# MISSOURI RIVER FLOOD OF 2011

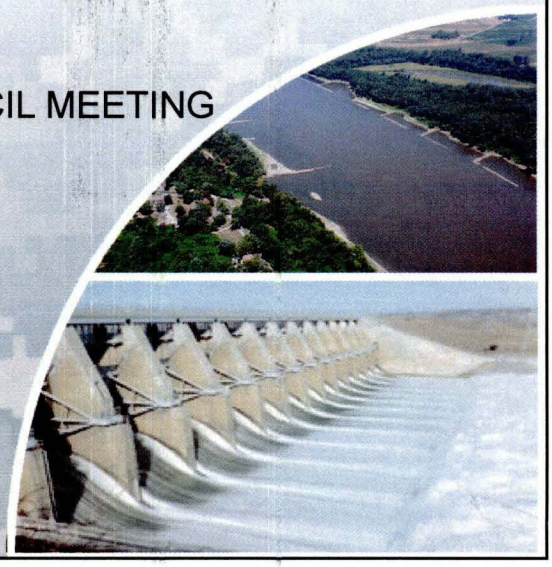
NORTH DAKOTA
LEGISLATIVE COUNCIL MEETING

October 10, 2011

Ted Streckfuss
Deputy District Engineer

Omaha District
Corps of Engineers

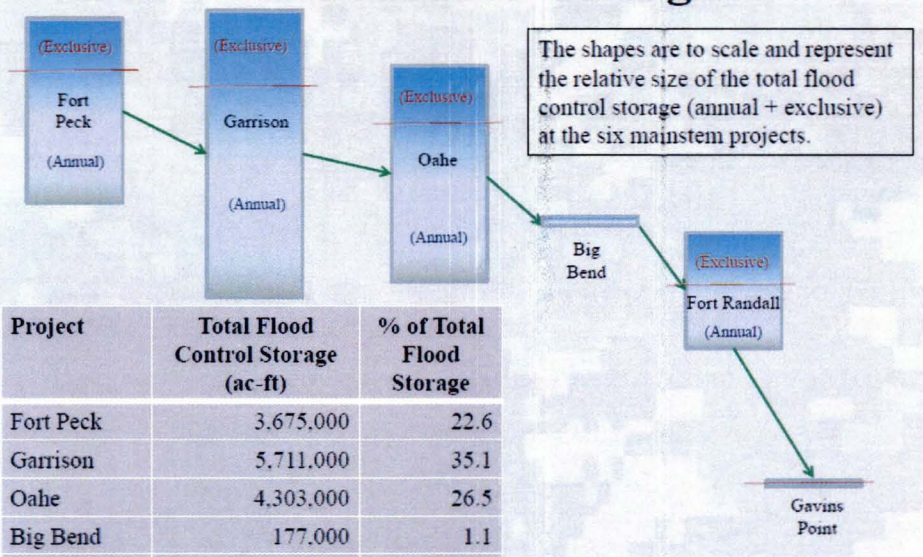
US Army Corps of Engineers
BUILDING STRONG®



# Missouri River System

BUILDING STRONG®

# Flood Control Storage

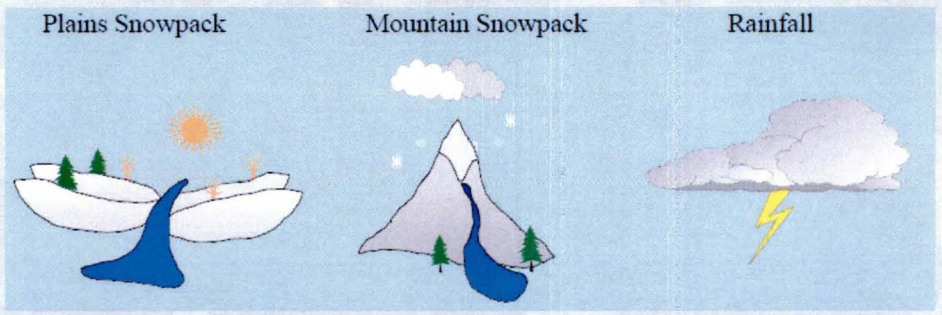



The shapes are to scale and represent the relative size of the total flood control storage (annual + exclusive) at the six mainstem projects.

| Project | Total Flood Control Storage (ac-ft) | % of Total Flood Storage |
|---|---|---|
| Fort Peck | 3,675,000 | 22.6 |
| Garrison | 5,711,000 | 35.1 |
| Oahe | 4,303,000 | 26.5 |
| Big Bend | 177,000 | 1.1 |
| Fort Randall | 2,294,000 | 14.1 |
| Gavins Point | 108,000 | 0.7 |

3

# Runoff Components




| March and April | May, June and July | March through October |
|---|---|---|

2011 Forecast* = 60.4 MAF

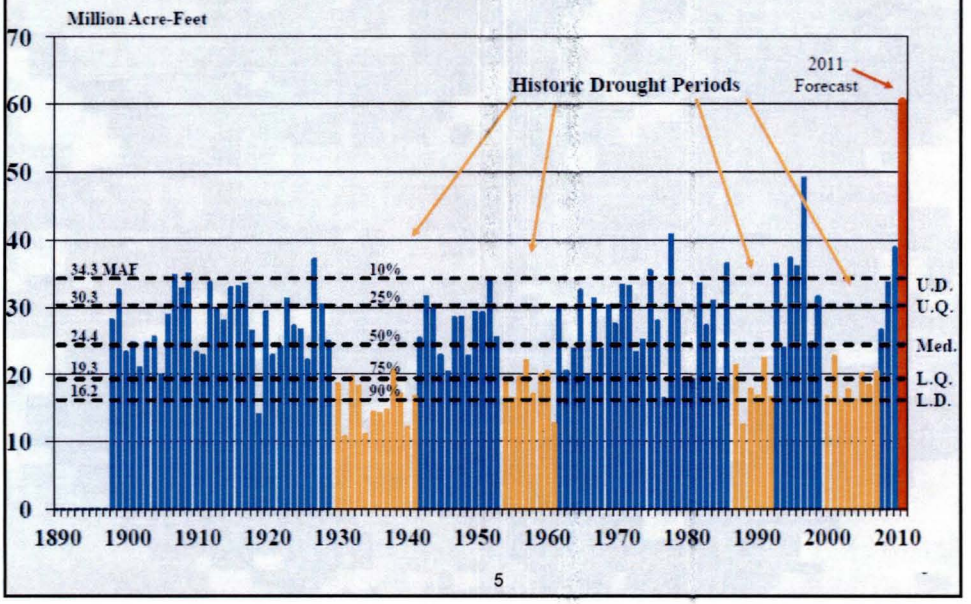
Highest runoff since 1898

Previous Record was 49.0 MAF in 1997

*October 1 Forecast

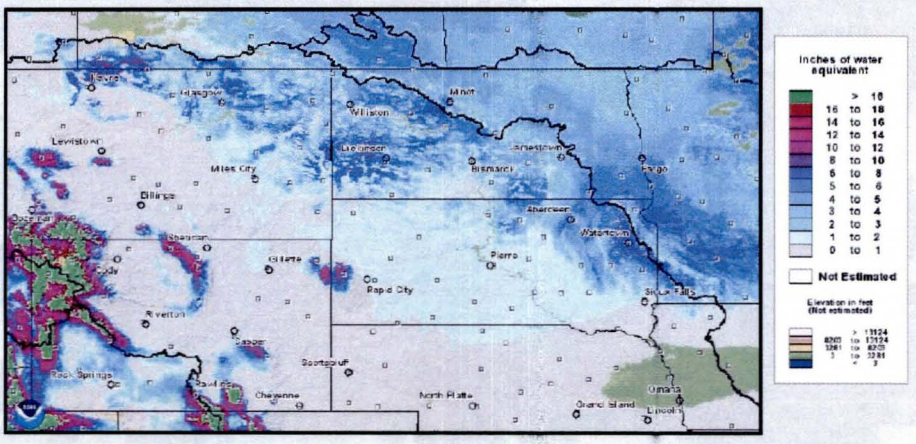
4

# Missouri River Mainstem System
## Annual Runoff above Sioux City, IA




5

# Plains Snowpack
## 25 February 2011

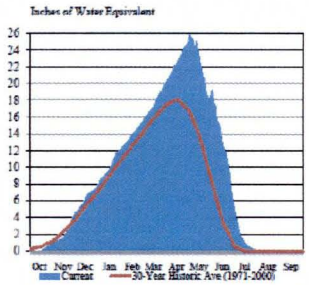



BUILDING STRONG®

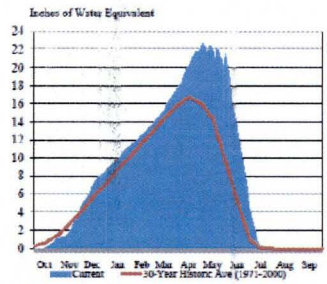
6

**Missouri River Basin**
**Mountain Snowpack Water Content**
**2010-2011**

**Total above Fort Peck**




**Total Fort Peck to Garrison**




The Missouri River Basin mountain snowpack normally peaks near April 15. The mountain snowpack in both the "Total above Fort Peck" and the "Total Fort Peck to Garrison" reaches peaked on May 2 at 141 percent and 136 percent of the normal April 15 peak, respectively. As of August 1, the mountain snowpack has melted in both reaches.

August 1, 2011

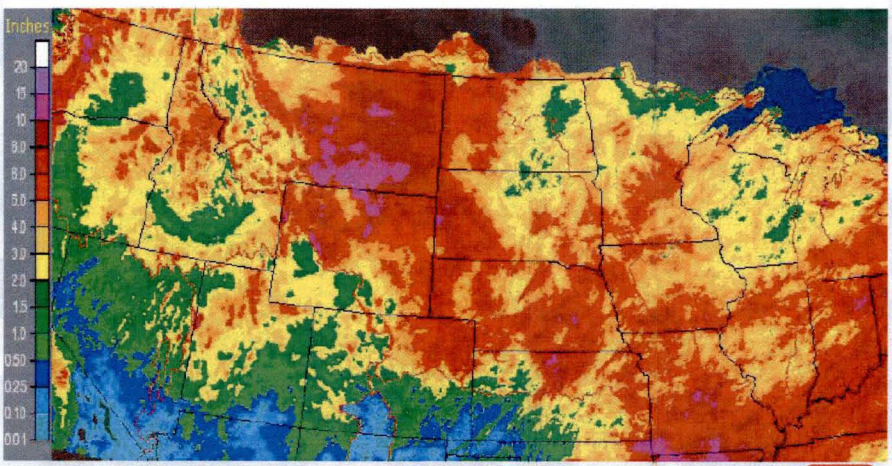
Provisional data. Subject to revision.

BUILDING STRONG®

7

# May 2011 Precipitation

Missouri Basin RFC Pleasant Hill, MO: May, 2011 Monthly Observed Precipitation
Valid at 6/1/2011 1200 UTC- Created 6/2/11 17:40 UTC




BUILDING STRONG®

8

# Missouri River Mainstem Reservoir May 2011 Runoff

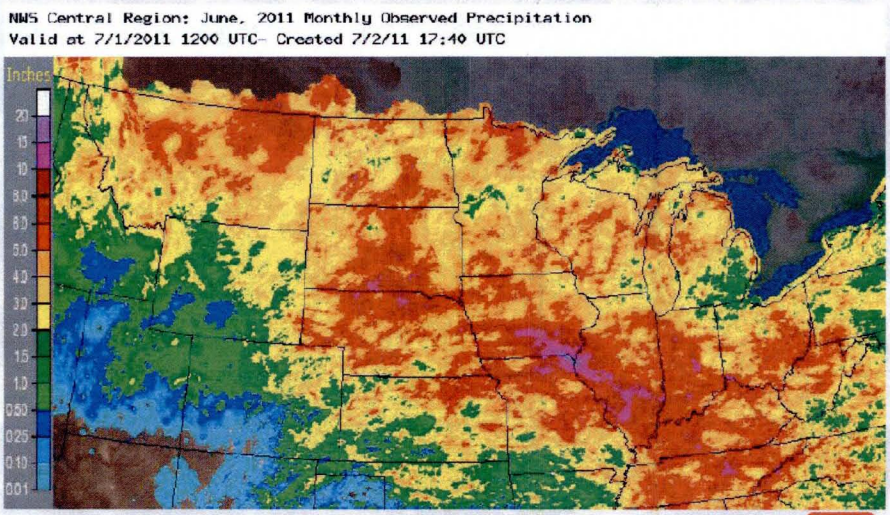
Total runoff above Sioux City = 10.5 MAF
Wettest May on record
Second (now third) highest single month on record

| | 2011 | Previous May Record |
|---|---|---|
| Fort Peck | 2.9 MAF | 2.6 MAF(1975) |
| Garrison | 4.4 MAF | 2.8 MAF(1978) |
| Fort Peck and Garrison | 7.3 MAF | 6.7 MAF(1952) |
| Total Above Sioux City | 10.5 MAF | 7.2 MAF(1995) |

BUILDING STRONG®

9

# June 2011 Precipitation




BUILDING STRONG®

10

# Missouri River Mainstem Reservoir June 2011 Runoff

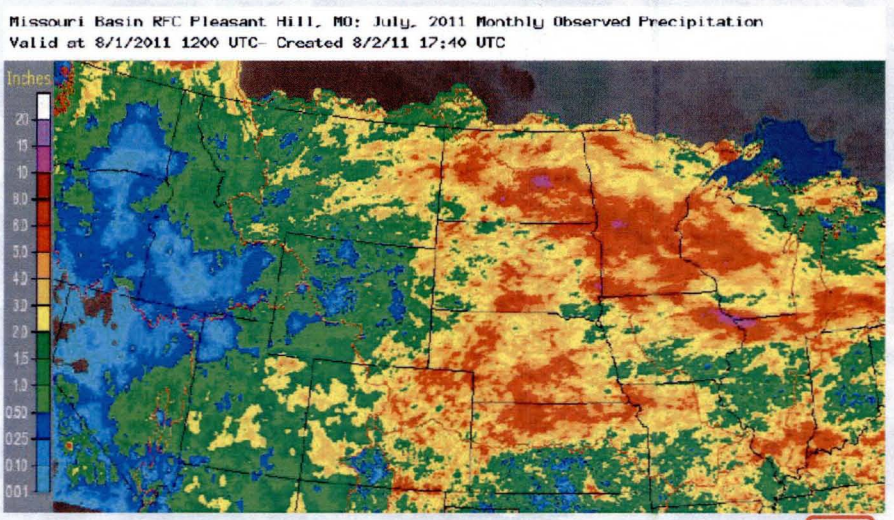
Total runoff above Sioux City = 13.8 MAF
Wettest June on record
Highest single month on record
Previous record was 13.2 MAF in April 1952

| | 2011 | Previous June Record |
|---|---|---|
| Garrison | 6.2 MAF | 5.1 MAF(1909) |
| Fort Randall | 0.9 MAF | 0.7 MAF(1962) |
| Total Above Sioux City | 13.8 MAF | 10.3 MAF(1909) |

BUILDING STRONG®

11

# July 2011 Precipitation




BUILDING STRONG®

12

# Missouri River Mainstem Reservoir
# July 2011 Runoff

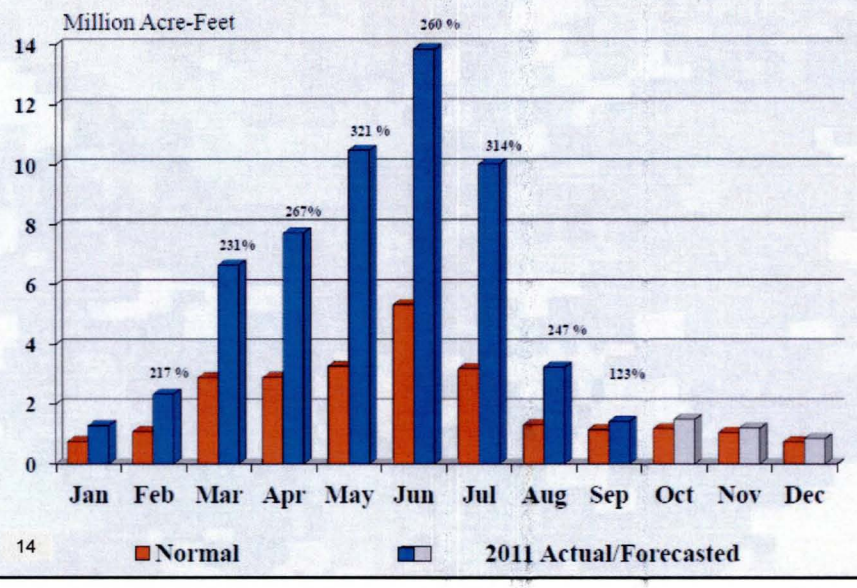
Total runoff above Sioux City = 10.0 MAF
Wettest July on record
Fifth highest single month on record

| | 2011 | Previous July Record |
|---|---|---|
| Garrison | 5.6 MAF | 4.1 MAF(1907) |
| Total above Sioux City | 10.0 MAF | 8.2 MAF (1993) |

BUILDING STRONG®

13

# Missouri River Runoff above Sioux City
# 2011 Actual/Forecasted versus Normal




14

# 2011 Mainstem System Regulation
## (What We Forecast)

- Full flood control capacity of the mainstem reservoir system was available at the start of the 2011 runoff season
  - 2010 was 3rd highest runoff year on record
  - All flood water was evacuated prior to start of runoff
- Until rain events in May, there was no need to evacuate water at historic levels
  - April 1 runoff forecast = 33.8 MAF; Gavins Point peak releases = 39 to 45 kcfs
  - May 1 runoff forecast = 44.0 MAF; Gavins Point peak releases = 57.5 kcfs
  - June 1 runoff forecast = 54.6 MAF; Gavins Point peak releases = 150 kcfs



# 2011 Mainstem System Regulation
## (What Actually Happened)

- Unprecedented runoff occurred in the Missouri River Basin above Sioux City, Iowa during May, June and July
  - June was the single wettest month on record with 13.8 MAF of runoff, surpassing the old record of 13.2 MAF set in April 1952.
  - May was the third wettest single month on record, with 10.5 MAF of runoff shattering the previous May record of 7.2 MAF set in May 1995
  - July was the fifth wettest single month on record with 10.0 MAF
  - Combined May through July runoff of 34.3 MAF is higher than the total annual runoff in 102 of 113 years in the period of record

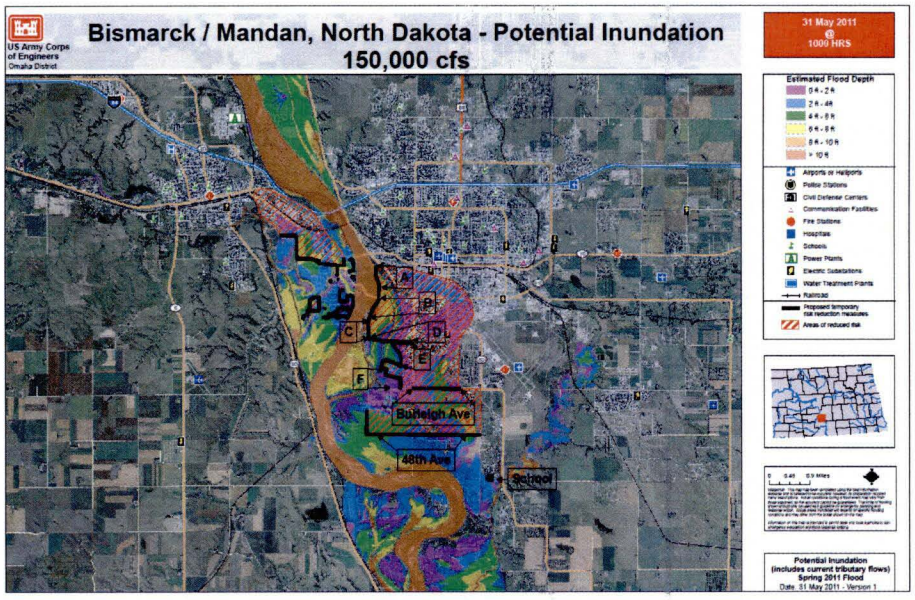
# Emergency Operations
# North Dakota



## North Dakota – Bismarck/Mandan

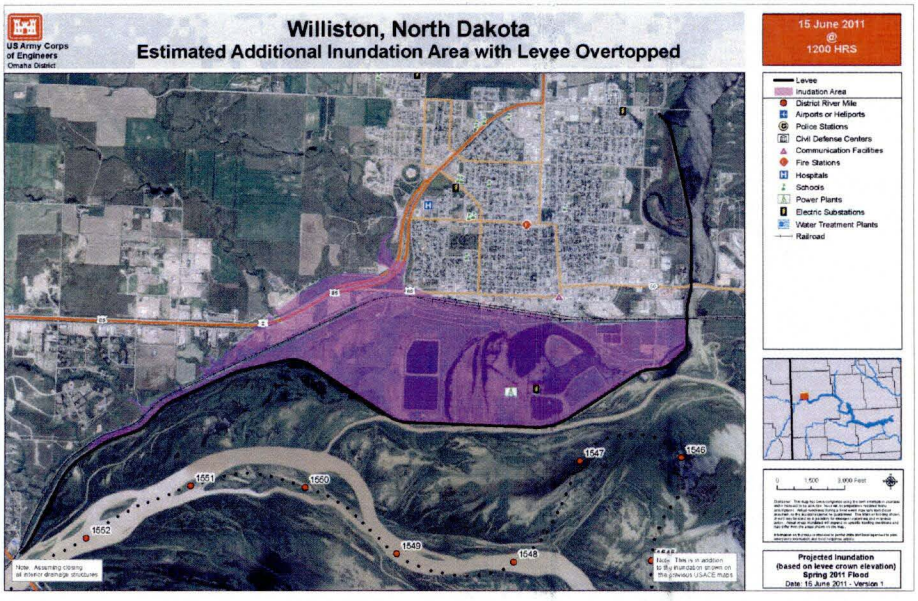
- Bismarck
  - 7.5 miles of clay, trapbag and Hesco levees
  - 2-8 feet average levee height
  - $4.2 Million
  - Construction completed 6 Jun 2011
  - Segment A,B,C,D,E and Prairie Rose Elementary School
- Mandan
  - 6 miles of clay and Hesco levees
  - 2-5 feet average levee height
  - $2.1 million
  - Construction complete on 6 June 2011

# North Dakota – Bismarck/Mandan




19

# North Dakota – Williston




20

# North Dakota – Williston

- Williston Levee
  - Substructure for risk reduction at the City of Williston
  - Previous record at Williston was a stage of 28.0 feet in 1912
  - Crested above record stage at 30.53 feet
  - Multiple sand boils developed along the landside of the levee
  - Omaha District Drill Crew installed two new relief wells
  - 3 contracts awarded
    - 29 May - $181,583 for a seepage berm to mitigate risk against boils
    - 11 June - $185,485 for access road improvements
    - 29 June - $16,170 for boil access

BUILDING STRONG®

21

# North Dakota – Fort Yates (SRST)

- Standing Rock Sioux Tribe – Fort Yates
  - Erosion threatened Sitting Bull site and City water intake
  - Erosion threatened causeway leading into the City
  - 2 contracts awarded
    - $150,000 for riprap protection at Sitting Bull site and water intake – complete 5 June
    - $600,000 for riprap protection along 0.75 miles of causeway on both north and south sides – complete 2 July

BUILDING STRONG®

22

# North Dakota – Technical Assistance

- Flood Fight Supplies Deployed
  - 1.9 million sandbags
  - 10,800 LF of Hescos
  - 485 Rolls of poly
  - 5 pumps
- Technical Assistance
  - Knife River – Hazen, Beulah, Zap
  - James River – Jamestown

BUILDING STRONG®

23

# Post Flood Recovery

- Reservoirs
  - Evacuate flood storage as fast as possible
  - Assess dam and reservoir infrastructure for damages
  - Repair damages in preparation for 2012 runoff season (subject to availability of funds)
  - Develop Annual Operating Plan (incl. public and agency input)
- Levees and Other Flood Infrastructure
  - Assess damages as soon as floodwaters recede
  - Work with levee sponsors to develop repair plan
  - Reconstruct and repair damages prior to 2012 runoff season (subject to availability of funds)

BUILDING STRONG®

24

# Post Flood Recovery

- Post Flood Evaluation
  - Flood Fight Review/After Action Report – Post flood documentation of the flood event and Corps of Engineers flood fight activities
  - Water Management Review/Reservoir Operations Independent Review – Independent scientific review of the flood event and reservoir operations decision-making
  - Infrastructure Damage Assessment – Compilation of damages to Corps of Engineers flood risk management structures
  - Basin Impact Assessment – Compilation of all Economic, Social and Environmental impact of the flood
  - Comprehensive Restoration Plan – Post flood comprehensive strategy of conceptual changes and potential results (increased flood storage, higher levees, set-back levees, reduced river stages, etc.)



# Comments / Questions?