingeniero hidráulico, profesor de la Universidad Federico Santa María.

2) Los científicos anteriormente citados formarán parte del equipo permanente.

3) Durante la visita será establecido qué otros profesionales de universidades y/o institutos de investigación, así como profesionales de servicios encargados del uso y distribución de las aguas de riego, serán invitados a formar parte del equipo permanente.

4) Tal como mencionamos en el fax fecha 18/8/97, enviado a la Sra. Paulina Erdmann, reiteramos nuestro propósito de fortalecer el compromiso de transferencia a través de un seminario abierto, a realizarse en el Salón de Honor de la Ilustre Municipalidad de Los Andes, extendiéndose una amplia invitación a todos los integrantes de las asociaciones de productores, agricultores y canalistas del Valle de Aconcagua como, también, a los científicos locales interesados.

Los temas del seminario incluirán:

- a) Las observaciones y primeras conclusiones científicas del consultor después de sus visitas a terreno;
- b) Los principales puntos del anteproyecto elaborado durante la visita con el título "Estudio conceptual de caracterización de aguas subterráneas en el Valle de Aconcagua e incidencia de y hacia otras cuencas".



Los Andes, 9 octubre 1997

Sra. Paulina Erdmann
Presente

Ref. Propuesta B-015

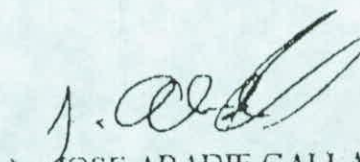
De mi consideración:

De acuerdo a lo conversado telefónicamente referente a su fax 7/10/97, CT N° 768 Ref. Contratación Consultor Calificado, envío las últimas modificaciones al presupuesto.

COSTO TOTAL Y APOORTE SOLICITADO (EN PESOS)

ITEM	COSTO TOTAL	APORTE PROPIO	APORTE SOLICITADO	ACTIVIDAD ASOCIADA
Pasajes aéreos	449.526		449.526	San Francisco/Santiago/San Francisco
Tasas de embarque	30.000		30.000	Tasa Aeropuertos
Costos de envío e impuestos	40.449		40.449	Gastos según item
Seguro de viaje	45.870		45.870	Seguro de salud y vida
Focus Group	429.754	429.754		Organización de Focus Group
Honorarios	2.500.000		2.500.000	Consultoría elaboración de proyecto de estudio
Gastos de bencina	100.000		100.000	Organización de visitas, reuniones
Seminario	170.246		170.246	Organización del seminario final
Vuelos de helicóptero	1.000.000	1.000.000		Medición de glaciares y de hielos. Aporte de Codelco, División Andina
TOTAL	4.765.845	1.429.754	3.336.091	

Le saluda muy atentamente.


JOSE ABADIE GALLARDO
- Director Ejecutivo -



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históricos de la zona, dos horas de vuelo en helicóptero para visita a glaciares, apoyo de sus especialistas y, por último, colaborará en la organización de los eventos.

ANEXO Nº 1

CURRICULUM PROFESOR ROBERT CURRY

ANEXO Nº 2

CARTAS COMPROMISO DEL CONSULTOR



CURRICULUM VITA

Robert R. Curry

Research Professor, University of California Santa Cruz; Research Coordinator and Senior Scientist, California State University Monterey Bay, Watershed Institute and Adjunct Professor, Earth Systems Science and Policy, California State University. Principal: Watershed Systems, P.O. Box 770, Soquel, Calif. 95073 curry@cats.ucsc.edu or (408) 459-4061 (lab); 426-9604 (fax); 426-6131 (res.). 408 459-4098- Watershed Institute CSUMB. Fax 582-3691; Research Station 760 932-7700

Research Specialties:

Fluvial Geomorphology, Geologic Hazards, Wetlands and Stream Restoration, Watershed Systems, Mined-land Reclamation, Environmental Geology, Soil Erosion and Formation, Climatology, Water Quality Protection, Pleistocene Geology, Water and Energy Policy, Arctic & Alpine Plant Ecology, Sierra Nevada Natural History, Water Resources Conservation

1. EDUCATION

PhD: University of California, Berkeley, Department of Geology & Geophysics, 1967 in Geomorphology & Paleoclimatology

Dissertation Topics:

- Holocene Climatic History of the Sierra Nevada.
- Quaternary Glacial and Climatic History of the Sierra Nevada, California.
- Rates and Forms of Mass Wasting in the Sierra Nevada, California.

1.1. Pre-doctoral studies:

- | | | |
|--------------------------|---------------|-------------------------------|
| • University of Colorado | Geology | B.A., 1960 Boulder, Colorado |
| • University of Colorado | Geology | M.Sc., 1961 Boulder, Colorado |
| • University of Colorado | Plant Ecology | M.Sc., 1962 |

MSc thesis title: Geobotanical Correlations in the Tenmile Range, Colo



2. **EXPERIENCE—RESEARCH AND TEACHING**

- 1995-ff : Adjunct Professor of Watershed Systems, Earth Systems Science, Calif. State Univ. Monterey; Senior Scientist and Research Coordinator, Watershed Institute
- 1994-ff : Research Professor, University of California Santa Cruz (July 1, 1994 ff)
- 1981-94 : Professor of Environmental Geology, University of California Santa Cruz
- 1979-1981: Provost, College Eight; and Chair, Environmental Studies Board, Univ. of California Santa Cruz
- 1976-1979: Co-Chairman, National Coal Policy Project, Georgetown University, Wash. D.C.
- 1979 : visiting professor, College of the Atlantic, Bar Harbor, Maine (January).
- 1974-1979: Professor of Environmental Geology, University of Montana
- 1973-1975: Director, Sierra Club Research, San Francisco, California
- 1971-1974: Associate Professor, University of Montana
- 1969-1971: Assistant Professor, University of Montana
- 1969 : research fellow, French National Academy, France
- 1969-ff : staff consultant, U.S. Senate Public Works Committee, Washington, D.C.
- 1969 : consultant, Office of the Science Advisor, Executive Office of the President, Washington, D.C.
- 1967-1969: Assistant Professor III, Univ. California, Santa Barbara
- 1967-1976: Research Hydrologist, U.S. Geological Survey
- 1964-1967: teaching and research assistant, U.C. Berkeley, Geology & Geophysics
- 1963 : visiting scholar: Universities of Göttingen, Berlin, Edinburgh, and Innsbruck
- 1962-1963: teaching associate, University of Alaska, Department of Geology, College, Alaska
- 1962 : NSF research assistant, Santa Cruz, California
- 1962 : instructor, University of Colorado, Denver Extension Division
- 1960-1962: teaching assistant, University of Colorado, Boulder, Colorado



3. **PROFESSIONAL -REGISTRATION**

Registered Geologist

California

#3258

1994-ff : Consulting rubric: **Watershed Systems**, Soquel, California

4. **MEMBERSHIP in educational and scholarly associations**

- (1) Geological Society of America (Fellow - 1977 ff)
 - Geomorphology Division - panelest
 - Engineering Geology Division
 - Hydrogeology Division
 - Archaeological Division
- (2) Ecological Society of America
 - Paleoecology Division
- (3) Society for Ecological Restoration
 - SERCAL - California Chapter President 1995-96
- (4) American Geomorphological Field Group
- (5) International Glaciological Society
- (6) California Watershed Council
- (7) American Geophysical Union
- (8) Society for Soil and Water Conservation
- (9) Scientists Committee for Public Information (Fellow)
- (10) International Ecological Society (Committeeman for Soil Ecology Division)
- (11) American Institute of Biological Sciences
- (12) American Quaternary Association
- (13) Sigma Xi (science honorary)
- (14) Sigma Gamma Epsilon (earth sciences honorary)
- (15) International Association for Quaternary Research (committee officer)
- (16) Friends of the Pleistocene
- (17) New Zealand Hydrological Society
- (18) American Association for the Advancement of Science
- (19) Sierra Club (research advisor)



5. **MEMBERSHIP on advisory panels, commissions, etc.**

5.1. **-National**

- (1) Co-chairman, National Coal Policy Project, Georgetown University, Washington, D.C. -1976-1979
- (2) U.S. Senate, Public Works & Environment Committee - panel member - 1969-ff
 - subpanelest on Ocean Dumping
 - subpanelest on Eutrophication
 - subpanelest on Hazardous Wastes
- (3) Member, Federal Utility Advisory panel, 1975-1978 National Science Foundation ERDA/NASA "ECAS" Utility Review Panel (Energy Conversion Alternatives Study)
- (4) National Academy of Sciences & Engineering - 1975-1979 Risks Impacts Panel for Power Generation - panelest
- (5) U.S. Department of Interior - review panel on Teton Dam Failure- invited consultant 1976-1977
- (6) National Academy of Engineering and National Research Council, Committee on Criteria for Selection of National Coal Laboratories, 1978-ff.
- (7) National Academy of Sciences / National Research Council, Committee on Reclamation and Economic Valuation of Soil, 1978-1980. -panel chairman
- (8) American Association for the Advancement of Science (AAAS), Committee on Climate, 1984.
- (9) National Oceanic and Atmospheric Administration and U.S. Geological Survey; Working Group on Climatic Change, 1986-ff.
- (10) National Academy of Sciences, Mono Lake Review Committee, outside reviewer.
- (11) Geological Society of America, Penrose Conference on Environmental Geology. Chair of panel on "Role of the Geologist in the 21st Century", 1986-87
- (12) Geological Society of America, Penrose Conference. Co-chair for committee on geological education.
- (13) National Academy of Science/National Research Council, 1990, review panelest, Role of Scientists in the Courts, Science Court proposal

5.2. **-Regional**

- (1) Northern Cheyenne Tribal Government - advisor on hydrologic and pedologic problems of coal development
- (2) Alberta Farm Organizations - advisor on agricultural problems and reclamation in coal land
- (3) Wyoming Environmental Institute - coal development impacts advisor 1972-1974
- (4) Rocky Mountain Center on Environment 1970-72, consultant on problems of open pit mining



- (5) Trans-Alaska Pipeline - Scientific coordinator for public technical critique for the Center for Law & Social Policy, Wash. D.C., 1971-73
- (6) Northern Tier Pipeline - impact assessment and technical stipulation specialist for state of Montana. 1978-1979.
- (7) Redwood National Park, Outside Technical Review Committee, Watershed Rehabilitation Program, contracted through the Center for Natural Resource Studies, Berkeley, Calif., 1982-ff
- (8) Coordinating Board, Water Resources Center (California), Chair of Research Review Committee, Berkeley, Calif. 1982-86; 1994-ff.
- (9) State of California, Departments of Forestry and Water Resources, Resources Agency: Shrubland Watershed Vegetation Management Committee, 1982-84.
- (10) State of California, Transportation Department, Consultant and advisor on geologic and hydrologic aspects of highway construction.
- (11) State of California, University of California, School of Forestry, Wildlands Resources Institute, Advisory Board, 1987-1992
- (12) State of California, California Watershed Management Conference, Coordinating Board, 1985-89
- (13) University of California Watershed Management Conference, Steering Committee, UCB, Wildlands Resources Center, School of Forestry, 1986-89
- (14) U.S. Forest Service, Academic Peer Review Panel, Cumulative Effects Analysis, U.S. F. S., Region V., California. (letter report of December, 1987), 1986-90
- (15) California Dept. of Forestry, Hardwoods Task Force, 1990-92.
- (16) University of California, Water Resources Research Review Board, reappointment, 1994-95.
- (17) -- 1996 -- US EPA and Corps of Engineers - Hydrogeomorphic Wetland Function training (National Wetland Science Training Cooperative)

6. **PRINCIPAL RESEARCH INTERESTS**

- (1) 1959-1961: Geobotanical correlations in the Tenmile Range of central Colorado. Geologic mapping in an area masked by tills using indicator plant species for bedrock mapping. M. Sc. thesis topic, Univ. Colo.
- (2) 1962: Santa Cruz, California, marine terrace study. N.S.F.-sponsored study of the origin, deformation, and soil development on the marine terrace sequence of northern Monterey Bay. Wm.C. Bradley - principal investigator.
- (3) 1963-1965: Santa Clara County, California landslide hazard mapping project. Co-principal investigator for active and potential slide mapping for land-use planning throughout entire County.
- (4) 1965-present: Northern California watershed erosion research. A series of projects initiated through request of California State Assembly to assess stability of California watersheds and to assess the impacts of land use manipulations upon that stability. Subsumed under sponsorship of California Division of Forestry and Dept. of Water Resources in 1983.
- (5) 1966-present: Sierra Nevada, California - chronology of glaciations. Ph.D. research topic on radiometric chronology of Tertiary and Quaternary glaciation on the Sierra Nevada, including detailed Holocene climatic history.



- (6) 1968-present: Climatic trend analysis. Use of historical climatic data to predict future climatic perturbations based upon correlation of paleoclimatic indicators and use of time-series analyses. 1986-ff PACCLIM - Pacific Basin Climate Group - U.S. Geol. Survey.
- (7) 1973-present: East Sierra fault and volcanic hazard evaluation. Planning and theoretical geologic studies of Mono County, California.
- (8) 1972-1975: Director, public interest research organization. Establishment, funding, and direction of a conservation research organization - Sierra Club Research.
- (9) 1973-present: Reclamation potential of arid western lands. N.S.F. and National Academy - supported work integrating paleo-climatic, time-series, and pedologic studies of nutrient status and hydrologic parameters of reclaimed and native areas of western North American coal lands.
- (10) 1988-Present: Series of research projects on wetland definition theory and practice. Combine geochemical soil studies with botanical and hydrologic studies to develop geomorphically-based criteria for delineation and definition of wetlands in California. Work supported by Calif. Energy Commission, Water Resources Control Board, EPA, CoE, USF&W, and local governments.
- (11) 1989-91: U.S. Geological Survey Sponsored (National Earthquake Hazards Reduction Program) studies of geochemistry of surface and groundwaters affected by the Loma Prieta earthquake of 1989. Work completed in 1991.
- (12) 1986-ff: Demonstration building project of "earth-coupled" solar housing. Innovative design and construction of experimental housing unit that requires no fossil fuels at all for any phase of operation (heating, cooking, electricity, water, etc.) and is suitable for very cold climate regions with long periods of no solar input.
- (13) 1976-1983: Natural Regions study: National Park Service supported assessment and selection of geologic and ecologic natural areas in the Sierra Nevada, Calif.
- (14) 1977-1978: Director of small project to assess the hydrology and total available domestic water for Missoula County, Montana. E.P.A. funded.
- (15) 1976-1978: Co-chairman, Mining Task Force, National Coal Policy Project: develop, through mediation and "Rule of Reason" process, a proposed national coal development policy that is acceptable to both industry and environmental Final report completed and published, 1978. Stage 2 begun 1979.
- (16) 1978-1981: Chairman, National Academy of Sciences / National Research Council study on soil erosion as a function of land uses in the United States, and prospects for recovery.
- (17) 1979-1984: Carmel River watershed channel stability studies. Contracted and thesis supervision research on causes and controls of bank and channel cross-section instability in the Carmel River Valley. For the Monterey Peninsula Water Management District; leading to work on the role of riparian vegetation in bank stability of rivers.
- (18) 1982-present: Estuarine and freshwater stream restoration projects. Primary research with students on restoration of damaged estuarine ecosystems. Pescadero Marsh Management Plan study for California Dept. of Parks and Recreation. Schwan Lake restoration plan, 1991-95. San Lorenzo river restoration planning, 1986-94; Lahontan Regional Water Quality Control Board regional wetland restoration.



7. PUBLICATIONS

7.1. -Books and Monographs

- (1) Curry, R.R., and Wahrhaftig, Clyde, 1967, Geologic Implications of Sediment Discharge from the Northern Coast Ranges, California: p. 35-60 in Goldman, C.R., (ed), Man's Effect on California Watersheds, Section 3; Inst. of Ecology, University of California, Davis, Calif. 434 p.
- (2) Curry, R.R., 1962, Geobotanical Correlations in the Alpine and Subalpine Regions of the Tenmile Range, Summit Co., Colo. Univ. Colo. MSc thesis, 123 p. + maps, unpublished.
- (3) Curry, R.R., 1968, Quaternary Climatic and Glacial History of the Sierra Nevada, California: Univ. Microfilms 68-13,896; Ann Arbor, Mich., 238 p. (PhD thesis, University of California, Dept. of Geology and Geophysics, 1968).
- (4) Curry, R.R., 1969, Holocene Climatic and Glacial History of the Central Sierra Nevada, p. 1-47, Special Paper 123, Geol. Soc. America.
- (5) Committee on Public Works, U. S. Senate, 1970, Toxicological and Environmental Implications on the use of Nitrilotriacetic Acid as a Detergent Builder: Staff Report, Dec. 1971, G.P.O., Washington, D.C. 52-354, 84 p.
- (6) Curry, R.R., 1970, Eutrophication and the Role of Phosphates in Eutrophication. Special Staff Report, U.S. Senate Committee on Public Works, Scientific Advisory Panel, July 23, 10 p.
- (7) Curry, R.R., 1971, Glacial and Pleistocene History of the Mammoth Lakes Sierra: Univ. Montana, Dept. Geology, Geol Series Publ. 2, 50 pp + map.
- (8) Curry, R. R. (ed), 1972, Field Guide: Univ. Montana winter field, Idaho, Washington, Oregon, Feb. 1972, Dept. Geol. Univ. Montana, 81 p.
- (9) Curry, R.R., 1972, Technical Comments on the Trans-Alaska Pipeline, vol. 1, tab b; Center for Law and Social Policy, Washington D.C., 107 p.
- (10) Curry, R.R., Malde, H.E., Andrus, D.R., and Balzer, J.L., 1975, Reclamation of Mined Lands. The Reclamation Question. Rocky Mountain Center on Environment, Coal in the West Series - A Colorado Business Survey, Denver, Colo. 18 p.
- (11) Curry, R.R., Lister, J.C., and Stoffel, Kieth, 1977, Glacial History of Flathead Valley and Lake Missoula Floods. Geol. Soc. America, Rocky Mountain Section, 30th annual meeting, Field Guide No. 4, p. 14-38. in Glacial Geology of the Flathead Valley and catastrophic drainage of Glacial Lake Missoula; Smith, D.G., et al, eds.
- (12) Murray, F.X. (ed), 1978, Where We Agree - Report of the National Coal Policy Project: Georgetown University, Center for Strategic and International Studies; Westview Press, Boulder, Colo. vol. 2, Report of the Mining Task Force, 477 p.
- (13) Committee on Criteria for Establishing Coal Research Laboratories in Universities, 1979, Criteria for Establishing University Coal Research Laboratories. National Academy of Sciences / National Research Council, Energy Engineering Board, NAS Press, Washington D.C., 20 p. (Committee member and coauthor)
- (14) CONAES (Committee on Nuclear and Alternative Energy Systems), 1980, Energy and the Fate of Ecosystems. Supporting Paper 8, Report of Ecosystems Impacts Resource Group, John Harte, Chair. National Academy of Sciences/National Academy of Engineering, NAS Press, Wash. D.C., 399 p. (Member of Group, and author of Chapt. 5, "Land Reclamation in North America", pp. 95-121)



- (15) Committee on Soil as a Resource in Relation to Surface Mining for Coal, 1981, Surface Mining: Soil, Coal and Society. National Academy of Sciences, Commission on Natural Resources, National Research Council, NAS Press, Washington DC, 220 p. (co-author of report and primary author of Chapt. 5, pp. 73-105, "The Soil").
- (16) Kennett, Gregory A, and R.R. Curry, 1981, Investigations of high groundwater in Polson terminal moraine; Bozeman, Mont. : Montana Water Resources Research Center, Montana State University
- (17) National Coal Policy Project, 1981, Final Report, Center for Strategic and International Studies, Georgetown University, Wash. D.C., 124 p. (project co-chair).
- (18) Burke, Mary T., R. Curry, J. Major, and D. Taylor, 1982, Natural Landmarks of the Sierra Nevada. U.S. Dept. Interior, National Park Service, Conservation and Recreational Services Division. Landmark Survey of the Sierra Nevada, 529 p.
- (19) Curry, R.R., (technical coordinator and writer), 1982, "Kampf und Wasser - Kalifornian wissen..." ["Fight for Water - California's position between water excess and water deficit]. Video Documentary produced by Hans G. Wiegand for West Deutsche Rundfunk, Science Dept., Koln, W.D., and first aired nationwide March, 1982. Audio version edited for radio first aired Sept 7, 1984. Seventy minute program exploring conflicts in water resource allocation in California. Videotape with German and English soundtracks.
- (20) Kondolf, G.M., John Williams, and R. R. Curry, 1983, Channel Stability and Fish Habitat, Carmel River, California. Field Conference Guidebook for Symposium and Field Conference, Monterey Peninsula College, Monterey, Calif. June 16-18, Monterey Peninsula Water Management District, 76 p.
- (21) Curry, R. R., 1985, Sedimentologic and Hydrologic Analysis of Pescadero Marsh and its Watershed. Report to State of California, Dept. of Parks and Recreation, 110 pp.
- (22) Curry, R. R., and A. Beth Dyer (eds), 1992, The current status of Schwan Lagoon, Santa Cruz County, California and some management considerations. A compilation of technical reports. Univ. of California Santa Cruz, 96 p.

7.2. -Journal papers and book chapters

- (1) Curry, R.R., 1966, Observations of Alpine Mudflows in the Ten-mile Range, central Colorado: Geol. Soc. America Bull., v. 77, p. 771-776.
- (2) Curry, R.R., and Clyde Wahrhaftig, 1966, Geologic Implications of Sediment Discharge Records from the Northern Coast Ranges, California. Report to the California state Assembly Committee on Natural Resources, Planning, and Public Works; Sub-committee on Forest Practices and Watershed Management, August, Sacramento, Calif., 22 p.
- (3) Curry, R.R., 1966, Glaciation -- 3,000,000 years ago in the Sierra Nevada, California: Science, v. 152, p. 155-156.
- (4) Curry, R.R., 1967, Glacial History of the Central Alps between Sellrain and Otztal: (english summary of report by Helmut Heuberger): Wissenschaftliche Alpenvereins Hefte 20, 10 p.
- (5) Curry, R.R., 1967, On the use of vegetation to date land surfaces: Revue de Geomorphologie Dynamique, v. 17, no. 4, p. 168-169.
- (6) Curry R.R., 1967, Photography and Stereophotography: Revue de Geomorphologie Dynamique, v. 17, no. 4, p. 174-175.



- (7) Curry, R.R., 1967, Repeated Photographs: *Revue de Geomorphologie Dynamique*, v. 17, no. 4, p. 175-176.
- (8) Curry, R.R., 1968, California's Deadman Pass Glacial Till is also nearly 3,000,000 years old: *Calif. Divn. Mines, Mineral Information Service*, v. 21, no. 10, p. 143-145.
- (9) Curry, R.R., 1969, Lake: in Styles, Ed. (ed), *Jefferson Encyclopedia*, World Book Publ. Co., Cleveland, Ohio.
- (10) Curry, R.R., 1969, River: in Styles, Ed. (ed), *Jefferson Encyclopedia*, World Book Publ. Co., Cleveland, Ohio.
- (11) Curry, R.R., 1969, Swamp: in Styles, Ed. (ed), *Jefferson Encyclopedia*, World Book Publ. Co., Cleveland, Ohio.
- (12) Curry, R.R., 1969, Santa Barbara and Beyond: *in*: Olsen, R.A. and M. M. Wallace (eds), *Geologic Hazards and Public Problems*. Exec. Office of the President, Office of Emergency Preparedness, Reg. 7, Wash. D.C.
- (13) Curry, R.R., 1969, Vertical movements of the Sangamon marine terrace around the Santa Barbara Channel, California. p. 300 *in*: *Symposium de Neotectonique du Pacific, Resumes de communications, VIIIe Congress INQUA*, Paris, France.
- (14) Curry, R.R., 1969, Chronologie Glaciare Absolue de la Sierra Nevada, Californie, pour les derniers 2,700,000 ans. p. 346 *in*: *resumes des communications, VIIIe Congress INQUA*, Paris, France.
- (15) Curry, R.R., 1970, Wilderness as biota refugia. *In*: Luten, D.B. (ed), *Wilderness, the Edge of Knowledge*; *Proc. of the 1969 Sierra Club Wilderness Conf.*, Sierra Club, San Francisco.
- (16) Curry, R.R., 1970, Fluorine in the marine environment—a legislative proposal prepared for the Sub-committee on Ocean Dumping, U.S. Senate Public Works Committee, advisory panel, 9 p.
- (17) Curry, R.R., 1970, Lodgepole Subclimax—its maintenance by insects and birds: *Reports of the American Quaternary Association*, 1st meeting, 1970, p. 26.
- (18) Curry, R.R., 1970, Altithermal precipitation maximum: *Reports of the American Quaternary Association*, 1st meeting, p. 25.
- (19) Curry, R.R., 1970, Report to the subpanel on Ocean Dumping, U.S. Senate Committee on Public Works; including a proposal for the establishment of national dumping sites; reports of the Senate Committee on Public Works, advisory panel, 12 p.
- (20) Curry, R.R., 1970, A proposal for ecological refugia: *Intecol Bulletin*, v. 1, p. 3-7.
- (21) Curry, R.R., 1971, How to deforest a continent: *Not Man Apart*, v.1, no. 9, p 25-27.
- (22) Curry, R.R., 1971, Soil destruction associated with forest management and prospects for recovery in geologic time: *Assoc. Southeastern Biologists Bull.* v. 18, no. 3, p 117-128.
- (23) Curry, R.R., 1972, Geology, the environmentalists foundation: *Michigan Acad. of Science, Arts and Letters Bull.*, 10 p., East Lansing, Mich.
- (24) Curry, R.R., 1972, Rivers—a geomorphic and chemical overview, p. 18-32 *in*: Oglesby, R.T., Carlson, C.A. and McCann, J.A. (eds), *River Ecology and Man*, Academic Press, New York, 465 p.
- (25) Curry, R.R., 1972, Some questions on forest soils, p. 18-32 *in*: *Western Montana Scientists' Committee for Public Information*, lecture volume of May, 1972, WMSPCI, Missoula, Mt. 212 p.
- (26) Curry, R.R., 1973, Geologic and hydrologic effects of even aged management on productivity of forest soils, particularly in the Douglas-fir region, 43 p. *in*: Hermann, R.K. (ed), *Even-Aged Management*, Oregon State Univ. Press, Corvallis.



- (27) Curry, R.R., 1973, Reclamation of Arid Western Lands: Montana Outdoors, v. 4, no. 3, p 18.
- (28) Curry, R.R., 1973, The great tree rip-off: Not Man Apart, Oct., 1973, p. 1-7.
- (29) Curry, R.R., 1973, A scientific and policy review of the draft environmental impact statement: Crow Ceded Area Coal Lease Westmorland Resources Mining Proposal; Inst. of Ecology, Applegate, Rick, et al, (eds), Denver, Colo. 69 p.
- (30) Curry, R.R., 1974, Reviewers comment: p. 165-171 in: Rehabilitation Potential of Western Coal Lands; National Academy of Sciences, Ballanger Publ. Co., Cambridge, Mass., 198 p.
- (31) Curry, R.R., 1975, Practices and problems of land reclamation in western North America: Biogeochemical limitations on western reclamation—the high Northern Great Plains example. p. 18-47 in: Wali, M.K. (ed), Practices and Problems of Land Reclamation in western North America, Univ. North Dakota Press, Grand Forks, 196 p.
- (32) Curry, R.R., 1976, Downstream effects of runoff changes, p. 251-262 in: Sharma, Raj, D. Buffington, and J. McFadden (eds), Proceedings of the workshop on biological significance, Argonne National Laboratories. U.S. Nuclear Regulatory Comm., NR-CONF-002, Wash. D.C., 327 p.
- (33) Curry, R.R., 1976, Practices and problems of reclamation in North America, p.23 in: Tixier, Stan (ed), Vegetative Rehabilitation and Equipment Workshop, annual report, 30th annual workshop report. U.S. Dept. Agriculture, Wash. D.C., 34 p.
- (34) Curry, R.R., 1976, Teton Dam Collapse. Geophysical Event Notification Report, Smithsonian Inst., Center for Short-lived Phenomena, Cambridge, Mass. Event 47-76, card 2450, 16 June, 1976.
- (35) Strasser, Gabor, Curry, R.R., and others, 1976, Roles and responsibilities. p. 108-130 in: Advanced Power Systems for Utility Implementation; Proceedings of an ERDA Workshop of April, 197 Mitre Corp. Report M76-49, 138+ p.
- (36) Curry, R.R., 1977, Watershed form and process: The elegant balance. p. 14-21 in: CoEvolution Quarterly, winter 1976-77.
- (37) Curry, R.R., 1977, Reinhabiting the Earth: Life support and the future primitive. p. 1-23 in: Carins, John, Dickson, K.L., and Herricks, E.E., (eds), Recovery of Damaged Ecosystems, University of Virginia Press, Charlottesville, 531 p.
- (38) Curry, R.R., 1977, Natural Resources, p. 74 in: Nash, Hugh (ed), Progress as if Survival Mattered. Friends of the Earth, San Francisco, 319 p.
- (39) Curry, R.R., 1977, Watershed Systems and Policy Planning, p. 47-61 in: Inst. for Policy Studies, Portland State University, Water for Oregon's Future, Inst. for Policy Studies, Portland, 144 p.
- (40) Curry, R.R., 1977, Realities and problems of reclamation, p. 4-12 in: Coal Industry Reclamation Symposium, Proceedings Volume. The Coal Association of Canada, Calgary, 197 p.
- (41) Koch, Roy, Robert Curry and Mark Weber, 1977, The effect of altered streamflow on the hydrology and geomorphology of the Yellowstone River Basin, Montana. Montana Dept. of Natural resources and Conservation, 163 p., Tech. Rept. No. 2; Yellowstone Impact Study.
- (42) Curry, R.R., 1978, Collision Terracy, p. 34-37 in: Berg, Peter (ed), Reinhabiting a Separate Country: A bioregional anthology of northern California. Planet Drum Foundation, San Francisco, Calif. sponsored by the California Arts Council, 220 p.
- (43) Curry, R.R., 1978, New Directions Needed for Agricultural Research, p. 122-137, Truck No. 18, Truck Press, St. Paul., Minn.



- (44) Curry, R.R., 1978, Reinhabiting the Earth, p 17-42, Truck No. 18, Truck Press, St. Paul, Minn.
- (45) Curry, R.R., 1979, Policy Development to Minimize Mining Impact: Report of the U.S. National Coal Policy Project, p. 127-136 in *Ecology and Coal Resource Development* (M. Wali, ed), V. 1, Pergamon Press, New York.
- (46) Curry, R.R., and G. M. Kondolf, 1981, Strategy for Restoration of Channel Stability, Carmel River, Monterey County, Calif., p. 191-208 in "Watershed Rehabilitation in Redwood National Park and other Coastal Areas", Proc. of a Symp. held Aug. 24-28, R.N. Coats, (ed), National Park Service and Center for Natural Resource Studies of JMI, Berkeley, Calif.
- (47) Curry, R. R., 1981, Watershed Form and Process: The Elegant Balance. Chapt 20 (p. 319-340) in Emery, F.E. (ed), "Systems Thinking", Vol. 2, Penguin Books, Middlesex, England, 474 p. Penguin Modern Management Readings, Education Series, published simultaneously by Penguin Books, New York; Victoria, Australia; Markham, Ontario, Canada; and Auckland, New Zealand.
- (48) Curry, R.R., 1981, Watershed Form and Process, p. 36-52 in "Symposium on Watershed Rehabilitation in Redwood National Park and Other Coastal Areas", Symposium Program and Readings, Center for Natural Resource Studies of the John Muir Institute, Berkeley, Calif., R. N. Coats, (ed), 307 p.
- (49) Curry, R. R., with Peter Berg, 1984, Volcanoes Make Good Neighbors, p. 2-3, Raise the Stakes, No. 9, Planet Drum Foundation, San Francisco.
- (50) Curry, R. R., 1984, Competition for Water, Chapt. 3 in Englebert, Earnest, and A.F. Scheuring (eds), *Water Scarcity: Impacts on Western Agriculture*, Univ. Calif. Press, Los Angeles.
- (51) Kondolf, G. M., and R. R. Curry, 1984, Role of Riparian Vegetation in stream channel equilibrium: The Carmel River Example, Monterey County, California. pp. 124 - 133 in Warner, R.E. and K.M. Hendrix (eds), *California Riparian Systems*, Univ. Calif. Press, Los Angeles.
- (52) Curry, R. R., 1984, Water Yield and Water Quality in Shrubland Watersheds, Chapt 5, p. 51-60, in J.J. deVries (ed), *Shrublands in California: Literature Review and Research Needed for Management*. Water Resources Center, Univ. of California, Davis, California, June, 1984.
- (53) Curry, R.R. and W. Oechel, 1984, Shrubland Ecosystem Dynamics, Chapt 8, p. 98-103, in J.J. deVries (ed), *Shrublands in California: Literature Review and Research Needed for Management*. Water Resources Center, Univ. of California, Davis, Calif., June, 1984.
- (54) Kondolf, G.M., and R.R. Curry, 1986, Channel Erosion along the Carmel River, Monterey Co., Calif. *Earth Surface Processes and Landforms*, v. 11,, no. 3, pp. 307-319.
- (55) Curry, R.R., 1987, Water quality protection in forest management: Are Best Management Practices working?, pp. 55-61 in Callahan, R.Z., and J.J. DeVries (eds), *Proceed. of the California Watershed Management Conference*, Nov. 18-20, Sacramento, Calif. Wildland Resources Center, Univ. Calif., Berkeley, Rept. 11, 167 p.
- (56) Chambers, R. L., and R. R. Curry, 1989, Glacial Lake Missoula: Sedimentary evidence for multiple drainages; pp 3-11 in *International Geological Congress Guidebook T310, Glacial Lake Missoula and the Channeled Scabland*, American Geophysical Union, Washington, D.C., July, 1989. Also published in *Glacial Lake Missoula*, R. L. Chambers and R. R. Curry (eds), 1989, American Geophysical Union, Washington, D.C.



- Geology and Geomorphology of North America, Vol 1, 28th Annual Geological Congress, American Geophysical Union, 1989.
- (57) Bailey, Roy A, N.K. Huber, and R.R. Curry, 1990, The diamicton at Deadman Pass, central Sierra Nevada, California: a residual lag and colluvial deposit, not a 3-Ma glacial till. *Geol. Soc. America Bull.* v. 102, p. 1165-1173.
 - (58) Curry, R.R., Bret A. Emery and Tom G. Kidwell, 1994, Sources and Magnitudes of Increased Streamflow in the Santa Cruz Mountains for the 1990 water year after the Earthquake. U.S. Geological Survey Professional Paper 1551-E, The Loma-Prieta, California, Earthquake of October 17, 1989 - Hydrologic Disturbances, p. 31-50, Wash. D.C.
 - (59) Curry, R. R., 1992, Eastern Sierra Nevada Wetland Assessment: Bridgeport Basin Study Site—Climatic change, irrigation, and wetland boundaries. pp 396-414 in *The History of Water— White Mountain Research Station Symposium Volume 4*, Clarence A. Hall, Jr., et al (eds), University of California White Mountain Research Station, Los Angeles, Calif., 453 p.
 - (60) Curry, R. R., 1992, Reasserting Riparian Rights—The Walker River case study. pp. 303-313 in *The History of Water — White Mountain Research Station Symposium Volume 4*, Clarence A. Hall, Jr., et al (eds), University of California White Mountain Research Station, Los Angeles, Calif., 453 p.

7.3. -Selected Professional Reports (1971-ff only)

- (1) Curry, R.R., 1971, Specific recommendations on the Council on Environmental Quality's report on Ocean Dumping: To the U.S. Senate, Committee on Public Works, 3 p.
- (2) Curry, R.R., 1971, Interim progress report on Montana Power electric utility advertising: To the Montana state Legislature, 19 p.
- (3) Curry, R.R., 1971, Criteria for evaluating proposals for disposal of underground fluids— suggestions on groundwater pollution control legislation and evaluation of 102-statements: To the U.S. Senate Committee on Public Works, May 18, 7 p.
- (4) Curry, R.R., 1971, Critical review of the Environmental Impact Statement for the Trans-Alaska Pipeline: Cong. Record, Apr. 21, 1971, submitted by Ed Muskie, (D) Maine, S5298-S5300.
- (5) Curry, R.R., 1971, Geologic analysis of the draft Environmental Impact Statement, Radioactive Waste Depository, Lyons, Kansas: Cong. Record, submitted by Robt. Dole @ Kansas, 12 p.
- (6) Curry, R.R. (with Cong. Pete McCloskey, @ Calif.), 1971, Geologic input to Congress: Energy, Eskimos, and Equilibrium: To Geol. Soc. America, Plenary Session, National Meetings, Nov. 2, Washington, D.C. *Geol. Soc. America Abstracts*, vol 3, no. 7, p. 535.
- (7) Curry, R.R., and Crosby, Gary, 1972, Groundwater conditions on the Earl I. Meier property, Lincoln Co., Mont. To: client, on effects of railroad cuts by Corps of Engineers on regional groundwater conditions at site of Libby Dam, Mont., for court trial.
- (8) Curry, R.R., 1972, Geologic report for Baca Land and Cattle Co., vs. New Mexico Timber Co.; Valles Caldera, New Mexico: For Dunnigan Enterprises, Inc., Abilene, Texas. On impacts of timber removal from prospective National Park site.
- (9) Curry, R.R., 1972, Flood Hazard Report on proposed regional golf course near Lolb, Mont.: For U.S.D.A., Soil Conservation Service, April.
- (10) Curry, R.R., 1972-1978, Effects of changes in Flathead Lake levels, Montana, on salt-affected soils and agricultural uses of the north shore of Flathead Lake. To: McGarvey and Heberling, Kalispell, Mt. for landowners. - technical court case and study. Published Supreme Court decision, Montana [see item (30)]
- (11) Curry, R.R., 1973, Critical analysis of the Eastern Powder River Basin Environmental Impact Statement: For, The Institute of Ecology, Environmental Impact Assessment Project Wash. D.C.



- (12) Curry, R.R., 1973, Minimal requirements for baseline data studies, Northern Cheyenne Reservation. To: U.S. EPA, for establishing the Northern Cheyenne Research Project. Continued review work and reports to EPA in 1975 and 1976.
- (13) Curry, R.R., 1973, Hazard geology and soils of the proposed Sherwin Bowl ski area, Mono Co., Calif. For: U.S. Forest Service, Inyo N.F.
- (14) Curry, R.R., 1970-1973, Hydrology and surficial geology (reports) on the White Clouds Peaks area, Idaho. For: American Smelting and Refining Co. through Rocky Mountain Center on Environment. Final report 125 p., September, 1973.
- (15) Curry, R.R., 1973, Comments on proposed minimum standards and rules for implementation of the Montana Floodway Management Act. For: Montana Dept. Natural Resources & Conservation, May 30, 4 p.
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CALIFORNIA STATE UNIVERSITY MONTEREY BAY

100 Campus Center Seaside, California 93955-8001

June 11, 1997

Ministerio de Agricultura
Republica de Chile
Fondo de Investigacion Agropecuaria
Programa Capturas Technologicas
Subprograma Giras Technologicas
Santiago Chile

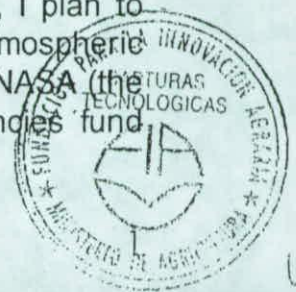
by Express Mail

Honorable Minister:

By this letter I hereby officially acknowledge and pledge my willingness to participate fully in the in the proposed exchange study : **"Estudio Conceptual de Characterization de Aguas Subterranas en El Valle de Aconcagua e Incidencia de y Hacia Otras Cuencas"** that is proposed for funding through the Subprogram: *Giras Tecnologicas* through your *Fundacion Fondo de Investigacion Agropecuaria*. I will plan on being in Los Andes and the other scheduled sites for the duration of the period 22 septiembre to 30 octubre, as outlined in the proposal.

My home institutions: the University of California and California State University Monterey have given me their permissions to be absent from my local teaching duties at that time, although I must return directly to my ongoing classes. My universities have also asked me to investigate the possibilities of student exchange programs in watershed and water sciences, and to seek support funding from U.S. and international sources to support a Chile - California student exchange.

I also am currently investigating the possibilities of long-range funding for a period of 3-5 years to develop a cooperative Chilean - U. S. program to establish a joint research project directed at prediction of snowmelt runoff for the purposes of helping those agricultural users of water who rely directly upon snowmelt. As global warming accelerates, it impacts the Southern Hemisphere more strongly than it does the Northern Hemisphere, even though the primary causes of the warming derive from Northern actions. On that basis, I plan to seek funding from NOAA (the National Oceanic and Atmospheric Administration); US EPA (the Environmental Protection Agency), and NASA (the National Aeronautics and Space Administration). All of these agencies fund



research on climatic change effects and are eager to develop cooperative programs that will help North American agriculture cope with increased drought, greater climate fluctuations, and more difficult year-to-year crop planning. If farmers could know 6 months in advance that snowmelt runoff was to be much below or above normal, their planting strategies could be adjusted better to use the available water resource.

In many ways, the mountain climates of central Chile mirror those of the southern Rocky Mountains of Colorado and New Mexico, and the Sierra Nevada of California. The valley farmers of the Rio Grande and San Joaquin valleys rely almost exclusively on snowmelt for summer irrigation water. Major corporate farms pump limited groundwater resources and are "mining" those resources in a non-renewable fashion. By establishing agricultural systems that can allow recharge of groundwater in times of surplus, and by use of that natural storage in times of shortage, agriculture can be more efficient and productive. This requires a level of cooperation between large ground-water dependent farms and smaller snowmelt ditch irrigators. It also can profit greatly from a 6-month prediction of potential snow water content before the snow has accumulated.

It is on this point that central Chile and the U.S. Rio Grande valley have a unique potential contribution. The two areas are linked by what some global climatologists term a "teleconnection". When one place is wet, the other is likely to be dry, and vice-versa. We cannot send water from the Rio Grande in New Mexico to the Aconcagua Valley, but we can send information. Chile has real-time sea-surface temperature monitoring now, and can establish computer links to present snow water content as the accumulation season progresses. These kinds of data are available through my California institutions for the United States. We need to study the possible value of such data for annual predictions, and we need to place these data in the context of the multi-year ENSO (El Nino - Southern Oscillation) studies that are currently better known but still not useful for practical agricultural prediction. Our last two years have been much above normal for precipitation in parts of western U.S. You have, until last week, been much below normal in parts of the Andes. But the concept of "normal" needs thorough reanalysis in light of climatic change.

This "predictive" tool is the "carrot" that I will use to try to develop cooperative research funding for a joint U.S.-Chile program. I cannot guarantee any future funding, but I am committed to try, and have received substantial encouragement from NASA and EPA. The United States needs the Chilean cooperation.

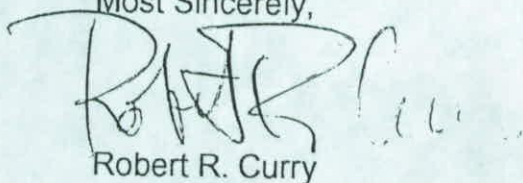
In conjunction with this theoretical work, we will hope to train Chilean and U.S. agricultural students and advisors on methods for improving efficiency of water use in areas like the Valley of Aconcagua, as I am now doing in the valleys of the Sangre de Cristo Mountains of Colorado and New Mexico. Chile can develop an inexpensive program for monitoring groundwater recharge and water quality and for managing its limited surface waters very carefully. My California colleague Mark del Piero of the California Water Quality Control Board has



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I want to work to help link the ongoing very good Chilean work on ocean-based climatology with the agricultural needs and opportunities for Chileans. I am a senior (emeritus) Research Professor at the University of California and am helping to initiate programs in restoration ecology and water science at our new California campus in Monterey, where I am a Professor of Earth Systems Science and Policy and Research Director of the Watershed Institute. I have a long history of work in agricultural, silvicultural, and range-land hydrology and have taken a special interest in sustainable agronomic systems that use their soils and water most wisely. My primary subjects are soil science and watershed science, and I have been one of the primary proponents of the integrative systems approach to applied sciences - especially using watersheds as the organizing focus for land management. I have served as federal science advisor on these matters and work with many governments and regional organizations. I would very much like to explore linkages and cooperative programs with a country as progressive as Chile and with your fine scientists and students.

Most Sincerely,



Robert R. Curry

Professor





Watershed Systems

Hydrology - Geology - Soil Science

Robert Curry, PhD, P.G.

Box 770, Soquel, Calif. 95073
408 426-6131; FAX 426-9604 curry@cats.ucsc.edu
ATT: 1-700-STREAMS; field 619 932-7700

June 11, 1997

Ministerio de Agricultura
Republica de Chile
Fondo de Investigacion Agropecuaria
Programa Capturas Tecnologicas
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by Express Mail

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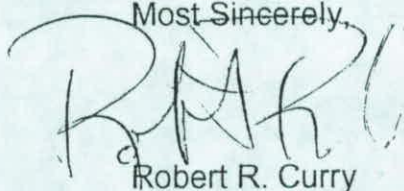
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Most Sincerely,



Robert R. Curry

Professor





UNIVERSIDAD
CATOLICA
DE VALPARAISO

FUNDACION ISABEL CACES DE BROWN

FACULTAD DE AGRONOMÍA

Fono 56 33 310524 FAX 56 33 313222

Casilla 4-D Quillota, CHILE

DE/158/97

Quillota, Julio 11 de 1997.

CARTA DE AUSPICIO

A

FUNDACION PARA LA INNOVACION AGRARIA

Programa Capturas Tecnológicas - Subprograma Consultores Calificados

Por medio de la presente comprometo oficialmente el auspicio de la Facultad de Agronomía de la Universidad Católica de Valparaíso al proyecto "ESTUDIO CONCEPTUAL DE CARACTERIZACION DE AGUAS SUBTERRÁNEAS EN EL VALLE DE ACONCAGUA E INCIDENCIA DE Y HACIA OTRAS CUENCAS".

El consultor, Dr. Robert Curry, de la Universidad de California, es un profesional de larga trayectoria en este ámbito y pienso sería muy positivo traerlo a fin de elaborar un proyecto de mayores proporciones, financiado por fondos procedentes de EEUU.

El Dr. Curry, como su carta lo indica, ha manifestado que esto es muy posible debido a que Chile puede servir como un modelo agroclimatológico para zonas como California y Arizona de EEUU.

La Facultad de Agronomía se compromete a administrar los fondos y el proyecto propuesto a través del profesor de esta Facultad, Dr. Leví Mansur V.



EDUARDO SALGADO VARAS

Decano

Facultad de Agronomía



INSTITUTO DE CIENCIAS APLICADAS

LAS HERAS # 63

LOS ANDES

Los Andes, 9 de Julio de 1997.-

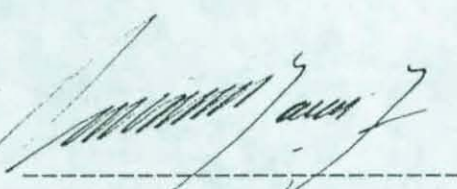
El Instituto de Ciencias Aplicadas tiene su origen en el Proyecto "Aconcagua Verde", financiado por la Fundación Jhon D. y Catherine MacArthur, administrado por la Universidad de California, Santa Cruz, con participación de la División de Control Biológico de la Universidad de California en Berkeley.

El Instituto de Ciencias Aplicadas fue creado por los científicos chilenos y extranjeros que participaron en el Proyecto citado, con la finalidad de continuar el trabajo iniciado, principalmente en apoyo de control biológico en los parronales de exportación y la medición permanente de contaminación del agua y alimentos, causada por el uso de plaguicidas en la agricultura.

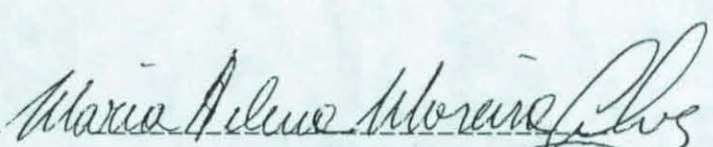
Esta institución trabaja directamente con los agricultores de la región del Valle del Aconcagua, con el Servicio de Salud San Felipe-Los Andes y la Ilustre Municipalidad de Los Andes.

El Instituto es una entidad sin fines de lucro, teniendo como principal objetivo la captura de tecnología extranjera para beneficio de la comunidad de la Quinta Región.

La institución está reconocida legalmente como "Organización No Gubernamental de Desarrollo, Instituto de Ciencias Aplicadas", de acuerdo a la personalidad N° 210, otorgada según decreto fecha 15 de Febrero de 1996, del Ministerio de Justicia, publicado en el Diario Oficial el 14 de Abril de 1996.


BLAS MARDONES VEJAR

PRESIDENTE


MARIA HELENA MOREIRA ALVES

SECRETARIA



4. PATROCINANTE.

Instituto de Investigaciones Agropecuarias, Centro Regional de Investigación INTIHUASI. Colina San Joaquín s/n, La Serena, IV Región. Apartado Postal 36-B La Serena. Teléfono (51) 22-3290. Fax (51) 22-7060.

5. CONTRAPARTE NACIONAL

Leoncio Francisco Martínez Barrera. Ingeniero Agrónomo Ph.D. Director Departamento de Recursos Naturales y Medio Ambiente. INIA-INTIHUASI

6. TERMINOS DE REFERENCIA PARA EL CONSULTOR

El consultor debe ser un ingeniero civil, ingeniero agrícola o ingeniero agrónomo con comprobada experiencia profesional en ambientes desérticos con alto grado de tecnificación en el uso de recursos hídricos. Además, se requiere experiencia internacional en proyectos de riego localizados en zonas árida y semiáridas. El especialista debe exponer la forma en que se enfrentan períodos de sequía en aquellas áreas y dar pautas o ideas que deben ser consideradas en un plan estratégico del manejo del agua en la región.

7. DESCRIPCION DE LA PROPUESTA

7.1 Descripción de la propuesta. Visita del consultor por 10 días a la Región, de los cuales 8 son de trabajo y 2 de descanso. Durante el tiempo señalado, el consultor deberá recorrer las distintas zonas agroclimáticas, evaluar la infraestructura de riego disponible, conocer los métodos de trabajo, entrevistarse con autoridades regionales y profesionales responsables del manejo del agua y dar a conocer los avances científicos y tecnológicos utilizados en zonas áridas de gran desarrollo agrícola e industrial.

7.2 Objetivos. Los objetivos de la propuesta son los siguientes :

7.2.1 Objetivo general. Orientar a los actores regionales hacia un uso eficiente del recurso hídrico, tanto en la actividad agropecuaria como en el área urbana e industrial.

