Rice Cultivation Project Protocol (RCPP)

CLIMATE ACTION RESERVE

Workgroup Meeting #2

May 11, 2011

12 PM - 2 PM PDT

Purpose

- Update on progress
- Review research to date on performance standards
  - Discuss options and identify directions for research
- Review DNDC Model Uncertainty Analysis Results
- Discuss Options for Project Aggregation
- Discuss Wildlife Habitat Impacts and Options
- Next Steps

Protocol Development Timeline

WG Meeting 1 (conference call)	February 9
WG Meeting 2 (conference call)	May 11
Draft protocol to workgroup	June 01
WG Meeting 3 (Los Angeles)*	June 06
WG Written Comments on Draft Protocol Due	June 28
WG Meeting 4 (conference call)	Week of September 12
Start of 30-day public comment period	September 23
Public workshop	Early October
WG Meeting 4 (if necessary)	Late October
Protocol adoption by Reserve Board	Early December

Update on Progress

- Draft Protocol from EDF project - Undergoing VCS Validation?
- Background work on Performance Standards - near completion
- DNDC Uncertainty Analysis - near completion
- First Draft CAR Protocol will build off of the above milestones (expected end of this month)

Standardized Additionality

- Projects must:
  - Meet start date criteria
  - Be in an eligible location
  - Exceed any existing regulatory requirements
  - Meet a performance standard
  - Attest to being implemented voluntarily

Performance Standards for Rice Cultivation

- For each rice growing region, would like to assess common practice, adoption rates, trends, for:
  - water management,
  - residue management,
  - seeding
  - other potential project activities (e.g. fertilizer application, cultivars)

- Agricultural practices are often highly variable due to numerous drivers (weather, prices, water availability etc.)
  - More difficult to standardize (e.g. winter flooding in California)
  - May be open to some degree of project-specific additionality assessment

Rice Water Management

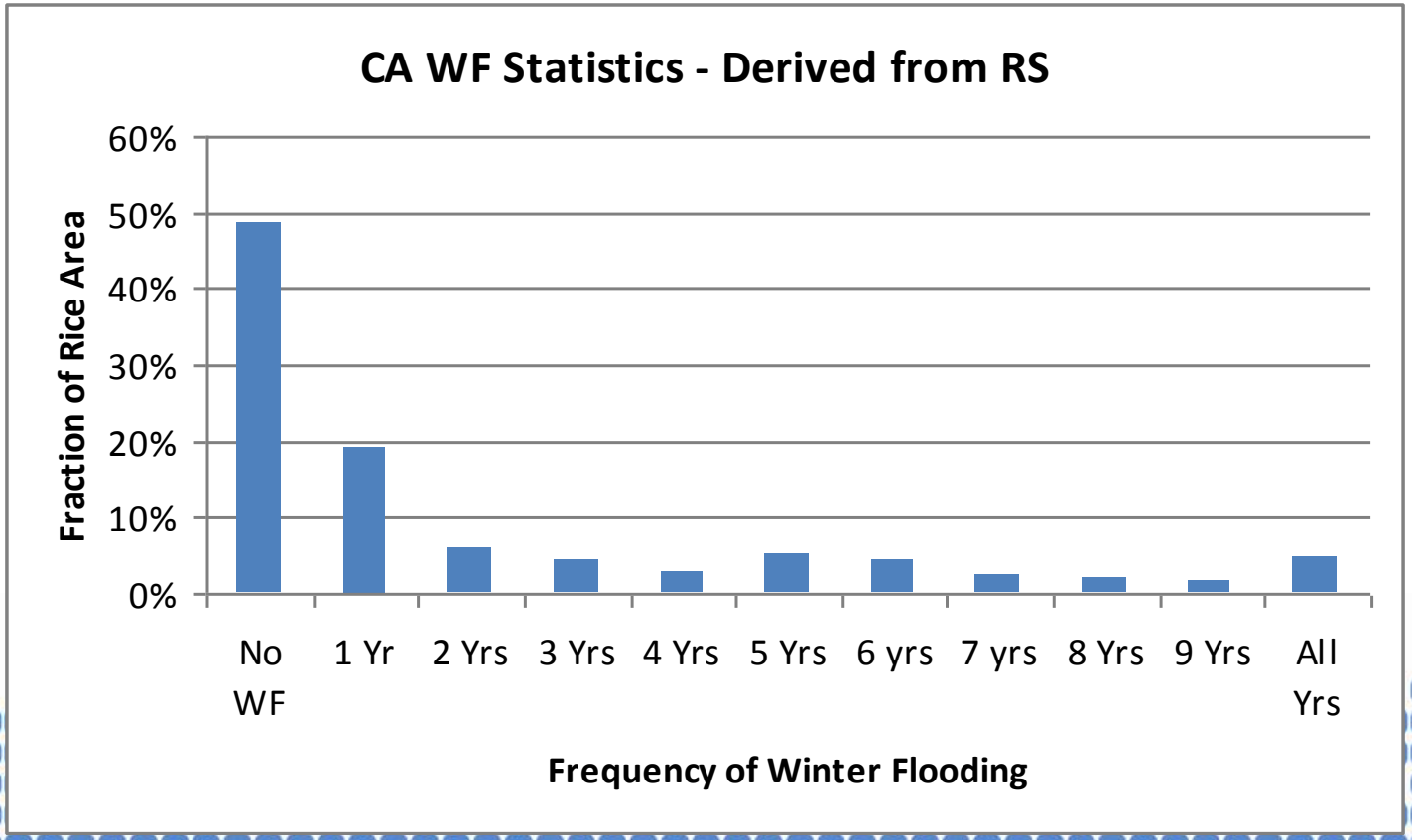
- 3 dominant in season flooding systems:
  - **continuous flood** – from seeding to just before harvest
  - **pinpoint flood** – same as continuous, except short drain (3-5 days) for seeds to "peg"
  - **delayed flood** – dry seeded system with irrigation for germination followed by flooding at 4,5 or 6 leaf stage
- **Winter flooding** – for straw decomposition, waterfowl habitat or crawfish production (LA)
- **GHG Impact**: flood duration impacts CH4 production, draining from saturated soil to aerobic soil can lead to peaks in N2O

CA Water Management

- Overwhelming majority (~97%) of continuous flooding
  - Drain for herbicide application is common in early season, but soils remain saturated.
- Small fraction use delayed flood for drill seeding (estimated to be less than 3%)
- Pinpoint flooding is not used in California
  - Need to verify with Paul and Cass
- Winter flooding: used extensively for straw decomposition and waterfowl habitat.
  - Total fraction varies year to year. Variation due to timing of harvest, availability of water, grower management…
  - Need quantitative survey…see remote sensing analysis…next slides

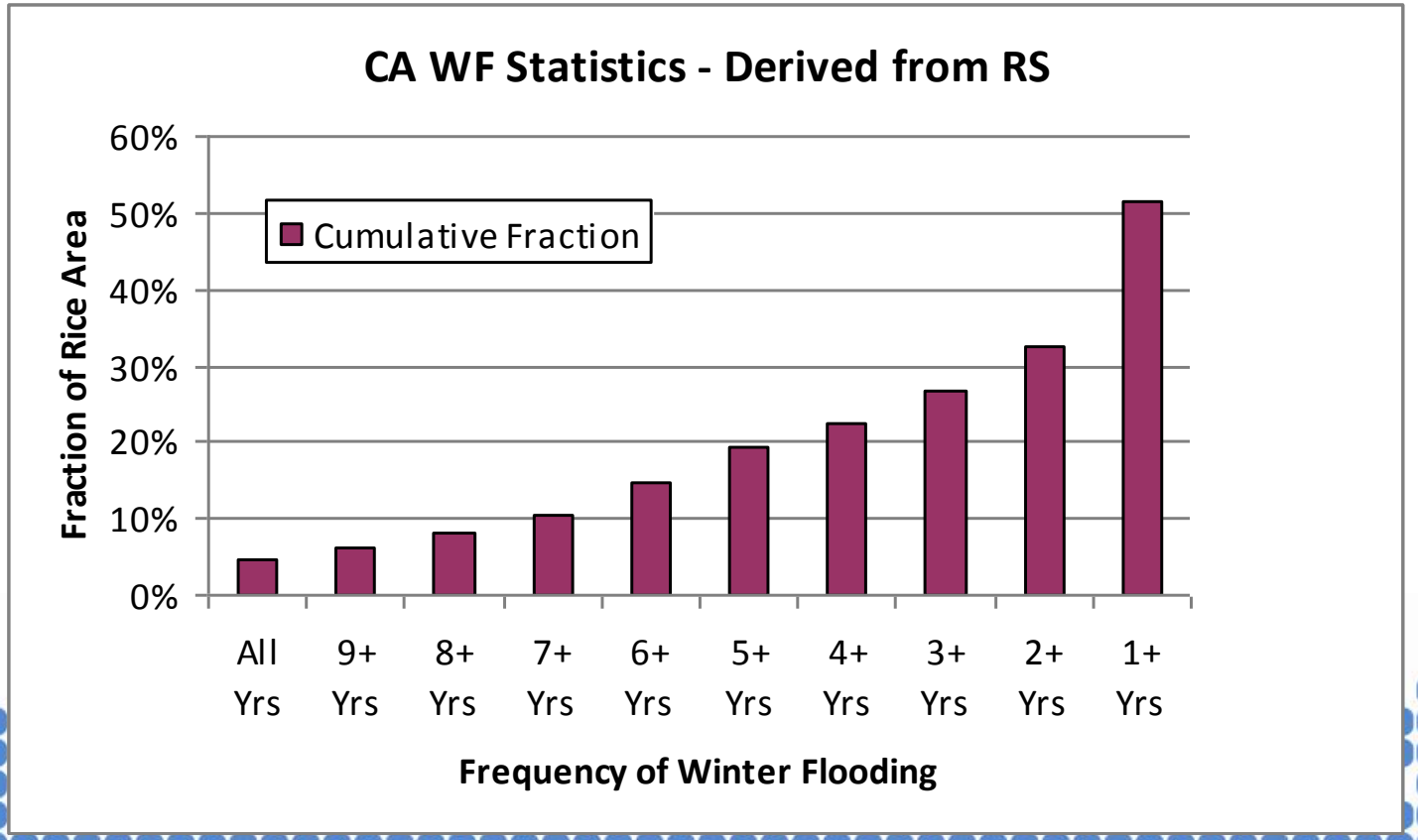
RS of Winter Flooding in CA: 2001 -2010

- 48% of fields had no winter flooding, 5% were flooded every year, large variability in flooding year to year.



RS of Winter Flooding in CA: 2001 -2010

- Cumulative frequencies: 20% of all fields were winter flooded at least 5 times in 2001-2010.



MS Delta and Gulf Coast Water Management

- Overwhelming majority use delayed or pinpoint flooding: quantitative data for Arkansas and Louisiana
- Annual estimates available for Arkansas:
  - 92-98% use delayed flood
  - 20-26% use winter flooding for straw decomposition
- Louisiana: 85-94% use delayed flood

	Management	2003	2004	2005	2006	2007	2008	2009
		Percentages						
	Dominant Flooding							
Arkansas	Delayed Flood	95	94	94	95	96	98	92
Louisiana	Delayed Flood	93	89	92	85	82	89	94
	Winter Flooding							
Arkansas		26	22	20	22	21	23	20
Louisiana		No Annual Data: 125,000 acres crawfish, no annual estimates of waterfowl habitat						

Rice Water Management: Issues and Questions for WG

- What drives farmers decisions to winter flood one year to the next?
- Do farmers rotate flooding across their fields?
  - E.g. always flood a portion of their fields but rotate which fields year to year…
- Are there quantitative data for TX, MO, MS?

Rice Straw Management

- Rice straw represents a significant challenge to rice farmers, primarily a disposal issue
- Options include
  - Burning (statewide regs, e.g. CA)
  - Baling for offsite use
  - Discing into soil (with or without winter flooding)
  - Rolling into soil (with or without winter flooding)
- **GHG Impact**: straw is a significant source of organic C which can lead to higher CH4 production and emissions when flooded.

CA Straw Management

- Due to 1991 Rice Straw Burning Reduction Act, small fraction of straw is burned annually: 10-12%
- Straw baling: 6-8% per year (NB: when straw is baled approximately 75% or so is removed, the rest stays in the field)
- Soil incorporation: 80-84% (do not have breakout of disced versus rolled)

MS Delta and Gulf Coast Straw Management

- Arkansas collects annual estimates of straw use in their surveys with county extension.
- No quantitative estimates for LA, TX, MO and MI
  - LA: virtually non is burned (pers com. LA Ag Center)
- Arkansas: less than 25% is burned, a bit more rolling than discing

Management	2003	2004	2005	2006	2007	2008	2009
	Percentages (%, some round off error)						
Arkansas Straw management							
Burn	22	17	22	24	23	26	15
Incorporation - Tillage	28	26	33	27	30	26	24
Rolling	38	41	28	33	30	40	33

Rice Straw Management: Issues and Questions for WG

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- Are there quantitative data for LA, TX, MO, MS?
- Are there policy regulations that currently do or will impact rice straw management decisions in MS Delta and Gulf Coast regions? New policies in CA?

Rice Crop Rotations

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- Market and economic drivers on decision to plant continuous rice versus rice-soybean rotation
- Crop rotations impact management decisions: e.g. straw management
- **GHG Impacts**: legacies from previous crop can alter GHG emissions in crop rotation. For example, ratoon rice has 2-3 times the CH4 emissions than non-ratoon rice…

Rice Crop Rotations

- Collected some data:
  - CA: mostly continuous rice
  - AR: Rice-soybean rotation dominant (68-80%), rice-rice rotation second (13-28%)
  - Ratoon rice: significant areas in Coastal LA and Texas

	1990	2000	2005	2006	2007	2008	2009
	Acreage of Ratoon Rice						
Louisiana	66,168	77,701	27,620	27,924	53,541	75,111	65,722
Texas	57,143	43,302	21,963	23,675	21,125	36,892	39,903

Rice Crop Rotation:
Issues and Questions for WG

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- How much are decisions of crop rotations influenced by weather (e.g. ratoon rice)?
- How much are decisions on crop rotations driven by market forces (rice prices, ethanol, etc).
- Is it worth compiling better data on crop rotations?
- Ratoon rice: opportunity for large reductions, issues of leakage.

Rice Crop Seedling and Tillage

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- Various approaches for creating rice seedbeds:
  - conventional (tillage after harvest and again in spring),
  - Fall stale seedbed (prepare seedbed in fall, no spring tillage),
  - Spring stale seedbed (prepare seedbed in Spring several weeks before planting) and
  - No-till
- **GHG Impacts**: impacts soil carbon dynamics, potential impact on methane and nitrous oxide as well.

Rice Crop Seeding and Tillage Practices

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- LA and AR: Conventional seedbed: 53-68%; stale seedbed 20-35%, no-till less than 10%.
- CA: very small area with stale seedbed (less than 0.5%)
- Question: Are we seeing trends in seeding and tillage practices? Increase in no-till? Are there operational barriers?
- Question: Should we collect further data?

Discussion

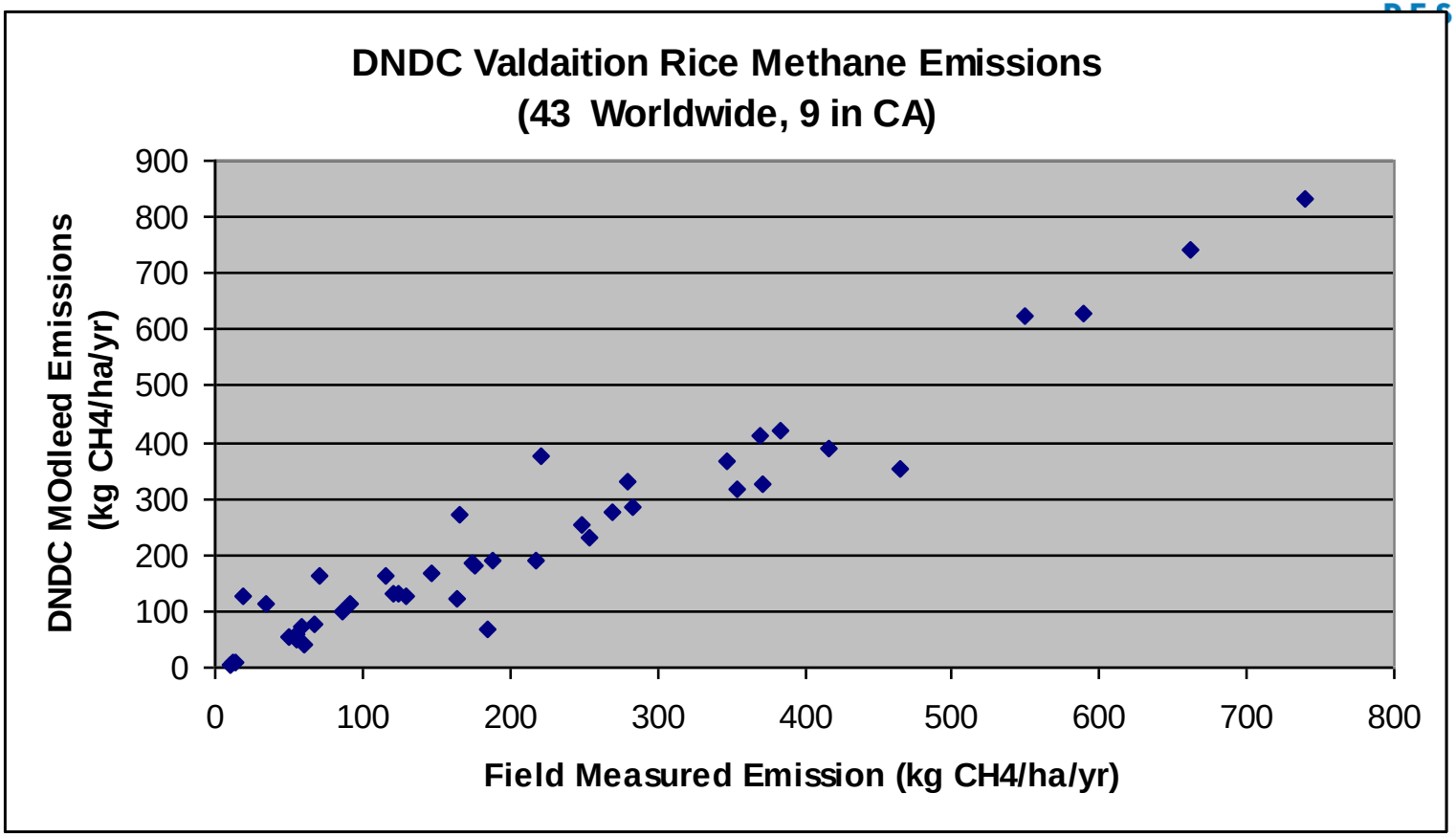
- Geographic scope: Some success finding data outside of CA, however the necessary PS and model validation data is not complete for any region outside of CA.
  - Concentrate on CA, while continuing to make progress in other regions
  - Suggestions for data resources for non-CA regions?

- Potential Project activities in CA:
  - Dry seeding
  - Residue baling
  - Decreasing winter flood frequency
  - Other activities worth including (e.g mid-season drainage)

DNDC Model Uncertainty Analysis

- Uncertainty of model performance comes from two sources:
- (1) **Scientific structure** (processes and parameterization);
- (2) **Input data**.

DNDC Validation: Model Structure Results



The average of the modeled is 218.9 and the average of the observed is 234.3. The median residual is -7. The standard deviation of the residuals is 52.87 and the RMSE is 54.48.

DNDC Validation Results

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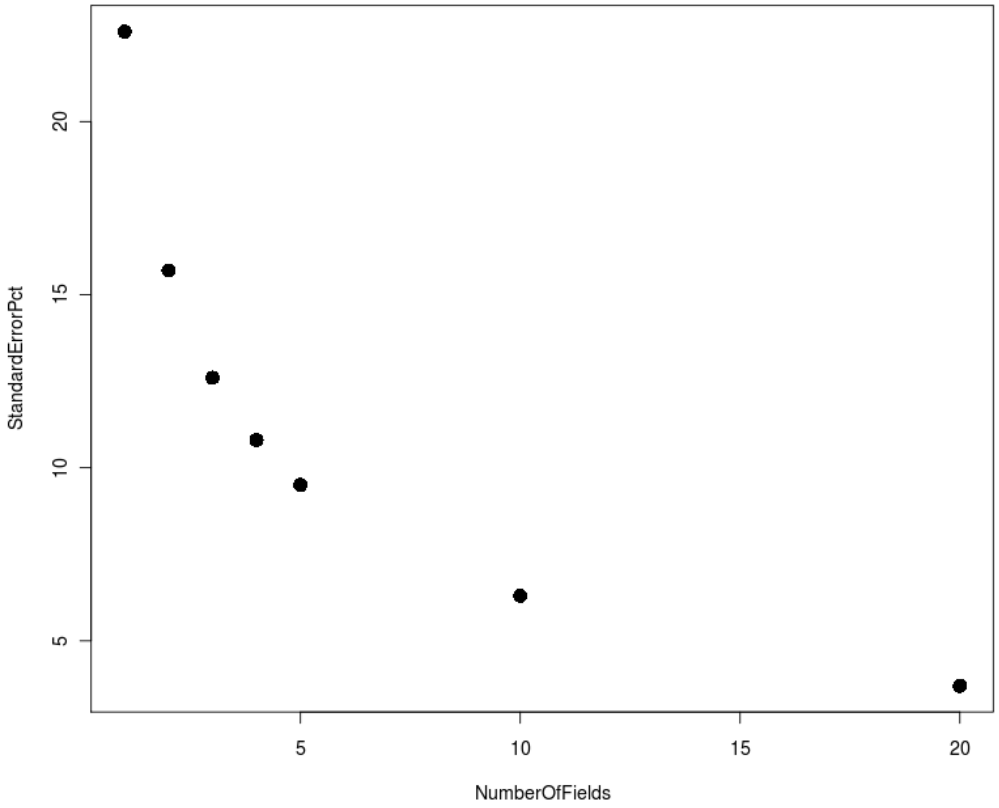
- The California data show similar statistics with an average of the nine points = 186 kg CH4/ha for modeled and192 for field measured.
- The median residual is -1 and the standard deviation of the residuals is 65.0
- A statistical test (Student's t test) on the California data shows there is no evidence that these data are significantly different from the model results for other regions.
- Residuals do not show significant heteroskedasticity. This is in part because there are only four observations above 500 kg CH4/ha/day.

Impact of aggregation of model performance



Number of Fields	Standard Error of Model	Deduction 90% CL	Deduction 95% CL
	Units in kg CH4/ha/year		
1	75	123	147
2	53	87	104
3	43	71	84
4	37	62	73
5	33	55	66
10	24	39	46
20	17	27	33

95% CI Example:

Single field – reduce CH4 emission Offset by 147 kg CH4/ha.

10 Fields: reduce CH4 emission offset by 46 kg CH4/ha.

Project Aggregation - Overview

- Protocol needs to have guidance for aggregation
  - Who can serve as the aggregator
  - How do the ‘projects’ enter, or leave aggregates
  - What are requirements for setting baselines, performing calculations, verification and site visits
  - Registration and Credit Issuance
    - Do projects need Reserve accounts, or just aggregator
    - CRTs issued to aggregator, or to each project separately

Project Aggregation - Forests

- Forest Protocol has aggregation guidelines:
  - All forest 'projects' have to be submitted separately and have separate accounts on Reserve
  - Projects under certain size can join aggregates
  - Projects Must Undergo Onsite Verification Prior To Joining An Aggregate
  - Aggregator: May Be Any Individual, Municipality, Or Validly Incorporated Business Entity
    - Must Act As Agents In Conducting CRT Transactions
    - Not Official Agents; Forest Owners Still Ultimately Responsible For Complying With FPP
  - Verifiers annually audit a 'sample' of reports
  - Successful verification results with CRT issuance to all projects in aggregate

Project Aggregation - Options

- Forest Rules form good starting point, may be simplified for non-sequestration projects
- Open to WG suggestions
- May be helpful for WG to review forest aggregation guidelines for starting point

Wildlife Habitats

- Flooded rice fields provide much-needed habitat for wildlife in all three rice growing regions of the US
  - waterfowl (e.g. ducks), migratory birds, shorebirds, wading birds, mammals, amphibians, and reptiles
- Ricelands are considered a leading example of integrating agricultural and natural resource management
  - USDA 'Legacy of Conservation' Award to USA Rice
- Due to the Reserve's "Do No Environmental Harm" Policy, project impacts on ricelands as wildlife habitat must be considered.

Wildlife Habitats

- Flooded riceland habitats serve as:
  - Primarily, foraging and resting grounds during fall and winter (i.e. coinciding with bird migration)
  - Also, breeding grounds for certain species during the growing season (e.g. mallards)
- Residual rice, weed seeds, and invertebrates provide an excellent food source, particularly for avian species

Wildlife Habitat - Regions

- In California, rice lands are used by 230 species of wildlife, including:
  - 187 species of birds, 27 of mammals, 16 of reptiles and amphibians
  - ~7 million waterfowl (~10% of North American waterfowl)
  - Several hundred thousand shorebirds and wading birds
  - At least one endangered species (e.g. Giant Garter Snakes)
  - California is located in the Pacific Flyway
- Significantly less data is available for MAV and Gulf Coast regions, though both regions also intersect with migratory bird flyways (Mississippi and Central Flyways, respectively)

Wildlife Habitats: Behaviors

- Studies indicate the highest species richness and conservation value at depths of 10-15cm, but note that a variety of depth is necessary to support habitats of the wide range of species
  - Wide range of species preferring different flood-water depths and management practices

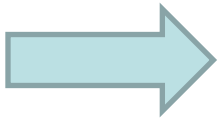
- Typically, waterbirds exhibit “flocking” behavior
  - Rotating winter flooding across fields might not have detrimental impact for waterbirds

Wildlife Habitat Loss – Mitigation Options

- Limits on how much winter flooding can be reduced (by area and time) compared to the project's baseline
  - Do we need similar measures for mid-season drainage (if we include this activity)
- Suggestions of other measures to consider?
  - Providing natural habitat on 'edges' of fields
- Last resort: Exclude winter flooding as a creditable project activity

Next Steps

- Continue to develop performance standard options
- Targeted research on wildlife habitat issues
- Development of Aggregation Guidelines
- Develop DNDC calculation guidelines GHG Assessment Boundary, Monitoring requirements



- First draft of Rice Cultivation Project Protocol (RCPP) to WG by June 1
- In-person meeting to discuss draft on June 6
- WG Written Comments on draft due June 28

Thank You

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