California Department of Food and Agriculture
ENVIRONMENTAL FARMING ACT SCIENCE ADVISORY PANEL
EVALUATION FRAMEWORK WORKING GROUP

MEETING AGENDA

June 22, 2012 (Friday)
9:00 AM to 12:00 PM

1220 N Street
Room 133
California Department of Food and Agriculture
Sacramento, CA 95833
(916) 654-0433

GoToMeeting Information
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Participant passcode - 3964856#

Meeting ID: 899-616-042

Jeff Dlott, PhD, Member and Chair
Mark Nechodom, PhD, Member — Don Cameron, Member
Mike Tollstrup, Member — Ann Thrupp, PhD, Member
Luana Kiger, MSc, Subject Matter Expert
Louise Jackson, PhD, Subject Matter Expert
Amrith Gunasekara, PhD, CDFA Liaison

1.	Introductions and other business (10 minutes)	Jeff Dlott Science Panel Chair
2.	Update since last meeting (10 minutes)	Amrith Gunasekara
3.	Proposed Evaluation Framework Tool Version 1.0 (30 minutes)	Amrith Gunasekara
4.	Public comment and discussion (60 minutes)	All
5.	Member comments and action (60 minutes)	Science Panel Members
6.	Adjournment	

Meeting materials for this meeting can be found at
http://www.cdfa.ca.gov/EnvironmentalStewardship/Meetings_Presentations.html

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http://cdfa.ca.gov/Meetings.html

CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE (CDFA)
ENVIRONMENTAL FARMING ACT SCIENCE ADVISORY PANEL (EFA SAP)
EVALUATION FRAMEWORK WORKING GROUP

Marin County Cooperative Extension Office
1682 Novato Blvd., Suite 150B
Novato, CA 94947

February 23, 2012

MEETING MINUTES

Panel Members
Jeff Dlott, PhD, Chairman
Ann Thrupp, PhD, Member
Mike Tollstrup, Member
Luana Kiger, PhD, Subject Matter Expert

Interested Parties
Jessica Siegal, Stewardship Index

CDFA Staff
Amrith Gunasekara, PhD

INTRODUCTIONS

The meeting was called to order at 9 am by Dr. Jeff Dlott. Introductions were made. A quorum was not present. This was a public meeting announced 10 days prior to the meeting on the CDFA Environmental Stewardship website.

INCENTIVES FOR IMPLEMENTING ECOSYSTEM SERVICES

The meeting began with evaluating potential framework tools currently in development. Ms. Siegal opened the meeting by presenting work that is being completed on the Stewardship Index for Specialty Crops (SISC). She discussed the focus, audience, and metrics of the SISC. Ms. Siegal noted that in 2012-2013, a beta calculator will be available based on water use, soil type, energy requirements, and nutrient management. The index is expected to be part of a 150 participant pilot project to consider pesticides and provide results inclusive of life cycle analysis.

There were several clarification questions for Ms. Siegal by EFA SAP members.

A suggestion for the science panel to recognize the work being completed by the SISC was made.

Dr. Gunasekara followed with a presentation on an evaluation framework tool that CDFA had developed. The presentation noted work completed by Foley et al (2005) where the adoption of ecosystem services in agriculture led to a more sustainable agricultural system. Several questions were asked by Dr. Gunasekara, during his presentation, in terms of what the evaluation framework tool will include (e.g., can we use numbers, what sort of assessment scales?). Several examples of existing tools

were presented including the SISC, a field-to-market tool, and the BASF tool. Literature findings were also provided. Examples of the tool as it related to different ecosystem services (e.g., pollination services and grazing on public lands) were presented.

Dr. Thrupp requested that USDA NRCS practices and case studies be considered and used as examples before the tool is recommended for adoption by the workgroup.

Discussion ensured that this tool must be maintained at a qualitative education/informational level and it must also be able to support other quantitative tools such as the SISC. Additionally, the tool should be maintained as a Yes/No tool to provide information to the reader on the outcomes of using ecosystems services on agricultural operations.

DISCUSSION AND DIRECTION FOR NEXT MEETING

The meeting ended after agreement that CDFA will re-evaluate the tool using USDA NRCS case study examples and practices.

NEXT MEETING DATE AND TIME

The next meeting will be planned by Dr. Gunasekara after evaluating the framework tool using USDA NRCS case studies and practices. Dr. Gunasekara adjourned the meeting at 11:30 am.

Respectfully submitted by:

_____ 06/05/2012

Amrith Gunasekara, Ph.D. Date

Principles for Creating Effective Ecosystem Services Incentive Programs

California Roundtable on Agriculture and the Environment

June 7, 2012

Working Paper
Version 1.0

DRAFT for CRAE member approval

The Opportunity to Build Incentives for Ecosystem Services in California

There is a growing recognition of the role that environmental markets and other incentive mechanisms could play in serving a variety of needs in California. Landowners and the agricultural community are facing increased pressure to demonstrate measurable gains in environmental quality, while at the same time needing to replace income lost from cuts in conservation and Williamson Act funding. Conservation groups and the agriculture sector are increasingly seeing opportunities for public benefits from building incentive-based approaches to environmental restoration efforts, and agencies are seeking ways to spend their limited funding more effectively. Ecosystem services programs can help target conservation investments for more strategic outcomes where financial support for general conservation outcomes is dwindling.

Meaningful efforts to address these needs are being explored through a variety of pilot projects throughout the state, yet a more comprehensive political and economic framework has yet to be established. The emerging field of environmental markets and other mechanisms for valuing and rewarding the provision of environmental services in California would greatly benefit from a unified collaborative framework, a more supportive regulatory and policy environment, and broader market development efforts. The time is ripe for decisive action to raise the visibility of ecosystem services opportunities and to build a more enabling policy environment for ecosystem services programs that address California's unique challenges.

Ecosystem Values and Valuation Mechanisms

A broad range of public benefits, both tangible and intangible, are supplied by farmland and rangelands, as well as specific agricultural conservation activities. These include, for example, safe, reliable food supplies, protection of endangered species, water quality improvements, climate stabilization, flood attenuation, economic development opportunities, strong rural communities, open space, scenic beauty, and recreational opportunities. We have an opportunity to more adequately recognize and reward farmers and ranchers for delivering benefits to society. Some valuation mechanisms exist today, but those that are available can be too difficult for producers to access because of high transaction costs or regulatory barriers.

There are a number of mechanisms that compensate and incentivize farmers and ranchers for their social and environmental contributions, including markets for ecosystem services, voluntary private payments for ecosystem services, government grants and loans, the Williamson Act, conservation easements, mitigation banks, and reduced regulatory costs (see definitions below). It is desirable that these tools are developed in collaboration with agriculturists, environmentalists, government, private entities, and other parties with a stake in the future of American farmland and rangelands. The field of ecosystem services is rapidly evolving and close collaboration of these stakeholders will help to ensure effective outcomes.

We recommend that the following principles be used to guide the development of new efforts to build incentive programs to value and encourage the provision of ecosystem services on farmland and rangelands. This list is preliminary and we anticipate its evolution and expansion as the field develops.

Guiding principles for ecosystem services incentive programs

1. Ecosystem services may be provided both as co-benefits from agricultural activities and from non-agricultural activities.
2. Ecosystem services providers may be compensated for actions that do not necessarily have permanent or long-term impacts, provided that outcomes that garner ecosystem benefits are secured. Generally speaking, longer periods of service provision should be linked with higher compensation levels.
3. Practices generating multiple environmental benefits should not be precluded from qualifying for multiple streams of compensation (stacking of credits).
4. Ecosystem services programs should reward provision of services that are above and beyond an established baseline (or meet certain criteria) and provide mechanisms that recognize early adopters.
5. Risk in the program can be minimized, and opportunities for ecosystem services providers generated, by pooling or aggregation of credits.
6. Ecosystem services must have at least one identified buyer or beneficiary to have value, either monetary or other. Ecosystem service programs should link beneficiaries to producers.
7. Different benefits in different locations deserve tailored approaches rather than a one-size-fits-all framework.
8. To encourage the broadest possible participation, reward designated incremental improvements leading to biggest rewards for delivery of greatest benefit.
9. Credits should be scientifically based, using the best available science.
10. Rigorous quantification of ecosystem services is important. Quantification tools should be reviewed and updated on a regular basis.
11. Where appropriate, there should be rules established and overseen by a neutral third party in a transparent manner.
12. Programs must not create additional burden or transaction costs through conflict with other regulatory requirements. Furthermore, relevant regulatory entities should be engaged in developing the program in order to anticipate and overcome barriers upfront.
13. Monitoring, reporting and verification systems, as well as a methodology for maintaining an inventory, must be developed as integral components of any ecosystem services program. These systems should strive to ensure environmental outcomes while balancing precision with costs of implementation.

Definition of Ecosystem Services Compensation and Incentive Mechanisms

Ecosystem services:[1] In agriculture, ecosystem services are defined as the multiple benefits we gain from farming and ranching including crop and livestock production. In addition to valuable open space and wildlife habitat, the management decisions and conservation practices of farmers and ranchers also enhance environmental quality, provide recreational opportunities and offer social benefits. Examples of important benefits provided by ecosystem services include: provision of wildlife habitats; nutrient cycling; production of food, fiber and fuel; recreation; soil structure, formation and fertility; biodiversity conservation, water cycling, atmospheric gas/climate regulation; pest control, and pollination services.

Ecosystem services markets:[2] Ecosystem services markets include the full spectrum of regulatory, quasi-regulatory (cap-and-trade) and voluntary markets, such as wetland mitigation banking, habitat/conservation banking, water quality trading, environmental water transactions and carbon markets.

Williamson Act:[3] The California Land Conservation Act of 1965—commonly referred to as the Williamson Act—enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agriculture or related open space use. In return, landowners receive property tax assessments which are much lower than normal because they are based upon farming and open space uses as opposed to full market value. Local governments historically received an annual subvention of forgone property tax revenues from the state via the Open Space Subvention Act of 1971. However, today most counties have kept the program in place and have absorbed the costs of the program locally. Due to local economic constraints it is unclear how long this will continue in the future, and some counties have already taken steps to eliminate or modify the Williamson Act program at the local level.

Conservation Easements:[4] An "agricultural conservation easement" is a less than fee simple interest in land. It includes the right to prevent forever the development or improvement of the land, as specified in Public Resources Code Section 10211 and Civil Code Section 815.1 for any purpose other than agricultural production. The easement is granted by the landowner to the local government or a qualified nonprofit organization that has conservation of agricultural land as one of its primary purposes. The land restricted by the easement remains in private ownership. Aside from the separation of specified development rights, the landowner retains all other rights to the land, including the right to deny public access and to manage the land for

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[1] Environmental Farming Act Science Advisory Panel, March 2012.

[2] Oregon Sustainability Board (2010, December). *Senate Bill 513 Ecosystem Services and Markets*. Report to the 2011 Oregon Legislative Assembly.

[2] Oregon Sustainability Board (2010, December). *Senate Bill 513 Ecosystem Services and Markets*. Report to the 2011 Oregon Legislative Assembly.

[3] Modified from California Department of Conservation, Division of Land Resource Protection. *Williamson Act*. Retrieved May 1, 2012, from http://www.conservation.ca.gov/dlrp/lca/Pages/Index.aspx

[4] California Department of Conservation, Division of Land Resource Protection. *Williamson Act Program—Easement Exchanges*. Retrieved May 1, 2012, from http://www.conservation.ca.gov/dlrp/lca/easement_exchanges/Pages/index.aspx

agricultural uses.

Voluntary private payments:[5] Businesses, nongovernmental organizations, and conservation groups may provide payments to landowners for philanthropic, public relations, or ethical reasons or to protect investments. For example, a developer may pay a forest landowner to maintain an attractive view. An interest group may pay for hunting leases on private land. A bottled water company may protect its water source by paying upstream landowners to implement good management practices.

Government grants and loans: Federal, state and local governments allocate public revenues to stimulate or reward land management or conservation activities by individuals or groups that voluntarily produce beneficial environmental outcomes on their land. Funding can occur through direct grants (e.g., California Carl Moyer Air Quality Program), cost-share payments (e.g., NRCS Environmental Quality Incentives Program), 'rental' rates (e.g., USDA Conservation Reserve Program), or loans (e.g. FSA Conservation Loans). Specific guidelines and selection criteria exist for each type of program but funds are typically awarded based on an estimate of expected public benefit and rates are usually set to partially, but sometimes fully, compensate the land manager for the cost of implementing management change or for the foregone income when productive land is taken out of use. Accountability for the use of funds is typically based on verification that the proposed action was completed and maintained as planned. Government grant payments are NOT typically based on measurable site-specific performance outcomes but on accomplishing an agreed on land use, practice, or management activity that has an expected benefit based on prior studies.

Regulatory cost reduction: Regulatory agencies at the local, state and federal level may create incentives for provision of ecosystem services by (1) offering opportunities to reduce those costs associated with the process of regulation (e.g., reports and monitoring), and (2) shifting the focus of regulatory requirements to measurable environmental outcomes as opposed to prescriptive practice.

[5] USDA Forest Service. Valuing Ecosystem Services.
http://www.fs.fed.us/ecosystemservices/About_ES/faq.shtml#payments

CRAE

The California Roundtable on Agriculture and the Environment (CRAE) is an alliance of agricultural, environmental, regulatory, and social justice leaders seeking to promote an agriculture and food sector that is economically viable, environmentally sound and socially responsible. As members of CRAE, we believe that society should value (monetarily and otherwise) the benefits that farmland contributes to a healthy environment, feeding people, and providing additional social and economic outcomes. Natural resource and environmental management and regulatory systems that take a systemic approach rather than focus on single media or narrow outcomes, and that encourage growers and ranchers in effectively stewarding our natural resources, should be cultivated. The principal objective of the CRAE working group on ecosystem services is to foster policy and planning frameworks to incentivize and deliver practices that lead to strong agricultural, environmental, and societal outcomes.

Members of the CRAE Working Group on Ecosystem Services: Pelayo Alvarez, California Rangeland Conservation Coalition; Karen Buhr, California Association of RCDs; Bob Gore; Ann Hayden, Environmental Defense Fund; Holly King, King & Gardiner Farms; Paul Martin, Western United Dairymen; Daniel Mountjoy, Sustainable Conservation; Jessica Musengezi, Defenders of Wildlife; Dave Runsten, Community Alliance with Family Farmers; Tracy Schohr; Steve Shaffer, American Farmland Trust. Institutional advisors: Casey Walsh Cady, CDFA; Laura Harnish, California Department of Conservation; Luana Kiger, USDA NRCS; Mark Nechodom, California Department of Conservation. Conveners: Serena Coltrane-Briscoe, Katy Mamen, and Joseph McIntyre, Ag Innovations Network.

ENVIORNMENTAL FARMING ACT SCIENCE ADVISORY PANEL

Evaluation Framework Working Group Meeting 2

June 22, 2012

CDFA
1220 N Street
Sacramento, CA

Amrith Gunasekara, PhD
Science Advisor to the Secretary
California Department of Food and Agriculture

Update

- Last meeting held on February 23, 2012

1. Proposed a YES/NO evaluation framework
2. 30,000 foot level analysis as others doing details
3. The best-science
4. Tool will be qualitative/ informational/ educational
5. The department will benefit from this tool
6. EFA SAP requested study of USDA NRCS case studies

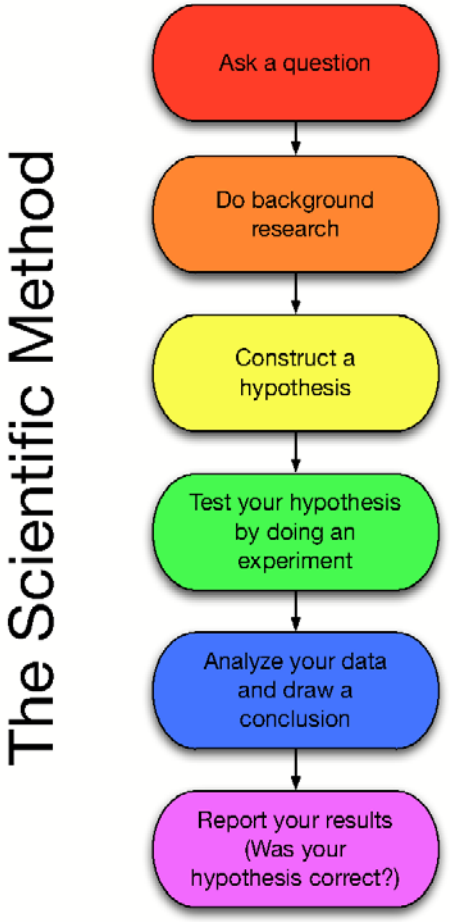
Process and methodologies

➢ Ask a questions

• What are benefits of using ecosystem services on agricultural systems?

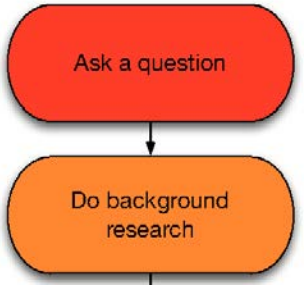
• Is there a tool which we can clearly see the benefits of using ecosystem services on agricultural systems?

• How do we show the benefits of using ecosystem services in agriculture?

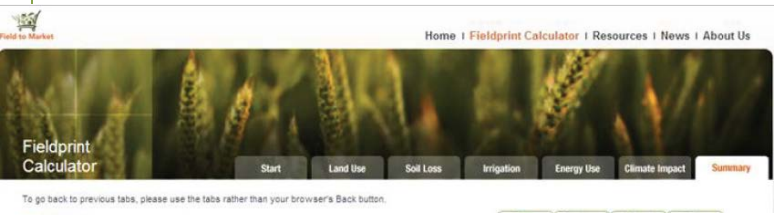


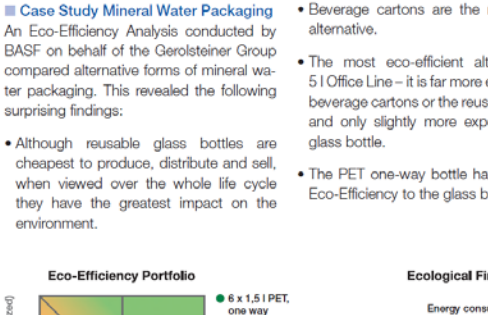
Process and methodologies

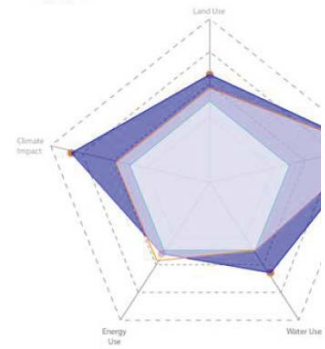
- Do background research

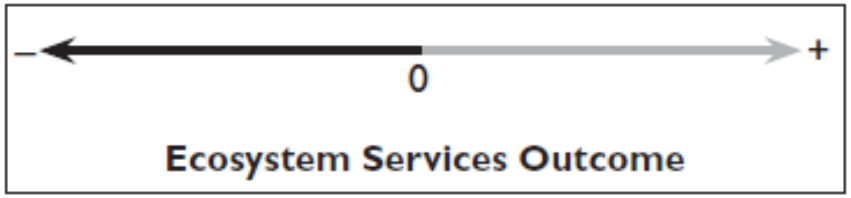


Background research presented at February 23rd meeting:









The Fieldprint values shown for a selected crop on the slider bars are plotted on the above Spidergram. The Spidergram axes are relative indices representing your resource use or impact per unit of output in each of the five resource areas. Lower values closer to the center indicate a lower impact on each resource. Your results (blue) are compared to your state (orange) average and national (green) averages (50).

Stacking Ecosystem Services Payments: Risks and Solutions

by David Cooley and Lydia Olander

David Cooley is an Associate for Project Development at the Duke Carbon Offsets Initiative at Duke University. He has also worked as a researcher at the Nicholas Institute for Environmental Policy Solutions at Duke University. Lydia Olander is the Director of the Ecosystem Services Program at the Nicholas Institute for Environmental Policy Solutions at Duke University. She leads the National Ecosystem Services Partnership.

Other Scales of Evaluation

- MEA

Table 8.5. Indirect Drivers of Food Provision (compiled by authors from assessment of literature and evidence)

		Past 50 Years		Current Trends		
Drivers		**Change**	**Relevance of Driver**	**Change**	**Relevance of Driver**	**Remarks/Examples**
Demand factors						
Population growth and structure	In	+/++	med	–/+	low/med	Europe static/shrinking; North America still growing
	Dg	+++	high	+/+++	med/v. high	East Asia slow; SSA, WANA, SA highest growth rates
Urbanization	In	++	med	–/+	low	70–80% urbanized
	Dg	+++	med	++/+++	med/high	40% urbanized, 3%/yr growth, 80% of global urban total
Income growth	In	++	med/high	++	med/high	slow to medium long-term growth
	Dg	+/+++	high	–/+++	high	some negative, esp. SSA; strong growth: East Asia
Food prices	In	––	med	–/o	low/med	well-integrated markets, productivity growth
	Dg	–	high	–/+	med/high	weaker markets, lower productivity growth
Food marketing: branding and advertising	In	++	med	+++	med	major diet changes are through switching brands/product
	Dg	+	low	+/++	med	less in poor rural areas, but increasing, e.g., radio, tv
Diet and health information	In	++	med	++/+++	med/high	increased information on the healthfulness or otherwise
	Dg	o/+	low	+/++	med	related to specific food types or food processing
Consumer concerns with production context	In	x	low	xx	low/med	concerns with environmental, food safety, child labor,
	Dg	o/x	low	o/x	low	equity, GMOs, animal welfare, etc. issues
Dietary (and lifestyle) preferences	In	o/x	low/med	o/x	low/med	largely consequence of marketing, diet, and health info
	Dg	x/xxx	med/high	xx	med/high	largely consequence of urbanization and income growth
Consumer demands for minimum produce grades, standards, labels	In	++	med/high	+++	high/v. high	most producers conform; contract farming on the rise
	Dg	o/+	low	o/+++	med/v. high	major challenge to poor smallholders

Key:

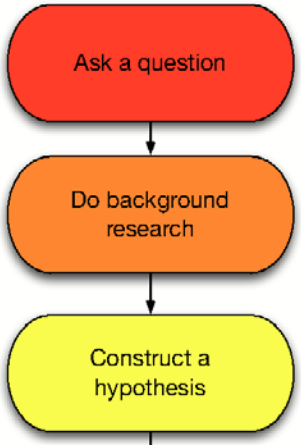
In – industrial-country grouping; Dg – developing-country grouping

Increases: + low; ++ medium; +++ high; decreases: – low, – – medium, – – – high; – –/+ indicates a range from – – to +

Change (no sign): x low, xx medium, xxx high, o no change.

Process and methodologies

- Hypothesis



a YES/NO (30,000 level) tool, can qualitatively show the benefits of ecosystem services in agriculture for informational and educational purposes.

Example

Pollination services (Swinton et al., 2007)

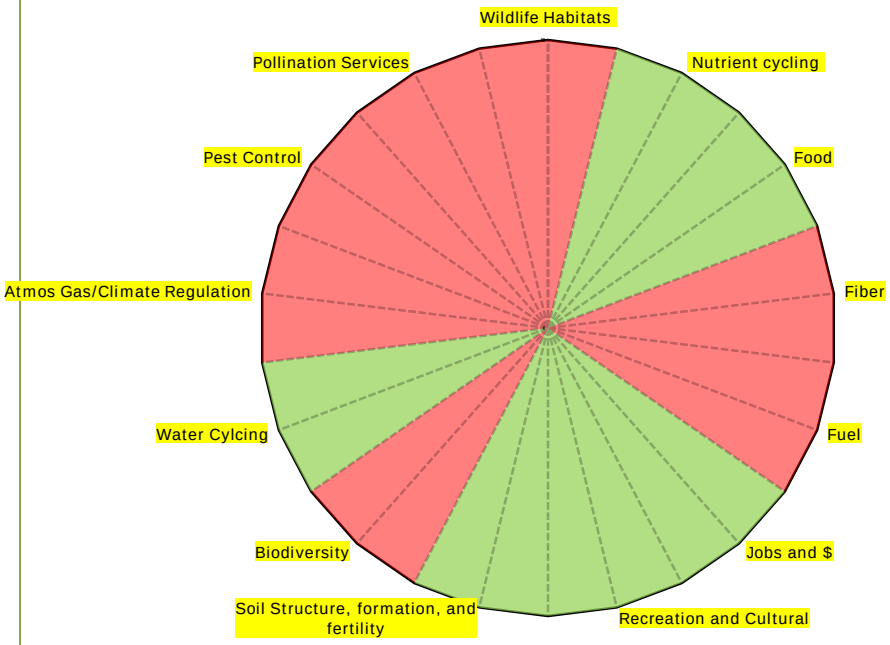
Contribute to fruit, nut, and vegetable production

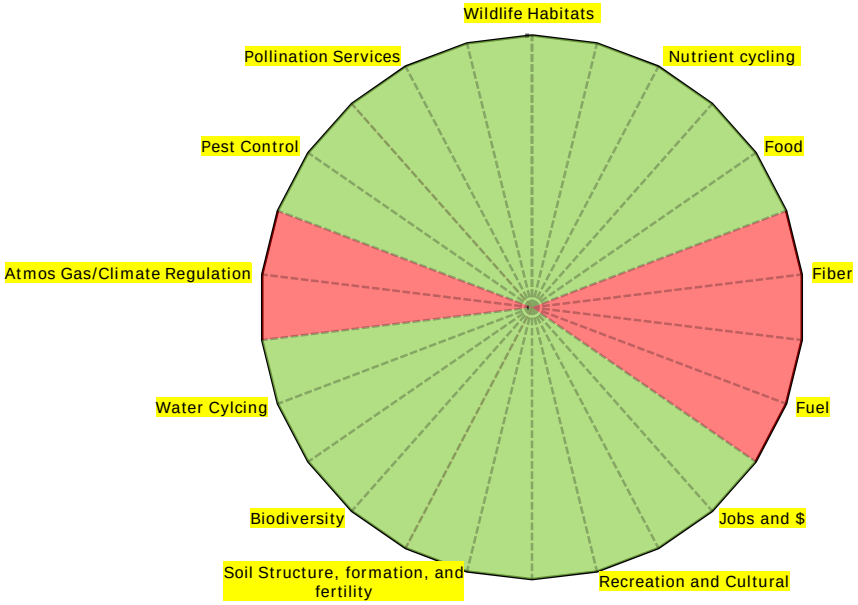
http://www.almondboard.com/Consumer/AboutAlmonds/Pages/default.aspx
http://www.sustainablewinegrowing.org/certifiedparticipant/5/Fetzer_Vineyards_Bonterra_Vineyards.html
http://www.benziger.com/

Insectaries - Vineyards

Before

After





http://www.sfgate.com/cgi-bin/object/article?f=/c/a/2001/08/22/HO204041.DTL&object=%2Fc%2Fpictures%2F2001%2F08%2F22%2Fho_joyce1.jpg

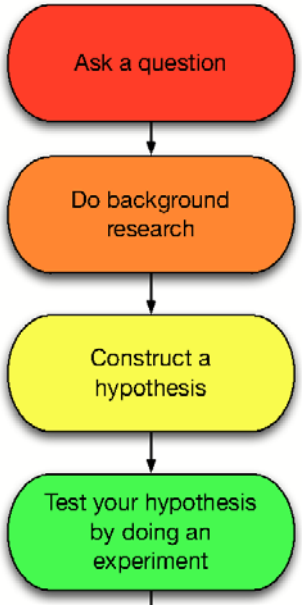
Process and methodologies

- Experimental

Use USDA NRCS case studies with a “before” and “after” scenario to test the hypothesis

Will have a specific “methodology” white paper

Will associate NRCS Conservation Practice Standards by Code to each ecosystem service



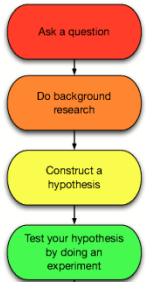
NRCS Conservation Practice Standard – see code 590 on Nutrient Management

Process and Methodology

- Select USDA NRCS case study

1. Establish problem
2. Determine purpose of funding and practice
3. Determine what technologies were used
4. Determine what was completed
5. Connect information to ecosystem service in definition
6. Tie NRCS practices into evaluation framework

1. Establish Problem



USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Agricultural Water Enhancement Program

AWEP

HELPING PEOPLE HELP THE LAND January 2011

"Securing this USDA funding shows the power that comes when agricultural and environmental interests combine their energies to help growers solve water quality problems."

— Parry Klassen, CURES Executive Director

Project Partners: Partnership for Agriculture and the Environment

- Almond Board of California
- California Dairy Campaign
- Coalition for Urban and Rural Environmental Stewardship (CURES)
- East San Joaquin Water Quality Coalition (ESJWQC)
- East Stanislaus Resource Conservation District (ESRCD)
- Environmental Defense Fund's (EDF) Center for Conservation Incentives (CCI)
- Stanislaus County Department of Agriculture
- Merced County Department of Agriculture
- Stanislaus County Farm Bureau
- Tuolumne River Trust
- University of California Cooperative Extension (UCCE)
- Western United Dairymen (WUD)
- Westside San Joaquin River Watershed Coalition (WSJRWC)
- West Stanislaus Resource Conservation District (WSRCD)

Northern San Joaquin River Water Quality Project

Addressing Water Quality Concerns in the Northern San Joaquin River Watershed

Stanislaus, Merced, and San Joaquin counties are three of the nation's highest producing agricultural counties, generating $7.5 billion in agricultural output annually. Since the 1990s, waterways in the three counties were impaired by sediment, nutrients and pesticides from agricultural, urban and other sources. State regulators imposed strict new requirements on farmers in 2003 that included developing management plans on many regional waterways due to impairments originating from agriculture.

The water quality of the San Joaquin River is of critical interest because it flows to the delta. Both the Delta-Mendota Canal, which supplies irrigation water to farms in the western San Joaquin Valley, and the California Aqueduct, which supplies drinking water to southern California, originate in the delta. Photo: USGS

Local watershed coalitions and the non-profit group CURES (Coalition for Urban Rural Environmental Stewardship) began working on correcting agricultural water quality problems in 2004. They knew that a combination of farm management practices would be needed to keep pollutants out of the San Joaquin River and its numerous tributaries. Infrastructure improvements such as irrigation tailwater recirculation systems and conversion from furrow to micro irrigation systems offered ways to prevent water pollution. These measures are considered best management practices (BMPs) that keep pesticides and sediments contained on farms, but are cost prohibitive for farmers to install even in profitable years.

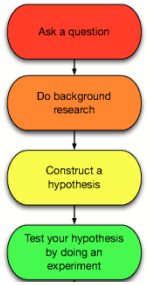
In 2009, CURES, in coordination with Partnership for Agriculture and the Environment (a broad coalition of agricultural and environmental interests), successfully applied for AWEP funding to help farmers in the northern San Joaquin Valley implement these practices to improve water quality. The USDA approved $2 million annually in AWEP funding over a 5-year period for projects to improve water quality in the three county region.

A tailwater recirculation system in Stanislaus County. Photo: CURES

THE NATURAL RESOURCES CONSERVATION SERVICE IS AN EQUAL OPPORTUNITY EMPLOYER AND PROVIDER

"Since the 1990s, waterways in the three counties were impaired by sediment, nutrients and pesticides from agricultural, urban and other sources."

2. Determine Purpose of Funding



The AWEP funding is directed to farms and dairies located along waterways shown to be impaired by farm inputs through water monitoring performed by the East San Joaquin Water Quality Coalition and Westside San Joaquin River Watershed Coalition, both members of the Partnership for Agriculture and the Environment. These two watershed coalitions represent landowners under the Irrigated Lands Regulatory Program (ILRP) mandated by the Central Valley Regional Water Quality Control Board. The Westside coalition region encompasses approximately 500,000 acres and the Eastside coalition approximately 1,000,000 acres of irrigated cropland.

Thousands of acres of farmland along waterways in the two coalition regions require some form of agricultural water quality mitigation. Growers must make changes to irrigation and farming practices to meet requirements of the ILRP and are using AWEP funding to assist in installing micro-irrigation systems and irrigation tailwater recirculation systems, among other practices. More than 250 crops are grown within the two Coalition watersheds, ranging from fruit and nuts to melons, field crops such as alfalfa and cotton.

Practices to protect water quality have been installed on thousands of acres of irrigated cropland since project funding began in 2009. Priorities for the first year were Ingram and Hospital Creeks in the Westside Coalition area and Dry Creek, Duck Slough and Prairie Flower Drain in the East San Joaquin Coalition area. Because watershed management plans had already been established by the two watershed coalitions, many "shovel-ready" projects had already been identified by the local NRCS offices. As a result, AWEP funds were immediately used for several priority projects.

A micro-irrigation sprinkler system minimizes or eliminates runoff and can also boost production. Photo: NRCS

In FY 2009, 21 projects were implemented on 4,458 acres. A total of 26 contracts were funded in FY 2010, with conservation practices implemented on 5,229 acres. Completed work includes installation of 19,217 feet (3.6 miles) of underground pipeline, four tailwater recovery systems, land leveling on 838 acres, and irrigation system improvements on 992 acres. Irrigation water management is a part of every AWEP contract.

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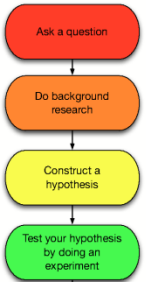
3. Determine Technologies Used



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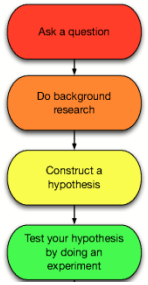
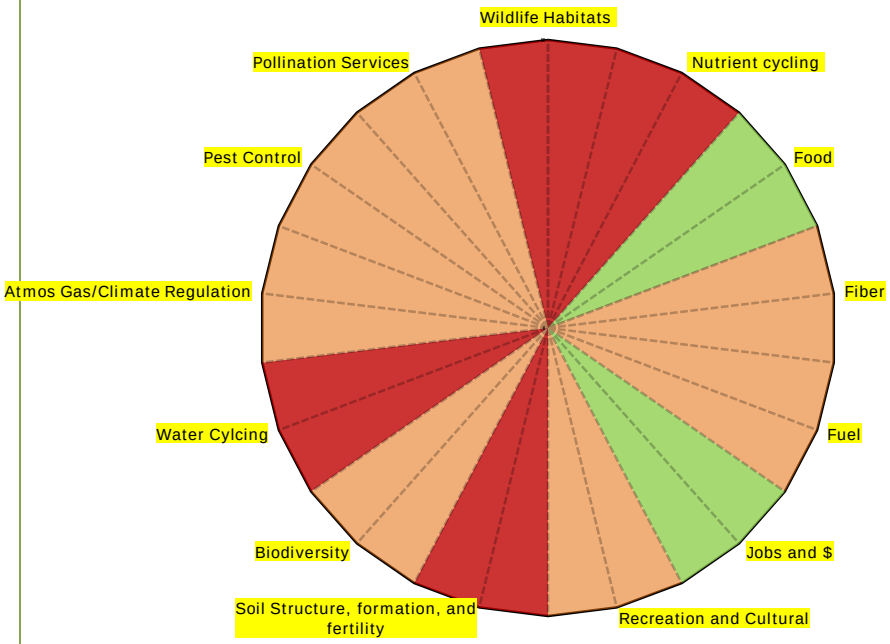


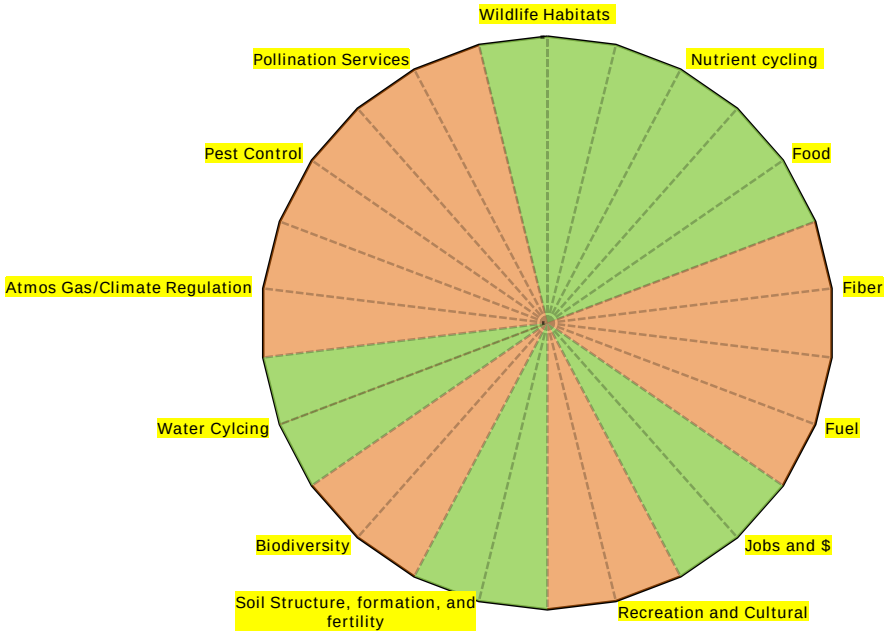
Red = Impacted

Orange = Neutral (no change)

Green = Ecosystem service enhanced



Before



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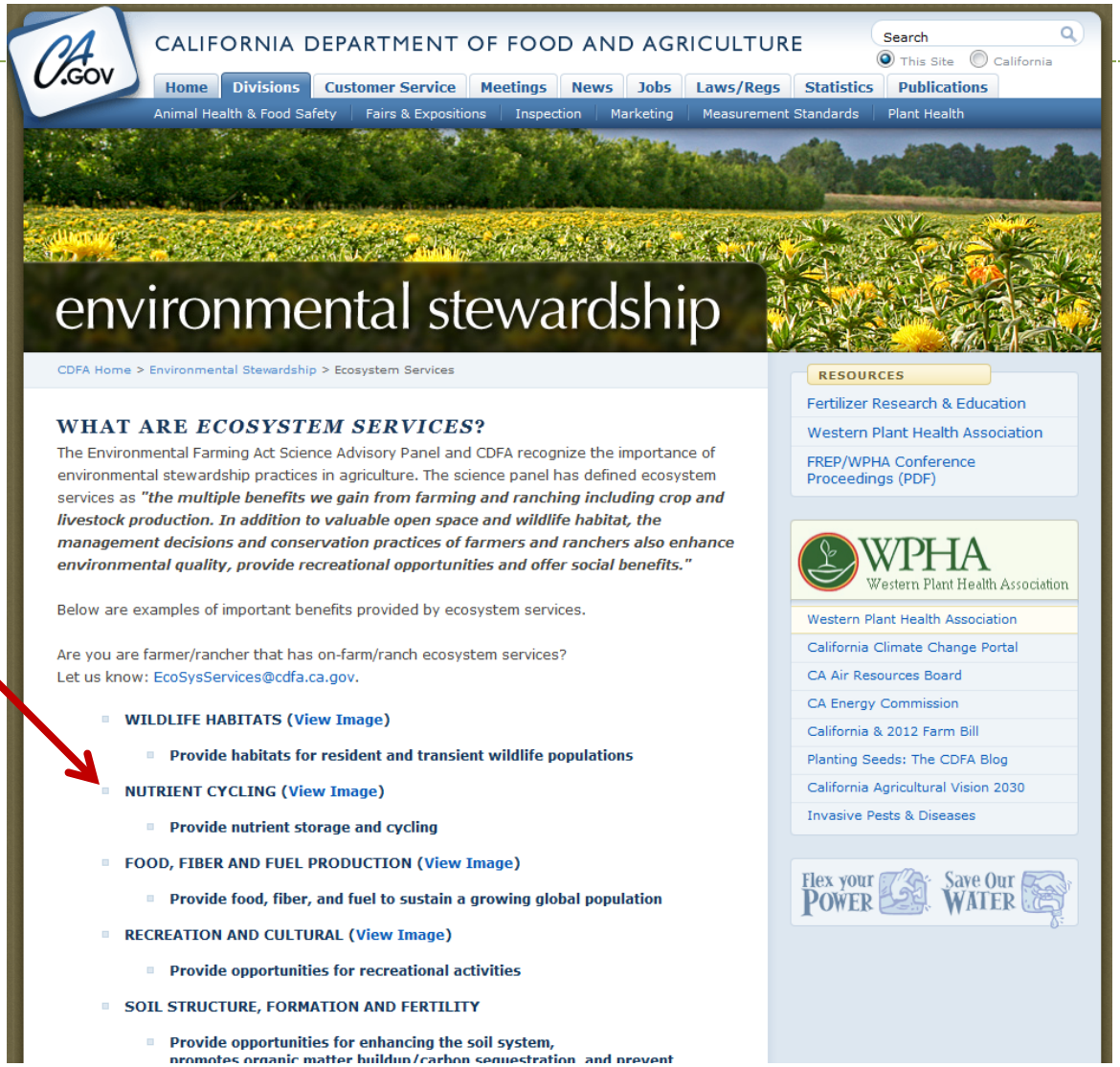

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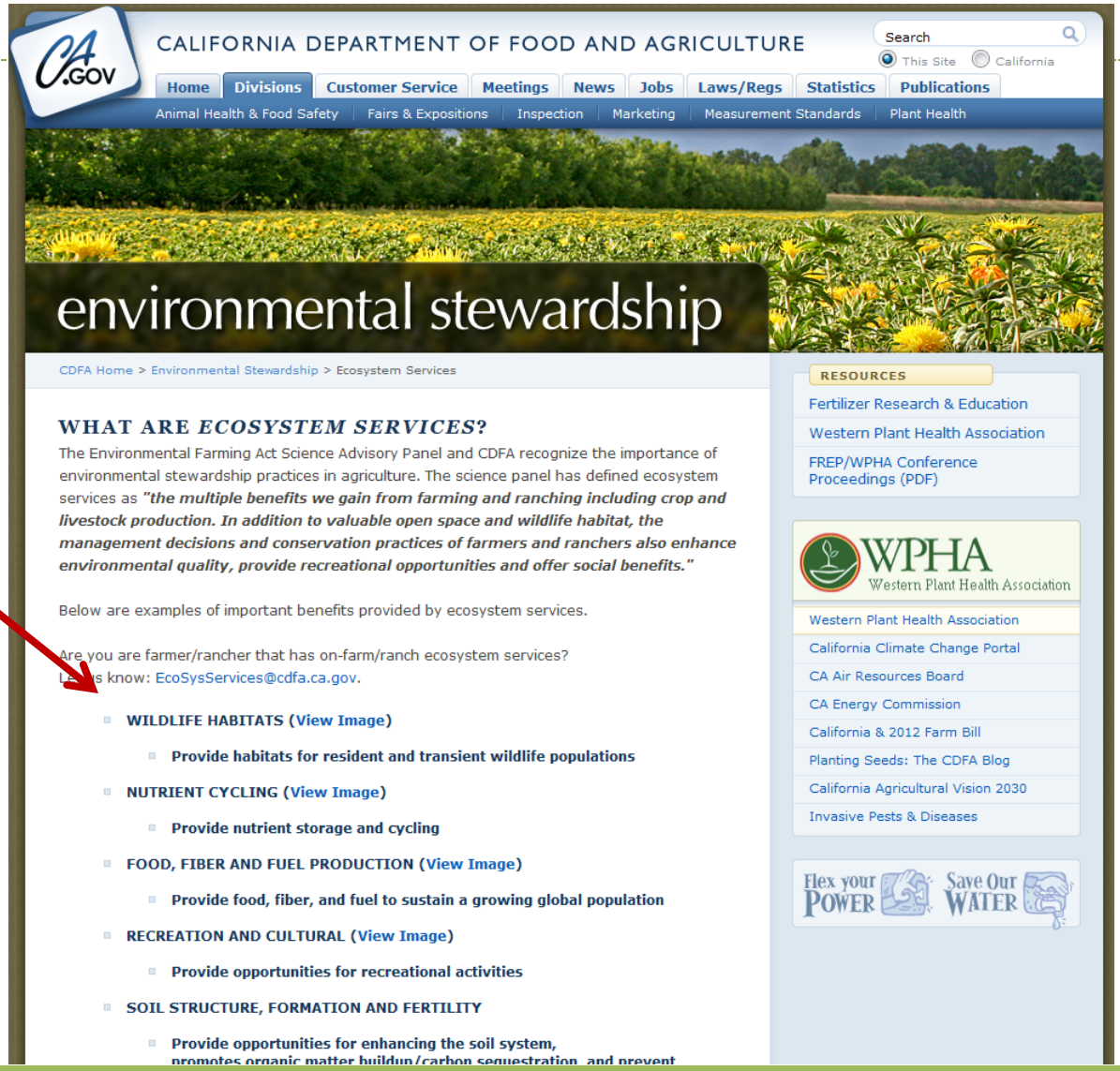

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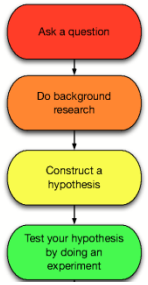

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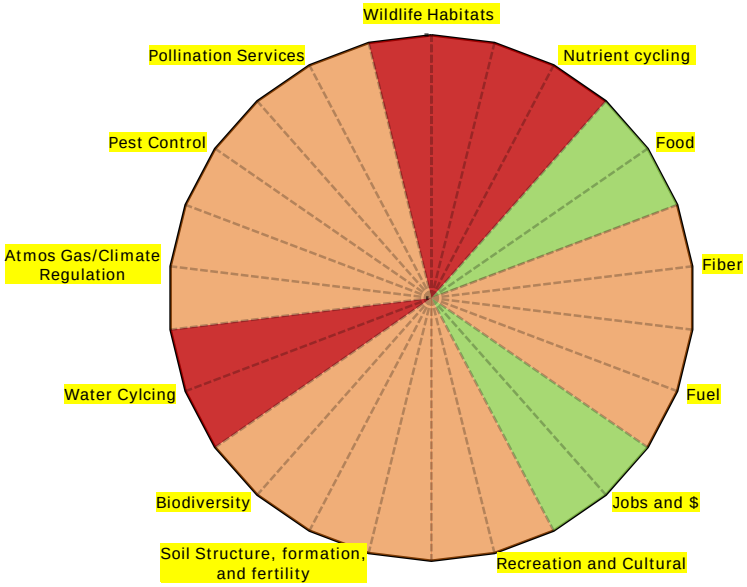

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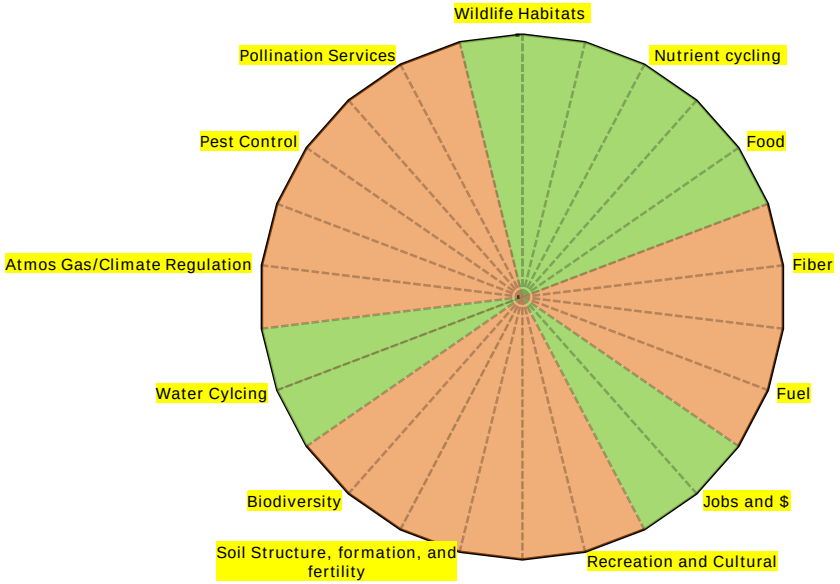


After

6. Tie NRCS Practices into Framework

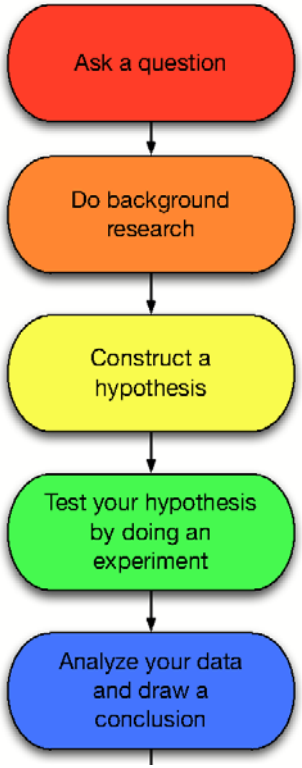
Impacted ("Before")	Enhanced by Statement	NRCS Practice ("After")
Wildlife Habitat	"Of three priority waterways identified by the water coalitions in 2009, two meet state standards for pesticides and toxicity and the third meets water quality regulations for all but one pesticide."	353 - Monitoring Wells 590 – Nutrient Management
Nutrient Cycling	"Completed work includes installation of 19,217 feet (3.6 miles) of underground pipeline, four tailwater recovery systems, land leveling on 838 acres, and irrigation system improvements on 992 acres."	554 – Drainage Water Management 464 –Irrigation Land Leveling 430 –Irrigation Pipeline 466 – Land Smoothing
Water Cycling	"Infrastructure improvements such as irrigation tailwater recirculation systems and conversion from furrow to micro irrigation systems offered ways to prevent water pollution."	441 – Irrigation System, Microi 447 – Irrigation System, Tail H2O 449 – Irrigation Water Management

Process and methodologies

➢ Conclusions

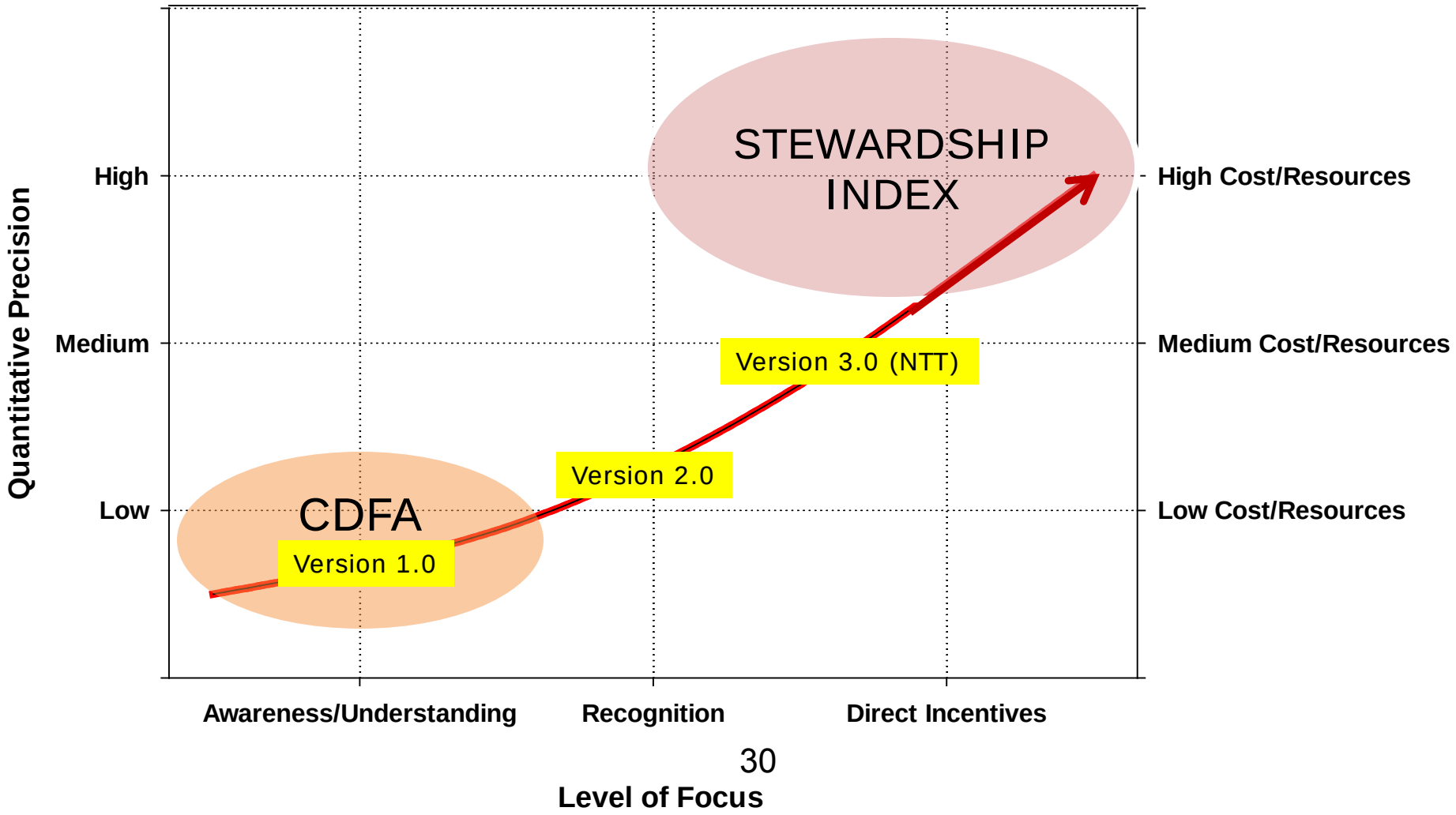
• This qualitative evaluation tool can be used to **inform, educate, and qualitatively show** the benefits of applying specific practices to enhance ecosystem services in agriculture.

• 30,000 foot level analysis tool will be useful for the department and to easily convey the benefits of ecosystem services to sister agencies, legislators, and the general public.

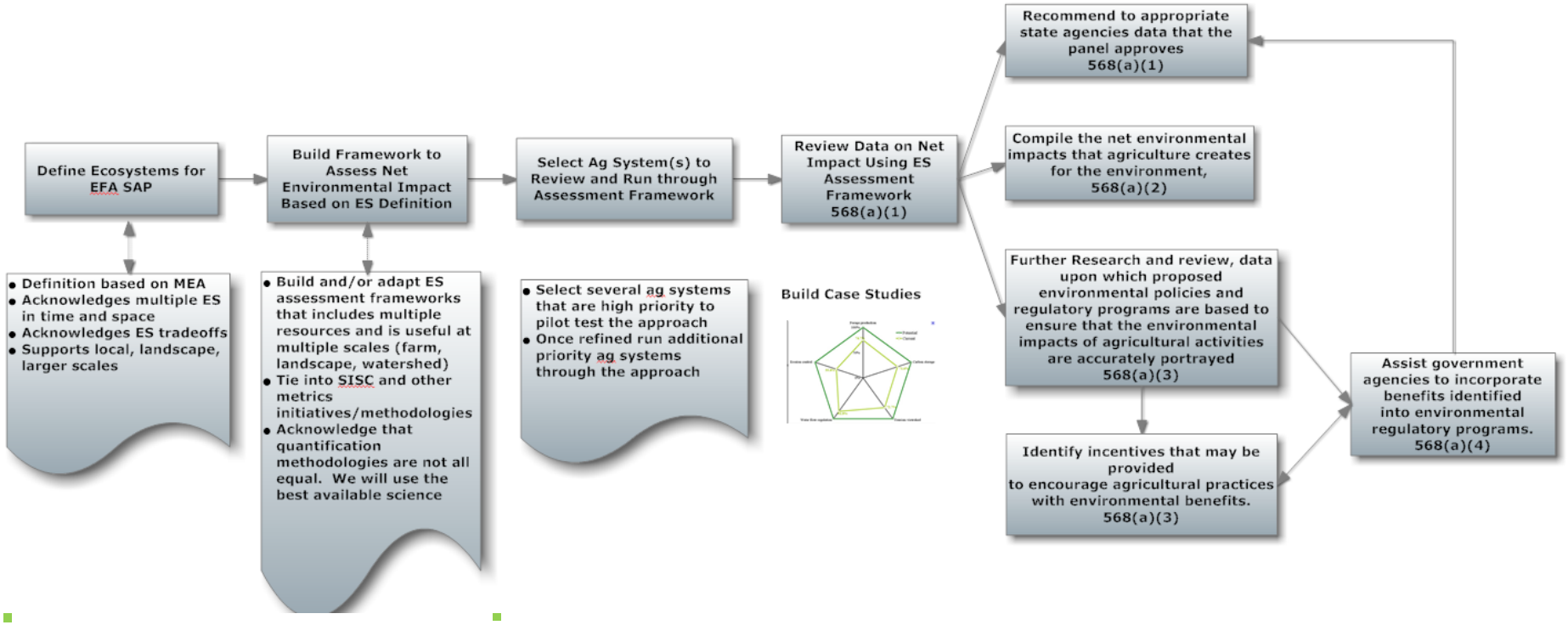


Where Are We Now? And Going?

- Version 1.0 – Informational/educational/qualitative tool

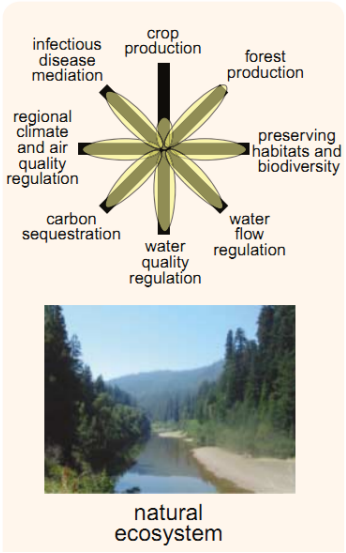


Where Are We Now

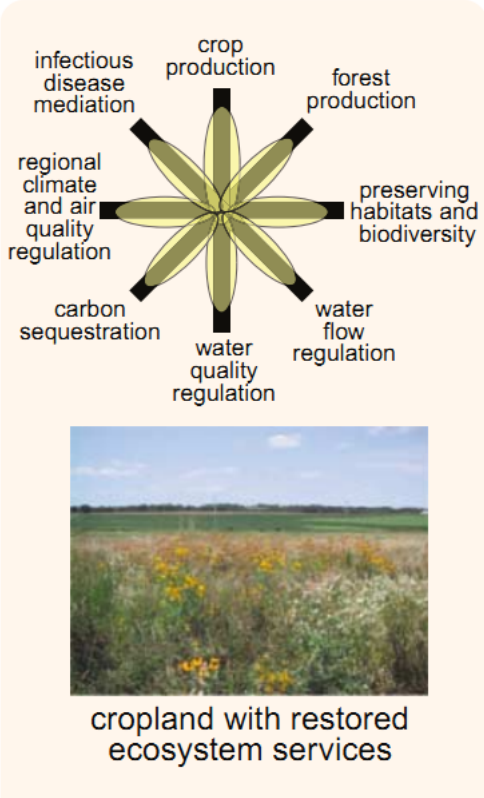


Foley et al., 2005

Natural and Agriculture System



Balance

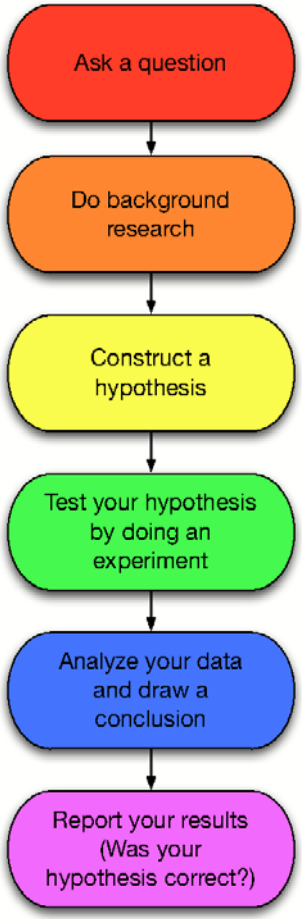


(Foley et al., 2005)

Next Steps

Version 1.0 of Evaluation Tool.

- Further edits to Version 1.0
- Evaluating benefits of any pilot projects
- Baseline for future tool development
- Compile in technical white-paper
- Post on Website
- Peer review?



USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Agricultural Water Enhancement Program
AWEP
HELPING PEOPLE HELP THE LAND
January 2011

"Securing this USDA funding shows the power that comes when agricultural and environmental interests combine their energies to help growers solve water quality problems."

— Parry Klassen, CURES Executive Director

Project Partners: Partnership for Agriculture and the Environment

- Almond Board of California
- California Dairy Campaign
- Coalition for Urban and Rural Environmental Stewardship (CURES)
- East San Joaquin Water Quality Coalition (ESJWQC)
- East Stanislaus Resource Conservation District (ESRCD)
- Environmental Defense Fund's (EDF) Center for Conservation Incentives (CCI)
- Stanislaus County Department of Agriculture
- Merced County Department of Agriculture
- Stanislaus County Farm Bureau
- Tuolumne River Trust
- University of California Cooperative Extension (UCCE)
- Western United Dairymen (WUD)
- Westside San Joaquin River Watershed Coalition (WSJRWC)
- West Stanislaus Resource Conservation District (WSRCD)

Northern San Joaquin River Water Quality Project

Addressing Water Quality Concerns in the Northern San Joaquin River Watershed

Stanislaus, Merced, and San Joaquin counties are three of the nation's highest producing agricultural counties, generating $7.5 billion in agricultural output annually. Since the 1990s, waterways in the three counties were impaired by sediment, nutrients and pesticides from agricultural, urban and other sources. State regulators imposed strict new requirements on farmers in 2003 that included developing management plans on many regional waterways due to impairments originating from agriculture.

The water quality of the San Joaquin River is of critical interest because it flows to the delta. Both the Delta-Mendota Canal, which supplies irrigation water to farms in the western San Joaquin Valley, and the California Aqueduct, which supplies drinking water to southern California, originate in the delta. Photo: USGS

Local watershed coalitions and the non-profit group CURES (Coalition for Urban Rural Environmental Stewardship) began working on correcting agricultural water quality problems in 2004. They knew that a combination of farm management practices would be needed to keep pollutants out of the San Joaquin River and its numerous tributaries. Infrastructure improvements such as irrigation tailwater recirculation systems and conversion from furrow to micro irrigation systems offered ways to prevent water pollution. These measures are considered best management practices (BMPs) that keep pesticides and sediments contained on farms, but are cost prohibitive for farmers to install even in profitable years.

In 2009, CURES, in coordination with Partnership for Agriculture and the Environment (a broad coalition of agricultural and environmental interests), successfully applied for AWEP funding to help farmers in the northern San Joaquin Valley implement these practices to improve water quality. The USDA approved $2 million annually in AWEP funding over a 5-year period for projects to improve water quality in the three county region.

A tailwater recirculation system in Stanislaus County. Photo: CURES

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INDEX OF CONSERVATION PRACTICE STANDARDS AND SPECIFICATIONS

(Listed in Alphabetical Order by Practice Name)

CODE	PRACTICE NAME	Responsible Discipline	CA Standard	CA Specifi-cation	Practice Require-ments	Operation & Maintenance	Statement of Work
472	Access Control	RANGE	May-10	------	------	------	May-10
560	Access Road	ENG	Sep-04	Nov-09	Sep-04	Nov-09	Aug-04
309	Agrichemical Handling Facility	ENG	Jun-08	2/	Jun-08	Nov-09	Jun-08
371	Air Filtration and Scrubbing	AQ / ENG	Mar-12	6/	------		Mar-12
311	Alley Cropping	FOR-AGRON	Oct-11	3/	------	------	Oct-11
591	Amendments for Treatment of Agricultural Waste	ENG	Aug-06	2/	------	------	Aug-06
366	Anaerobic Digester	ENG	Apr-11	2/	------	------	Apr-11
316	Animal Mortality Facility	ENG	Jan-11	2/	Jan-11	------	Jan-11
575	Animal Trails and Walkways	ENG-RANGE	Jun-11	Jun-11	Jun-11	Jun-11	Jun-11
450	Anionic Polyacrylamide (PAM) Application	ENG	Oct-11	Sep-10	Sep-10	Sep-10	Sep-10
397	Aquaculture Ponds	BIO-ENG	Jun-10	2/	------	Jun-10	Jun-10
396	Aquatic Organism Passage	BIO-ENG	Jun-11	Jun-11	Jun-11	Jun-11	Jun-11
310	Bedding	ENG	Apr-11	2/	------	Apr-11	Apr-11
314	Brush Management	RANGE	Apr-07	Oct-02	Jul-00	------	Aug-04
314A	Brush Management, Juniper Control	RANGE	------	Jan-11	May-10	------	------
584	Channel Bed Stabilization	ENG	Jun-11	Jun-11	Jun-11	Jun-11	Jun-11
326	Clearing and Snagging	ENG	Apr-11	Apr-11	Apr-11	Apr-11	Apr-11
360	Closure of Waste Impoundments	ENG	Aug-06	2/	------	Nov-09	Aug-04
372	Combustion System Improvement	AIR QUALITY	Sep-10	Sep-10	Sep-10	Sep-10	Sep-10
317	Composting Facility	ENG-AGRON	Mar-12	2/	------	Mar-12	Mar-12
327	Conservation Cover	AGRON-BIO	Sep-07	Jul-00	Jul-00	------	Aug-04
328	Conservation Crop Rotation	AGRON	Mar-12	Mar-12	Mar-12	------	Mar-12
656	Constructed Wetland	ENG-BIO	Jun-08	2/	------	Nov-09	Aug-04
332	Contour Buffer Strips	AGRON	Jul-00	5/	------	------	Aug-04
330	Contour Farming	AGRON	Oct-02	Jul-00	Jul-00	------	Aug-04
331	Contour Orchard and Other Perennial Crop	AGRON	Jun-11	Jun-11	------	------	Jun-11
340	Cover Crop	AGRON	Oct-11	Sep-07	Jun-08	------	Oct-11
342	Critical Area Planting	AGRON-BIO	Apr-07	------	------	------	Aug-04
342F	Critical Area Planting, Bermudagrass	AGRON-BIO	------	Jul-00	Jul-00	------	------
342H	Critical Area Planting, Container Plants	AGRON-BIO	------	Jul-00	Jul-00	------	------
342I	Critical Area Planting, Dune Stabilization	AGRON-BIO	------	Jul-00	Jul-00	------	------
342E	Critical Area Planting, Erosion Control Blanket	AGRON-BIO	------	Jul-00	Jul-00	------	------
342B	Critical Area Planting, Hydro-Mulch	AGRON-BIO	------	Jul-00	Jul-00	------	------
342C	Critical Area Planting, Split Hydro-Mulch	AGRON-BIO	------	Jul-00	Jul-00	------	------

CODE	PRACTICE NAME	Responsible Discipline	CA Standard	CA Specifi-cation	Practice Require-ments	Operation & Maintenance	Statement of Work
342A	Critical Area Planting, Straw Mulch	AGRON-BIO	------	Jul-00	Jul-00	------	------
342D	Critical Area Planting, Tackified Straw	AGRON-BIO	------	Jul-00	Jul-00	------	------
342G	Critical Area Planting, Woody Cuttings	AGRON-BIO	------	Jul-00	Jul-00	------	------
588	Cross Wind Ridges	AGRON	Sep-10	Sep-10	Sep-10	------	Sep-10
589C	Cross Wind Trap Strips	AGRON	Mar-12	Mar-12	Mar-12	------	Mar-12
402	Dam	ENG	Oct-11	2/	Oct-11	Nov-09	Oct-11
348	Dam, Diversion	ENG	Oct-11	Nov-09	Oct-11	Nov-09	Oct-11
324	Deep Tillage	AGRON	Oct-02	5/	------	------	Aug-04
356	Dike	ENG	Jun-08	Nov-09	Oct-03	Nov-09	Aug-04
362	Diversion	ENG	Apr-11	Apr-11	Apr-11	Apr-11	Apr-11
554	Drainage Water Management	ENG	Apr-11	2/	------	Apr-11	Apr-11
375	Dust Control from Animal Activity on Open Lot Surfaces	AQ / ENG	Oct-11	6/	------	------	Oct-11
373	Dust Control on Unpaved Roads and Surfaces	AIR QUALITY	Sep-10	Sep-10	Sep-10	Sep-10	Sep-10
432	Dry Hydrant	ENG	Mar-12	2/	------	Mar-12	Mar-12
647	Early Successional Habitat Development/Management	BIO	Mar-12	4/	------	------	Mar-12
592	Feed Management	AGRON-RANGE	Apr-07	5/	------	-----	Apr-07
374	Farmstead Energy Improvement	ENERGY / ENG	Oct-11	------	Oct-11	Oct-11	Oct-11
374A	Farmstead Energy Improvement, Greenhouse Energy Shade Screens	ENERGY / ENG	------	Oct-11	------	------	------
374B	Farmstead Energy Improvement, Lighting Replacement	ENERGY/ ENG	------	Oct-11	------	------	------
374C	Farmstead Energy Improvement, All Other Activities	ENERGY/ ENG	------	7/	------	------	------
382	Fence	RANGE	Apr-07	------	------	------	Aug-04
382C	Fence, Electrical	RANGE	------	Jul-00	Jul-00	------	------
382B	Fence, Suspension	RANGE	------	Jul-00	Jul-00	------	------
382A	Fence, Standard	RANGE	------	Jul-00	Jul-00	------	------
386	Field Border	AGRON-ENG	Oct-11	Oct-11	Oct-11	------	Oct-11
393	Filter Strip	ENG-AGRON	Oct-11	2/ (Job Sheet)	2/ (Job Sheet)	Oct-11	Oct-11
394	Firebreak	FOR	Apr-07	------	------	------	Apr-07
394B	Firebreak, Fuel-Break	FOR	------	Jul-00	Oct-02	------	------
394A	Firebreak, Standard	FOR	------	Oct-02	Oct-02	------	------
734	Fish and Wildlife Structure 1/	BIO	Mar-10	4/	------	------	------
398	Fish Raceway or Tank	BIO-ENG	Jun-10	2/	------	Jun-10	Jun-10
399	Fishpond Management	BIO	Apr-07	4/	------	------	Aug-04
512	Forage and Biomass Planting	AGRON-RANGE	Jun-11	Jun-11	Jun-11	------	Jun-11
511	Forage Harvest Management	AGRON-RANGE	Apr-11	5/	Apr-11	------	Apr-11
666	Forest Stand Improvement	FOR	Oct-11	------	------	------	Oct-11

CODE	PRACTICE NAME	Responsible Discipline	CA Standard	CA Specifi-cation	Practice Require-ments	Operation & Maintenance	Statement of Work
666C	Forest Stand Improvement, Aspen/Cottonwood/Other	FOR	------	Oct-02	Oct-02	------	------
666A	Forest Stand Improvement, Coastal Douglas Fir/Redwood	FOR	------	Oct-02	Oct-02	------	------
666D	Forest Stand Improvement, Competing Vegetation Control	FOR	------	Oct-02	Oct-02	------	------
666B	Forest Stand Improvement, Ponderosa Pine/Jeffrey Pine/Sierra Nevada Mixed Conifer	FOR	------	Oct-02	Jul-00	------	------
655	Forest Trails and Landings	FOR-ENG	Jan-11	Jan-11	Jun-11	Jun-11	Jun-11
383	Fuel Break	FOR	Apr-07	3/	------	-----	Apr-07
410	Grade Stabilization Structure	ENG	Jul-00	Nov-09	Jul-00	Nov-09	Aug-04
410A	Grade Stabilization Structure, Rock Drops	ENG	------	Nov-09	Jul-00	------	------
412	Grassed Waterway	AGRON-ENG	Jun-10	Jun-10	Jun-10	Jun-10	Jun-10
548	Grazing Land Mechanical Treatment	RANGE	Apr-07	Jul-00	Jul-00	------	Aug-04
561	Heavy Use Area Protection	ENG	Oct-11	2/	------	Jun-10	Jun-10
561A	Heavy Use Area Protection – Coal Ash Soil Surfacing	ENG	------	Jun-10	------	------	------
422	Hedgerow Planting	BIO	Mar-12	Mar-12	Mar-12	------	Mar-12
315	Herbaceous Weed Control	RANGE	Oct-11	8/	------	------	Mar-12
603	Herbaceous Wind Barriers	AGRON	Apr-07	Oct-02	Oct-02	------	Apr-07
423	Hillside Ditch	ENG	Nov-09	2/	------	Nov-09	Nov-09
595	Integrated Pest Management	AGRON	Jun-11	Oct-04	Sep-07	------	Aug-04
320	Irrigation Canal or Lateral	ENG	Mar-12	Mar-12	Mar-12	Mar-12	Mar-12
428	Irrigation Ditch Lining	ENG	Oct-11	------	Apr-11	Apr-11	Apr-11
428A	Irrigation Ditch Lining, Concrete	ENG	------	Apr-11	------	------	------
388	Irrigation Field Ditch	ENG	Mar-12	Mar-12	Mar-12	Mar-12	Mar-12
464	Irrigation Land Leveling	ENG	Mar-12	Mar-12	Mar-12	Mar-12	Mar-12
436	Irrigation Reservoir	ENG	Oct-11	2/	------	Jun-11	Jun-10
430	Irrigation Pipeline	ENG	Jun-11	------	Jun-11	Jun-11	Jun-11
430CMP	Irrigation Pipeline, Corrugated Metal Pipe	ENG	------	Jun-11	------	------	------
430PP	Irrigation Pipeline, Plastic Pipe	ENG	------	Jun-11	------	------	------
430SP	Irrigation Pipeline, Steel Pipe	ENG	------	Jun-11	------	------	------
441	Irrigation System, Microirrigation	ENG	Oct-11	Nov-09	Oct-11	Nov-09	Oct-11
442	Irrigation System, Sprinkler	ENG	Oct-11	Nov-09	Oct-11	Nov-09	Oct-11
442A	Irrigation System, Sprinkler, Above Ground Mainlines and Laterals	ENG	------	Nov-09	Sep-04	------	------
443	Irrigation System, Surface and Subsurface	ENG	Jun-11	Jun-11	Jun-11	Jun-11	Jun-11
447	Irrigation System, Tailwater Recovery	ENG	Oct-11	Apr-11	Apr-11	Apr-11	Apr-11
449	Irrigation Water Management	ENG	Oct-11	Nov-09	Oct-11	------	Oct-11
460	Land Clearing	ENG	Mar-12	2/	------	------	Mar-12
453	Land Reclamation, Landslide Treatment	ENG	Jul-05	2/	------	Nov-09	Jul-05

CODE	PRACTICE NAME	Responsible Discipline	CA Standard	CA Specifi-cation	Practice Require-ments	Operation & Maintenance	Statement of Work
455	Land Reclamation, Toxic Discharge Control	ENG	Aug-06	2/	------	Nov-09	Aug-04
543	Land Reconstruction, Abandoned Mined Land	AGRON-ENG	Sep-07	2/	------	Nov-09	Sep-07
544	Land Reconstruction, Currently Mined Land	AGRON-ENG	Sep-07	2/	------	Nov-09	Sep-07
466	Land Smoothing	ENG	Oct-03	2/	May-10	Nov-09	Aug-04
468	Lined Waterway or Outlet	ENG	Jun-11	Jun-11	Jun-11	Jun-11	Jun-11
457	Mine Shaft and Adit Closing	ENG	Jul-05	2/	------	Nov-09	Jul-05
482	Mole Drain	ENG	Mar-04	2/	------	------	Aug-04
353	Monitoring Well	ENG	Mar-12	2/	------	Mar-12	Mar-12
484	Mulching	AGRON	Oct-11	Oct-11	Oct-11	------	Oct-11
590	Nutrient Management	AGRON-ENG	Sep-07	Jun-08	Jun-08	------	Aug-04
500	Obstruction Removal	ENG	Jun-10	2/	------	------	Jun-10
582	Open Channel	ENG	Jul-00	2/	------	Nov-09	Aug-04
516	Pipeline	ENG	Oct-11	Oct-11	Oct-11	Oct-11	Oct-11
378	Pond	ENG	Oct-11	Nov-09	Oct-11	Nov-09	Oct-11
521C	Pond Sealing or Lining, Bentonite Sealant	ENG	Apr-11	Apr-11	Apr-11	Apr-11	Apr-11
521D	Pond Sealing or Lining, Compacted Clay Treatment	ENG	Apr-11	Apr-11	Apr-11	Apr-11	Apr-11
521A	Pond Sealing or Lining, Flexible Membrane	ENG	Apr-07	Nov-09	Apr-07	Nov-09	Aug-04
740	Pond Sealing or Lining, Soil Cement 1/	ENG	Jun-08	Nov-09	Jun-08	Nov-09	Jan-06
521B	Pond Sealing or Lining, Soil Dispersant	ENG	Apr-11	Apr-11	Apr-11	Apr-11	Apr-11
718	Precision Pest Control Application 1/	AQ-AGRON	May-09	------	------	Jun-08	Jun-08
718	Precision Pest Control Application, Ozone 1/	AQ-AGRON	------	Jun-08	Jun-08	------	------
462	Precision Land Forming	ENG	Oct-03	2/	------	------	Aug-04
338	Prescribed Burning	FOR	Jun-08	Oct-02	Oct-02	------	Aug-04
528	Prescribed Grazing	RANGE-AGRON	Jun-08	------	------	------	Jun-08
528A	Prescribed Grazing, Annual Rangeland	RANGE-AGRON	------	Apr-07	Apr-07	------	------
528B	Prescribed Grazing, Irrigated Pasture	RANGE-AGRON	------	Apr-07	Apr-07	------	------
528C	Prescribed Grazing, Perennial Rangeland	RANGE-AGRON	------	Apr-07	Apr-07	------	------
528D	Prescribed Grazing, Wetlands	RANGE-AGRON-BIO	------	Apr-07	Apr-07	------	------
528E	Prescribed Grazing, Woodland/Forestland	RANGE-FORESTRY	------	Jul-00	Jul-00	------	------
533	Pumping Plant	ENG	Oct-11	------	Jun-10	Jun-10	Jun-10
533B	Pumping Plant, Electric Submersible Pump	ENG	------	Jun-10	Jun-10	------	------
533C	Pumping Plant, Solar/Wind Power	ENG	------	Jun-10	Jun-10	------	------
550	Range Planting	RANGE	Sep-07	Jul-00	Jun-08	------	Aug-04

CODE	PRACTICE NAME	Responsible Discipline	CA Standard	CA Specifi-cation	Practice Require-ments	Operation & Maintenance	Statement of Work
550A	Range Planting – Annual Plant Species	RANGE	------	Jun-08	------	------	------
550B	Range Planting – Perennial Plant Species	RANGE	------	Jun-08	------	------	------
562	Recreation Area Improvement	FOR	Oct-02	Oct-02	Oct-02	------	Aug-04
566	Recreation Land Grading and Shaping	ENG	Oct-02	2/	------	Nov-09	Aug-04
716	Renewable Energy System 1/	ENERGY/ ENG	Oct-11	------	Oct-11	Oct-11	Oct-11
716A	Renewable Energy System, 1/ Wind	ENERGY/ ENG	------	Oct-11	------	-----	-----
716B	Renewable Energy System, 1/ Solar Photvoltaic	ENERGY/ ENG	------	Oct-11	------	-----	-----
716C	Renewable Energy System, 1/ Solar Thermal	ENERGY/ ENG	------	Oct-11	------	-----	-----
716D	Renewable Energy System, 1/ Geothermal	ENERGY/ ENG	------	7/	------	-----	-----
716E	Renewable Energy System, 1/ Hydropower	ENERGY/ ENG	------	7/	------	-----	-----
345	Residue and Tillage Management, Mulch Till	AGRON	Apr-07	Jun-08	Jun-08	-----	Apr-07
329	Residue and Tillage Management, No-Till / Strip Till / Direct Seed	AGRON	Sep-07	Jun-08	Jun-08	------	Jun-08
346	Residue and Tillage Management, Ridge Till	AGRON	Apr-07	Jun-08	Jun-08	-----	Apr-07
344	Residue Management, Seasonal	AGRON	Apr-07	Jul-00	Jul-00	------	Apr-07
344A	Residue Management, Seasonal, Rice Residue	AGRON	------	Jul-00	Jul-00	------	------
643	Restoration and Management of Rare or Declining Habitats	BIO	Mar-12	4/	------	------	Mar-12
391	Riparian Forest Buffer	FOR	Aug-06	Aug-06	Aug-06	------	Aug-04
390	Riparian Herbaceous Cover	BIO	Apr-07	4/	Aug-06	------	Aug-04
654	Road/Trail/Landing Closure and Treatment	FOR-ENG	Jun-09	Jun-09	Jun-09	Jun-09	Jun-09
555	Rock Barrier	ENG	Apr-11	2/	------	Apr-11	Apr-11
558	Roof Runoff Structure	ENG	Jun-10	2/	------	Jun-10	Jun-10
367	Roofs and Covers	ENG	Oct-11	2/	------	------	Oct-11
557	Row Arrangement	ENG	Oct-03	2/	------	------	Aug-04
610	Salinity and Sodic Soil Management	ENG-AGRON	Mar-12	------	------	------	Mar-12
610A	Salinity and Sodic Soil Management, Irrigated Lands	ENG-AGRON	------	Mar-12	Mar-12	------	------
798	Seasonal High Tunnel System for Crops 1/	AGRON-ENG	Jun-11	May-10	May-10	------	May-10
350	Sediment Basin	ENG	Jun-10	2/	------	Jun-10	Jun-10
646	Shallow Water Development and Management	BIO	Jan-11	4/	------	------	-----
632	Solid/Liquid Waste Separation Facility	ENG	Jun-09	2/	------	Nov-09	Aug-06
572	Spoil Spreading	ENG	Jun-10	2/	------	Jun-10	Jun-10
574	Spring Development	ENG-BIO	Jan-11	Nov-09	Oct-02	Nov-09	Sep-07
570	Stormwater Runoff Control	ENG	Oct-11	2/	------	Oct-11	Oct-11

CODE	PRACTICE NAME	Responsible Discipline	CA Standard	CA Specifi-cation	Practice Require-ments	Operation & Maintenance	Statement of Work
578	Stream Crossing	ENG	Mar-12	Mar-12	Mar-12	Mar-12	Mar-12
395	Stream Habitat Improvement & Management	BIO	Apr-07	4/	------	Mar-04	Aug-04
580	Streambank and Shoreline Protection	ENG	Jun-11	Jun-11	Jun-11	Jun-11	Jun-11
585	Stripcropping	AGRON	Mar-12	5/	------	-----	Mar-12
587	Structure for Water Control	ENG	Jan-11	------	May-10	May-10	May-10
587A	Structure for Water Control, Corrugated Metal Pipe	ENG	------	May-10	May-10	------	------
587C	Structure for Water Control, Fish Screen	ENG	------	May-10	May-10	May-10	------
587B	Structure for Water Control, Plastic Pipe Culverts	ENG	------	Oct-11	May-10	------	------
587D	Structure for Water Control, Wind Machines	ENG	------	Oct-11	Oct-11	May-10	------
606	Subsurface Drain	ENG	Mar-12	------	------	Mar-12	Mar-12
606A	Subsurface Drain, Tubing, 15 Inches or Less	ENG	------	Mar-12	Mar-12	------	------
607	Surface Drain, Field Ditch	ENG-AGRON	Apr-11	Apr-11	Apr-11	Apr-11	Apr-11
607A	Surface Drainage, Field Ditch, Vegetated Agricultural Drainage Ditch	ENG-AGRON	------	Jun-08	Jun-08	------	------
608	Surface Drain, Main or Lateral	ENG	Apr-11	Apr-11	Apr-11	Apr-11	Apr-11
609	Surface Roughening	AGRON	Oct-02	Jul-00	Jul-00	------	Aug-04
600	Terrace	ENG	Jun-10	2/	------	Jun-10	Jun-10
568	Trails and Walkways	ENG	Jun-10	2/	------	Jun-10	Jun-10
612	Tree/Shrub Establishment	FOR	Oct-11	------	------	------	Oct-11
612A	Tree/Shrub Establishment, Bareroot/Containerized Stock	FOR	------	Aug-06	Aug-06	------	------
612B	Tree/Shrub Establishment, Direct Seeding	FOR	------	Aug-06	Aug-06	------	------
612C	Tree/Shrub Establishment, Pole Plantings/Cuttings	FOR	------	Aug-06	Aug-06	------	------
660	Tree/Shrub Pruning	FOR	Aug-06	Aug-06	Aug-06	------	Aug-06
490	Tree/Shrub Site Preparation	FOR	Jun-08	------	------	------	Oct-11
490A	Windbreaks/Hedgerows Site Preparation	FOR	------	Oct-02	Oct-02	------	------
490B	Forest Site Preparation	FOR	------	Oct-02	Oct-02	------	------
620	Underground Outlet	ENG	Mar-12	Mar-12	Mar-12	Mar-12	Mar-12
645	Upland Wildlife Habitat Management	BIO	Jun-11	Jun-11	Jun-11	------	Jun-11
635	Vegetated Treatment Area	ENG-AGRON	Nov-09	2/	------	Nov-09	Nov-09
601	Vegetative Barrier	AGRON	Apr-07	5/	------	------	Apr-07
630	Vertical Drain	ENG	Mar-12	2/	------	Mar-12	Mar-12
313	Waste Storage Facility	ENG	Sep-07	------	------	Nov-09	Aug-04
313C	Waste Storage Facility, Concrete Structure	ENG	------	Nov-09	Sep-04	------	------
313B	Waste Storage Facility, Pond	ENG	------	Nov-09	Sep-04	------	------
313A	Waste Storage Facility, Shotcrete Structure	ENG	------	Nov-09	Sep-04	------	------

CODE	PRACTICE NAME	Responsible Discipline	CA Standard	CA Specifi-cation	Practice Require-ments	Operation & Maintenance	Statement of Work
629	Waste Treatment	ENG	Aug-06	2/	------	Nov-09	Aug-06
359	Waste Treatment Lagoon	ENG	Sep-04	Nov-09	Sep-04	Nov-09	Aug-04
634	Waste Transfer	ENG	Sep-10	2/	Sep-10	Sep-10	Sep-10
633	Waste Utilization	AGRON-ENG	Apr-07	2/	------	------	Aug-11
638	Water and Sediment Control Basin	ENG	Nov-09	2/	Nov-09	Nov-09	Nov-09
636	Water Harvesting Catchment	ENG	Jun-11	2/	------	Jun-11	Jun-11
642	Water Well	ENG	Mar-12	Mar-12	Mar-12	Mar-12	Mar-12
351	Water Well Decommissioning	ENG	Jun-11	2/	------	Jun-11	Jun-11
355	Well Water Testing	ENG	Oct-11	2/	Oct-11	------	Oct-11
614	Watering Facility	ENG	Sep-07	Nov-09	Oct-02	Nov-09	Aug-04
640	Waterspreading	ENG	Oct-03	2/	------	Nov-09	Aug-04
658	Wetland Creation	BIO-ENG	Jan-11	2/	------	Nov-09	Aug-04
659	Wetland Enhancement	BIO-ENG	Jan-11	2/	------	Nov-09	Aug-04
657	Wetland Restoration	BIO-ENG	Jan-11	2/	------	Nov-09	Aug-04
644	Wetland Wildlife Habitat Management	BIO	Jan-11	4/	------	------	Aug-04
380	Windbreak/Shelterbelt Establishment	FOR-BIO	Oct-02	Jul-00	------	------	Aug-04
650	Windbreak/Shelterbelt Renovation	FOR-BIO	Oct-02	Oct-02	Oct-02	------	Aug-04
384	Woody Residue Treatment	FOR	Oct-11	3/	------	-----	Oct-11

1/ California Interim Practice (Copy located in eFOTG Section IV - C - Conservation Practices - CA Interim)

2/ A Practice Specification has not been prepared. Specifications and design details will be prepared upon request of the Area Engineer or State Conservation Engineer

3/ A Practice Specification has not been prepared. Specifications and design details will be prepared upon request of the State Forester

4/ A Practice Specification has not been prepared. Specifications and design details will be prepared upon request of the Area Biologist or State Biologist

5/ A Practice Specification has not been prepared. Specifications and design details will be prepared upon request of the State Agronomist.

6/ A Practice Specification has not been prepared. Specifications and design details will be prepared upon request of the State Air Quality Specialist

7/ A Practice Specification has not been prepared. Specifications and design details will be prepared upon request of the State Energy Conservation Specialist, Area Engineer, or State Conservation Engineer

8/ A Practice Specification has not been prepared. Specifications and design details will be prepared upon request of the State Range Specialist.

CODE	PRACTICE NAME	Responsible Discipline	CA Standard	CA Specifi-cation	Practice Require-ments	Operation & Maintenance	Statement of Work

INDEX OF CONSTRUCTION SPECIFICATIONS

CODE	PRACTICE NAME	Responsible Discipline		Construction Specification	Last Review
901	Concrete (3000 psi)	ENG		Jun-10	Jun-10
901	Concrete (4000 psi)	ENG		Jun-10	Jun-10
902	Concrete Block Structure	ENG		Jul-05	Jul-05
903	Earthfill	ENG		Mar-12	Mar-12
904	Gabions	ENG		Jul-05	Jul-05
905	Geotextile Fabric	ENG		Jul-05	Jul-05
906	Post and Wire Revetment	ENG		Jul-05	Jul-05
907	Rock Riprap	ENG		Jun-08	Jun-08
908	Grouted Rock Riprap	ENG		Jul-05	Jul-05
909	Control of Water (to facilitate construction)	ENG		Jul-05	Jul-05

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

NUTRIENT MANAGEMENT

(Ac.)

CODE 590

DEFINITION

Managing the amount, source, placement, form and timing of the application of plant nutrients and soil amendments.

PURPOSE

- To budget and supply nutrients for plant production.
- To properly utilize manure or organic by-products as a plant nutrient source.
- To minimize agricultural nonpoint source pollution of surface and ground water resources.
- To protect air quality by reducing nitrogen emissions (ammonium and NO_x compounds) and the formation of atmospheric particulates.
- To maintain or improve the physical, chemical and biological condition of soil.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all lands where plant nutrients and soil amendments are applied.

CRITERIA

General Criteria Applicable to All Purposes

A nutrient budget for nitrogen, phosphorus, and potassium shall be developed that considers all potential sources of nutrients including, but not limited to animal manure and organic by-products, waste water, commercial fertilizer, crop residues, legume credits, and irrigation water. The nutrient budget shall use reasonable yields to set nutrient requirements based on currently accepted University of California guidance, or industry standards when acceptable to University of California.

Realistic yield goals shall be established based on soil productivity information, historical yield data, climatic conditions, level of management and/or local research on similar soil, cropping systems, and soil, tissue, and manure/organic by-products tests.

For new crops or varieties, industry yield recommendations may be used until documented yield information is available.

Plans for nutrient management shall specify the source, amount, timing and method of application of nutrients on each field to achieve realistic production goals, while minimizing movement of nutrients and other potential contaminants to surface and/or ground waters.

Areas contained within established minimum application setbacks (e.g., sinkholes, wells, gullies, ditches, surface inlets or rapidly permeable soil areas) shall not receive direct application of nutrients.

On irrigated lands, irrigation management shall be optimized based on Practice 449 "Irrigation Water Management". This applies whether or not nutrients are being applied with the irrigation water.

Nutrient loss to erosion, leaching, runoff, and subsurface drainage shall be addressed, as needed.

Soil, Manure, and Tissue Sampling and Laboratory Analyses (Testing) Nutrient planning shall be based on current soil, manure, and tissue test results developed in accordance with University of California guidance, or industry practice if recognized by

the University of California. When used to assess P and K, current soil tests are no older than three years. Soil sampling used for managing N applications shall be timely, collected very near anticipated application times and considering previous and planned irrigation events or N applications.

Soil, manure, irrigation water, and tissue samples shall be collected and prepared according to University of California guidance or standard industry practice. Soil, water, manure, and tissue test analyses shall be performed by laboratories that are accepted in one or more of the following:

- Laboratories successfully meeting the requirements and performance standards of the North American Proficiency Testing Program (NAPT) under the auspices of the Soil Science Society of America http://www.naptprogram.org/about/participants/, or
- Environmental Laboratory Accreditation Program (ELAP) http://www.dhs.ca.gov/ps/ls/elap/default.htm
- For manure, laboratories successfully meeting the requirements and performance standards of the Manure Proficiency (MAP) Program http://ghex.colostate.edu/map/

Soil and tissue testing shall include analyses for any nutrients for which specific information is needed to develop the nutrient plan. Request analyses pertinent to monitoring or amending the annual nutrient budget, e.g. pH, electrical conductivity (EC), soil organic matter, texture, nitrogen, phosphorus and potassium.

Nutrient Application Rates. Soil amendments shall be applied as needed, to adjust soil properties, including soil pH, to adequately provide for crop nutrient availability and utilization.

Recommended nutrient application rates shall be based on current (updated, as appropriate) University of California recommendations, (and/or industry practice when recognized by the university) that consider current soil test results, tissue tests, realistic yield goals and management capabilities. If University of California does not provide state or regional recommendations, then UC guidance from County Farm Advisors on nutrient application rates, or industry practice when consistent with local UC guidance, is acceptable. The planned rates of nutrient application, as documented in the nutrient budget, shall be determined based on the following guidance:

- Nitrogen Application - Planned nitrogen application rates shall match the recommended rates as closely as possible, except when manure or organic by-products are a source of nutrients. When manure or organic by-products are a source of nutrients, see "Additional Criteria" below.
- Phosphorus Application - Planned phosphorus application rates shall match the recommended rates as closely as possible, except when manure or organic by-products are sources of nutrients. When manure or organic by-products are a source of nutrients, see "Additional Criteria" below.
- Potassium Application - When forage quality is impaired by excess soil potassium levels, application of potassium shall be reduced or suspended until desirable levels in the soil and forage are regained.
- Other Plant Nutrients - The planned rates of application of other nutrients shall be consistent with University of California guidance or industry practice if recognized by University of California.
- Starter Fertilizers - When starter fertilizers are used, they shall be included in the overall nutrient budget, and applied in accordance with University of California recommendations, or industry practice if recognized by University of California.

Nutrient Application Timing. Timing of nutrient application (particularly nitrogen) shall correspond as closely as possible with plant nutrient uptake characteristics, while considering cropping system limitations, weather and climatic conditions, risk assessment tools (e.g., leaching index, P index) and field accessibility.

Nutrient Application Methods. Application methods to reduce the risk of nutrient transport to surface and ground water, or into the atmosphere shall be employed.

To minimize nutrient losses:

- Apply nutrient materials uniformly to application area(s) unless precision application technology indicates variable rates are appropriate. Precise placement with banding, use of drip irrigation, or other strategies to maximize root access to nutrients, is desirable.
- Nutrients shall not be applied to frozen, snow-covered or saturated soil if the potential risk for runoff exists.
- Nutrients shall be applied considering plant nutrient uptake patterns during the growing season, root growth patterns, irrigation practices, nutrient mobility, and other conditions so as to maximize availability to the plant and minimize the risk of runoff, leaching, and volatilization losses.
- Nutrient applications associated with irrigation systems shall be applied in a manner that prevents or minimizes leaching, runoff, or volatilization of nutrients.
- Incorporate or irrigate in any broadcast fertilizers within the shortest practicable timeframe. Apply nitrogen fertilizers as close to anticipated plant need as is possible.

Conservation Management Unit (CMU) Risk Assessment. In areas with identified or designated agricultural phosphorus related water quality impairment, a CMU specific risk assessment of the potential for phosphorus transport from the area shall be completed using the California P Index. In areas with identified or designated agricultural nitrogen related water quality impairment, a CMU specific risk assessment of the potential for nitrogen transport from the area to ground water or surface water shall be completed by evaluating the irrigation, soils, cropping, runoff management, nitrogen application strategies in use, and other factors pertinent to the site.

Note: California regulators may select an alternative method to the PI to manage P application. California NRCS is developing a tool for evaluating risk of N loss. This section will be revised in either case.

Additional Criteria Applicable to Manure and Organic By-Products or Biosolids Applied as a Plant Nutrient Source

When animal manures or organic by-products are applied, a risk assessment of the potential for nutrient transport from the CMU shall be completed using the California P Index to adjust the management of nutrient applications.

Nutrient values of manure and organic by-products shall be determined prior to land application. Samples will be taken and analyzed for nutrient concentration, moisture content, and Ec, as appropriate, with each hauling/emptying cycle for a storage/treatment facility. Manure sampling frequency may vary based on the operation's manure handling strategy and spreading schedule. Dilute manure storage ponds shall be tested at least seasonally when drawdown occurs, with testing at each application recommended. If "stable" (maintaining a certain nutrient concentration with minimal variation) levels are found after three years or more of sampling average values from all sampling may be used for planning manure applications unless continued testing is desirable for other purposes or required by law. When changes occur in manure collection, treatment, storage, herd size, or any other factor capable of significantly altering manure nutrient characteristics renew sampling to establish new characteristics. Samples shall be collected and prepared according to University of California guidance or industry practice. Manure exported from any facility shall be tested and measured as required by law.

In planning for new operations, acceptable "book values" recognized by the NRCS and/or University of California may be used (e.g., NRCS Agricultural Waste Management Field Handbook, UCCE publications, regulatory guidelines, ASABE standards, or unpublished data when appropriate).

Biosolids (sewage sludge) shall be applied in accordance with USEPA regulations. (40 CFR Parts 403 (Pretreatment) and 503 (Biosolids) and other state and/or local regulations regarding the use of biosolids as a nutrient source.

Manure and Organic By-Product Nutrient Application Rates. Manure and organic by-product nutrient application rates shall be based on nutrient analyses procedures recommended by state regulation, or University of California. As indicated above, "book values" may be used in planning for new operations. At a minimum, manure analyses shall include appropriate nutrient and specific ion concentrations. Solid manure test results will include percent moisture. Salt concentration (Ec) shall be monitored so that manure applications do not cause plant damage or negatively impact soil or water quality.

When applying manure with sprinkler irrigation, the application rate (in/hr) of liquid materials applied shall not exceed the soil intake/infiltration rate. All applications with irrigation water shall be managed to minimize ponding, minimize leaching below the root zone, and avoid runoff. Applications with irrigation water shall conform to the principles found in NRCS Practice 449, Irrigation Water Management.

The planned rates of nitrogen and phosphorus application recorded in the plan shall be determined based on the following guidance:

Nitrogen Application Rates

- When manure or organic by-products are used, the nitrogen availability of the planned application rates shall match plant uptake characteristics as closely as possible, taking into consideration the timing of nutrient application(s) in order to minimize leaching and atmospheric losses.
- Management activities and technologies shall be used that effectively utilize mineralized nitrogen and that minimize nitrogen losses through denitrification, leaching, and ammonia volatilization.
- Manure or organic by-products may be applied on legumes at rates equal to the estimated removal of nitrogen in harvested plant biomass.
- When the nutrient management plan component is being implemented on a phosphorus basis, manure or organic by-products shall be applied at rates consistent with a phosphorus limited application rate. In such situations, an additional nitrogen application, from non-organic sources, may be required to supply, but not exceed, the recommended amounts of nitrogen in any given year.

Phosphorus Application Rates

- When manure or organic by-products are used, the planned rates of phosphorus application shall be consistent with state regulation or the Phosphorus Index (PI) Rating. **

  ** Acceptable phosphorus-based manure application rates shall be determined as a function of soil test recommendation or estimated phosphorus removal in harvested plant biomass.

- The application of phosphorus applied as manure may be made at a rate equal to the recommended phosphorus application or estimated phosphorus removal in harvested plant biomass for the crop rotation or multiple years in the crop sequence. When such applications are made, the application rate shall:
  - ◊ Not exceed the recommended nitrogen application rate during the year of application, or
  - ◊ Not exceed the estimated nitrogen removal in harvested plant biomass during the year of application when there is no recommended nitrogen application.
  - ◊ Not be made on sites considered vulnerable to off-site phosphorus transport unless appropriate conservation practices, best

management practices or management activities are used to reduce the vulnerability.

Heavy Metal Monitoring. When sewage sludge (biosolids) is applied, the accumulation of potential pollutants (including arsenic, cadmium, copper, lead, mercury, selenium, and zinc) in the soil shall be monitored in accordance with the US Code, Reference 40 CFR, Parts 403 and 503, and/or any applicable state and local laws or regulations.

Additional Criteria to Protect Air Quality by Reducing Nitrogen and/or Particulate Emissions to the Atmosphere

In areas with an identified or designated nutrient management related air quality concern, any component(s) of nutrient management (i.e., amount, source, placement, form, timing of application) identified by available risk assessment tools as a potential source of atmospheric pollutants shall be adjusted, as necessary, to minimize the loss(es).

Comply with any Federal, State, or Local air quality regulations governing the use of fertilizers or the application of manure or biosolids to land.

When tillage can be performed, surface applications of manure and fertilizer nitrogen formulations that are subject to volatilization on the soil surface (e.g., urea) shall be incorporated into the soil within 24 hours after application.

When manure or organic by-products are applied to grassland, hayland, pasture or minimum-till areas the rate, form and timing of application(s) shall be managed to minimize volatilization losses.

When liquid forms of manure are applied with irrigation equipment, operators will select weather conditions during application that will minimize volatilization losses.

Operators will handle and apply poultry litter or other dry types of animal manures when the potential for wind-driven loss is low and there is less potential for transport of particulates into the atmosphere.

Weather and climatic conditions during manure or organic by-product application(s) shall be recorded and maintained in accordance with the operation and maintenance section of this standard.

CAFO operations seeking permits under CARB or USEPA regulations (40 CFR Parts 122 and 412) should consult with their respective state or local permitting authority for additional criteria.

Additional Criteria to Improve the Physical, Chemical and Biological Condition of the Soil

Nutrients shall be applied and managed in a manner that maintains or improves the physical, chemical and biological condition of the soil.

Minimize the use of nutrient sources with high salt content unless provisions are made to leach salts below the crop root zone and water quality impacts to receiving waters are considered.

To the extent practicable nutrients shall not be applied when the potential for soil compaction and rutting is high.

CONSIDERATIONS

The use of management activities and technologies listed in this section may improve both the production and environmental performance of nutrient management systems.

The addition of these management activities, when applicable, increases the management intensity of the system and is recommended in a nutrient management system.

Action should be taken to protect National Register listed and other eligible cultural resources.

The nutrient budget should be reviewed annually to determine if any changes are needed for the next planned crop.

For some sites specific soil sampling techniques may be appropriate to better manage nitrogen. These include post-harvest deep soil profile sampling for nitrogen, Pre-Sidedress Nitrogen Test (PSNT), Pre-Plant

Soil Nitrate Test (PPSN) or soil surface sampling for phosphorus accumulation or pH changes.

Additional practices to enhance the producer's ability to manage manure effectively include modification of the animal's diet to reduce the manure nutrient content, or utilizing manure amendments that stabilize or tie-up nutrients.

Soil test information should be no older than one year when developing new plans, particularly if animal manures are to be used as a nutrient source.

Excessive levels of some nutrients can cause induced deficiencies of other nutrients.

If increases in soil phosphorus levels are expected, consider a more frequent (annual) soil testing interval.

To manage the conversion of nitrogen in manure or fertilizer, use products or materials (e.g. nitrification inhibitors, urease inhibitors and slow or controlled release fertilizers) that more closely match nutrient release and availability for plant uptake. These materials may improve the nitrogen use efficiency (NUE) of the nutrient management system by reducing losses of nitrogen into water and/or air.

Sample the liquid manure/irrigation water mixture during each application to cropland.

Considerations to Minimize Agricultural Nonpoint Source Pollution of Surface and Ground Water

Erosion control and runoff reduction practices can improve soil nutrient and water storage, infiltration, aeration, tilth, diversity of soil organisms and protect or improve water and air quality (Consider installation of one or more NRCS FOTG, Section IV – Conservation Practice Standards).

Cover crops can effectively utilize and/or recycle residual nitrogen.

Application methods and timing that reduce the risk of nutrients being transported to ground and surface waters, or into the atmosphere include:

- Split applications of nitrogen to provide nutrients at the times of maximum crop utilization,
- Use corn stalk-test or other tissue tests to minimize risk of applying nitrogen in excess of crop needs.
- Where only summer crops are grown, avoid winter nutrient application for spring seeded crops,
- Band applications of phosphorus near the seed row,
- Incorporate surface applied manures or organic by-products as soon as possible after application to minimize nutrient losses,
- Delay field application of animal manures or organic by-products if precipitation capable of producing runoff and erosion is forecast within 24 hours of the time of the planned application.

Apply calcium or acidic soil amendments, as appropriate, to soils with infiltration rates reduced by low salt content in irrigation water or excessive sodium in the soil or irrigation water. This will improve crop health and help control runoff.

Use risk assessment tools for planning, such as the California P Index, where there is significant risk to water quality from nutrients even in areas without identified or designated nutrient related water quality impairment.

Considerations to Protect Air Quality by Reducing Nitrogen and/or Particulate Emissions to the Atmosphere

Odors associated with the land application of manures and organic by-products can be offensive to the occupants of nearby homes. Avoid applying these materials upwind of occupied structures when residents are likely to be home (evenings, weekends and holidays).

When applying manure with irrigation equipment, modifying the equipment can reduce the potential for volatilization of nitrogen from the time the manure leaves the application equipment until it reaches the surface of the soil (e.g., reduced pressure, drop down tubes for center pivots). N volatilization from manure in a surface

irrigation system will be reduced when applied under a crop canopy.

When planning nutrient applications and tillage operations, encourage soil carbon buildup while discouraging greenhouse gas emissions (e.g., nitrous oxide N_2O, carbon dioxide CO_2).

Storage and application of ammonia based materials will be done considering methods that limit volatilization.

Endangered Species Considerations

If during the Environmental Assessment, NRCS determines that installation of this practice, along with any others proposed, will have an effect on any federal or state listed Rare, Threatened or Endangered species or their habitat, NRCS will advise the client of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the client selects one of the alternative conservation treatments for installation; or with concurrence of the client, NRCS initiates consultations concerning the listed species with the U.S. Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game.

Cultural Resources Considerations

NRCS policy is to avoid any effect to cultural resources and protect them in their original location. Determine if installation of this practice or associated practices in the plan could have an effect on cultural resources. The National Historic Preservation Act may require consultation with the California State Historic Preservation Officer.

http://www.nrcs.usda.gov/technical/cultural.html is the primary website for cultural resources information. The California Environmental Handbook and the California Environmental Assessment Worksheet also provide guidance on how the NRCS must account for cultural resources. The e-Field Office Technical Guide, Section II contains general information, with Web sites for additional information.

Document any specific considerations for cultural resources in the design docket and the Practice Requirements worksheet.

PLANS AND SPECIFICATIONS

Plans and specifications for nutrient management shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s), using nutrients to achieve production goals and to prevent or minimize resource impairment.

Nutrient management plans shall include a statement that the plan was developed based on requirements of the current standard and any applicable Federal, state, or local regulations, policies, or programs, which may include the implementation of other practices and/or management activities. Changes in any of these requirements may necessitate a revision of the plan.

The following components shall be included in the nutrient management plan:

- aerial site photograph(s) or site map(s), and a soil survey map of the site,
- location of designated sensitive areas or resources and the associated, nutrient management restriction,
- current and/or planned plant production sequence or crop rotation,
- results of soil, water, manure and/or organic by-product sample analyses,
- results of plant tissue analyses, when used for nutrient management,
- realistic yield goals for the crops,
- complete nutrient budget for nitrogen, phosphorus, and potassium for the crop rotation or sequence,
- listing and quantification of all nutrient sources,
- CMU specific recommended nutrient application rates, timing, form, and method of application and incorporation, and

- guidance for implementation, operation, maintenance, and recordkeeping

If increases in soil phosphorus levels are expected, the nutrient management plan shall document:

- the potential for soil phosphorus drawdown from the production and harvesting of crops when phosphorus inputs are reduced, and
- management activities or techniques used to reduce the potential for phosphorus loss

OPERATION AND MAINTENANCE

The owner/client is responsible for safe operation and maintenance of this practice including all equipment. Operation and maintenance addresses the following:

- periodic plan review to determine if adjustments or modifications to the plan are needed. As a minimum, plans will be reviewed and revised with each soil test cycle.
- significant changes in animal numbers and/or feed management will necessitate additional manure sampling and analyses to establish a revised average nutrient content.
- protection of fertilizer and organic by-product storage facilities from weather and accidental leakage or spillage.
- calibration of application equipment to ensure uniform distribution of material at planned rates.
- documentation of the actual rate at which nutrients were applied. When the actual rates used differ from the recommended and planned rates, records will indicate the reasons for the differences.
- Maintaining records to document plan implementation. As applicable, records include:
    - Soil, plant tissue, water, manure, and organic by-product analyses resulting in recommendations for nutrient application,
    - quantities, analyses and sources of nutrients applied,
    - dates and method(s) of nutrient applications,
    - weather conditions and soil moisture at the time of application; lapsed time to manure incorporation, rainfall or irrigation event.
    - crops planted, planting and harvest dates, yields, and crop residues removed,
    - dates of plan review, name of reviewer, and recommended changes resulting from the review.

Records should be maintained for five years; or for a period longer than five years if required by other Federal, state or local ordinances, or program or contract requirements.

Workers should be protected from and avoid unnecessary contact with plant nutrient sources. Extra caution must be taken when handling ammoniacal nutrient sources, or when dealing with organic wastes stored in unventilated enclosures.

Material generated from cleaning nutrient application equipment should be utilized in an environmentally safe manner. Excess material should be collected and stored or field applied in an appropriate manner.

Nutrient containers should be recycled in compliance with state and local guidelines or regulations.

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Western Fertilizer Handbook, 8th Edition or later, Western Plant Health Association

University of California publications such as crop production manuals, crop specific IPM manuals, and crop or research group websites