WILLAMETTE BASIN PROJECT
CONSERVATION RELEASE SEASON OPERATING PLAN
WATER YEAR 2011

1. General

Operational planning for the conservation release season begins with the January forecast and continues through October. The conservation release season plan identifies flow and storage needs for each tributary and reservoir in the Willamette Basin, based on the anticipated total system storage in mid-May, from the April forecast. The plan is fine-tuned in early June after spring refill. For more information on the conservation plan development process, please refer to the National Marine Fisheries Service (NMFS) 2008 Biological Opinion, Appendix B, Section 5.

a. Hydrologic Conditions. The March forecast indicated that 2011 would be an adequate year as defined by having a system-wide conservation storage volume between 1.2 and 1.48 million acre-feet (MAF) by mid-May. The April forecast indicated that 2011 would be an abundant year as defined by having a system-wide conservation storage volume greater than or equal to 1.48 MAF by mid-May. Classification of runoff volumes are defined by the 2008 Biological Opinion in Appendix B, Section 5, Conservation Plan Development. The observed May 10 storage was 1,477,000 acre-feet and snow pack was 182% of average with some snow water equivalent measured at elevation 2600 feet.

b. The operating plan described herein is based on the joint Natural Resource Conservation Service (NRCS)/National Weather Service (NWS) April 2011 forecast for 50% probability of exceedance at Salem. Since the plan requires setting operational flow targets at Salem beginning on April 1, the April forecast is the best indicator of operational consequences for stored water throughout the release season. As the season progresses, operational adjustments are made by coordinating with the Willamette Action Team for Ecosystem Restoration (WATER) flow management committee.

c. Coordination. In addition to the normal operation of the Willamette Project for flood control, hydropower, in-stream water rights, irrigation, and summer flow augmentation, the Project will be operated to maintain spring mainstem flows based on the Oregon Department of Fish and Wildlife (ODFW) minimum flow objectives for juvenile winter steelhead, as requested and submitted to the Corps of Engineers (Corps) by the NMFS in the 2008 Biological Opinion. The Corps continues to carry out ongoing coordination with NMFS and the U.S. Fish and Wildlife Service (USFWS) regarding continued operation of the Willamette Project under Section 7 of the Endangered Species Act (ESA).

d. In the past few years, the Corps has adopted mainstem Willamette River flow targets at Salem from April through June based on recommendations from NMFS and ODFW (through the Oregon Water Resources Department). The recommendations are based on correlations between flow and water temperature during the juvenile steelhead out-migration and subsequent adult returns. Upper Willamette River (UWR) winter steelhead is listed as threatened under the ESA. These flows are also expected to benefit threatened UWR Chinook salmon that migrate as juveniles past Willamette Falls from February to May and from September to early December.

2. Conservation Release Season Objective

a. For 2011, the Corps will provide a minimum weekly average flow of 17,800 cubic feet per second (cfs) for the Willamette River at Salem for the April 1 through 30 time period as published in the Corps 2008 Supplemental Biological Assessment, described in Table 1, and supported by NMFS in their 2008 Biological Opinion.

b. The "threshold flows" at Salem described in Table 1 are minimum flows the Corps intends to provide. The overall operating objective is to operate with a 7-day running average flow that meets or exceeds these thresholds. The Corps will operate the system of reservoirs based on best available model forecasts which are subject to forecast accuracy, unexpected real-time contingencies, and system flow travel times. The threshold flows at Albany described in Table 1 are instantaneous minimum flows, below which the observed flow should not drop.

c. Assuming that projects are augmenting natural flows to maintain Salem at the flow threshold, the 7-day transition period between mainstem Salem flow thresholds is identified in Table 2. The transition between flow thresholds will be influenced by many factors, but should generally be gradual.

Table 1. Minimum Mainstem Threshold Flows in 2011 for Operational Purposes

Period	ALBANY	SALEM	SALEM
	Minimum Instantaneous Flow (cfs)	Minimum Weekly Flow Threshold (cfs)	Minimum Instantaneous Flow (cfs)
April	Not defined	17,800	14,300
May	Not defined	15,000	12,000
1-15 June	4,500	13,000	10,500
16-30 June	4,500	8,700	7,000
July	4,500	6,000	Not defined
1-15 August	5,000	6,000	Not defined
16-31 August	5,000	6,500	Not defined
September	5,000	7,000	Not defined
October	5,000	7,000	Not defined

Table 2. Transition Periods for Reducing Minimum Mainstem Flow Thresholds, April-July 2011

Transition Period	Transition Flow at Salem (cfs)
27 April – 3 May	17,800 – 15,000
28 May – 3 June	15,000 – 13,000
12 June – 18 June	13,000 – 8,700
27 June – 3 July	8,700 – 6,000

3. Management Approach

a. The Corps will continue to coordinate with the Federal and State agencies via telephone conference and webinar, as appropriate. The purpose of these meetings is to continue to assess the hydrologic situation as it develops, and if necessary, make occasional changes to the planned releases. The weekly interagency coordination meetings may be preceded by internal conference calls among Corps employees.

b. Close monitoring of the volume of conservation storage remaining above Salem and Albany through the conservation season, as typically done in previous years, and adjustment of planned releases should ensure that the Corps is able to meet the various flow requirements as outlined below.

4. Assumptions

Several assumptions were necessary to formulate the proposed flow requirements and lake elevations in this plan, as described below.

a. Natural flows in the Willamette River Basin for the April through September period are forecast to range from 105% to 120% of average, based on the joint NRCS/NWS April forecast for 50% probability of exceedance, estimated at Salem. The May-September NRCS/NWS forecast released on May 6, 2011 for 50% probability of exceedance at Salem is 115% of average.

b. The individual project minimum outflows that are considered essential to the success of this year's operation are given by month in Table 3. These minimum releases meet, and often exceed, the congressionally authorized project minimum outflows. The table reflects increased minimum releases to ensure adequate spawning and incubation conditions for winter steelhead and spring Chinook salmon. The maximum flows may be exceeded during regulation of high inflow events. Model results indicate that drafting the reservoirs in accordance with their respective flood control rule curves will make the maximum flows unlikely. Early drawdown will make the fall maximum flows more achievable.

c. To minimize dewatering and potential loss of juvenile salmonids, project outflows that are near the minimum authorized flow should be reduced using the lowest practical ramp rate. Stranding will also be minimized if the time increment between each flow change is greater than 1-hour. Ramp rates from the water control manuals for Cottage Grove, Dorena, and Fern Ridge will be used as there is no documentation of spawning of spring Chinook salmon in the reaches below those dams. Table 4 also provides the lowest practical ramp rates for Hills Creek, Dexter, Fall Creek, Cougar, Blue River, Foster, and Big Cliff based on equipment capability. Ramp-up rates listed in Table 4 are based on the applicable water control manual, as they were not defined in the 2008 Biological Opinion.

Table 3. Minimum and Maximum Flow Objectives below Willamette Basin Dams

Dam	Period	Primary Use	Minimum Flow (cfs)[1]	Maximum Flow (cfs)[2]
Hills Creek	Sep 1 - Jan 31	migration & rearing	400	
	Feb 1 - Aug 31	rearing	400	
Fall Creek	Sep 1 - Oct 15	Chinook spawning	200	400 through Sep 30, when possible
	Oct 16 - Jan 31	Chinook incubation	50 [3]	
	Feb 1 – Mar 31	rearing	50	
	Apr 1 - May 31	rearing	80	
	Jun 1 - Jun 30	Rearing/adult migration	80	
	Jul 1 - Aug 31	rearing	80	
Dexter	Sep 1 - Oct 15	Chinook spawning	1,200	2,400 through Sep 30, when possible
	Oct 16 - Jan 31	Chinook incubation	1,200 [3]	
	Feb 1 - June 30	rearing	1,200	
	Jul 1 - Aug 31	rearing	1,200	
Big Cliff[4]	Sep 1 - Oct 15	Chinook spawning	1,500	3,000 through Sep 30, when possible
	Oct 16 - Jan 31	Chinook incubation	1,200 [3]	
	Feb 1 - Mar 15	Rearing/adult migration	1,000	
	Mar 16 - May 31	Steelhead spawning	1,500	3,000 when possible
	Jun 1 – Jul 15 (possibly through July 30)	Steelhead incubation	1,200 [3]	
	Jul 16 - Aug 31	rearing	1,000	
Foster	Sep 1 - Oct 15	Chinook spawning	1,500	3,000 through Sep 30, when possible
	Oct 16 - Jan 31	Chinook incubation	1,100 [3]	
	Feb 1 - Mar 15	rearing	800	
	Mar 16 - May 15	Steelhead spawning	1,500	3,000 when possible
	May 16 - Jun 30 (possibly through July 15 to 30)	Steelhead incubation	1,100 [3]	
	Jul 1 - Aug 31	rearing	800	

Dam	Period	Primary Use	Minimum Flow (cfs)[1]	Maximum Flow (cfs)[2]
Blue River	Sep 1 - Oct 31	Chinook spawning	50	70 through Sep 30, when possible
	Nov 1 - Jan 31	Chinook incubation	50	
	Feb 1 - Aug 31	rearing	50	
Cougar	Sep 1 - Oct 31	Chinook spawning	400	580 through Sep 30, when possible
	Nov 1 - Jan 31	Chinook incubation	400	
	Feb 1 - May 31	rearing	400	
	Jun 1 - Jun 30	rearing/adult migration	400	
	Jul 1 - Jul 31	rearing	400	
	Aug 1 - Aug 31	rearing	400	
Cottage Grove	Feb 1 – Jun 30 Jul 1 – Jan 31	minimum in-stream flow	75 50	
Dorena	Feb 1 – Jun 30 Jul 1 – Jan 31	minimum in-stream flow	190 100	
Fern Ridge	Feb 1 – Jun 30 Jul 1 – Jan 31	minimum irrigation flow	50 at Monroe 30 at Monroe	

[1] When a reservoir is at or below minimum conservation pool elevation, the minimum outflow will equal inflow or the congressionally authorized minimum flows, whichever is higher.

[2] Maximum flows are intended to minimize the potential for spawning to occur in stream areas that might subsequently be dewatered at the specified minimum flow during incubation.

[3] The Corps will attempt to avoid prolonged releases in excess of the recommended maximum spawning season discharge to avoid spawning in areas that would require high incubation flows that would be difficult to achieve and maintain throughout the incubation period. When maximum flow objectives are exceeded for a period of 72 hours or longer, the WATER Flow Management Committee will review available monitoring information (e.g., regarding redd deposition in relation to flow rates), projected runoff, and reservoir storage, and will formulate a recommendation for an appropriate and sustainable incubation flow rate prior to the initiation of the subsequent incubation period.

[4]Big Cliff Outflow will be augmented with 73 cfs over minimum flow from April 1 through September in accordance with RPA 3.4 “Annual Availability of Contract Water for Irrigation.”

Table 4. General Flow Guidelines for Ramping Flows

	Increase	**Decrease**		
Dam	**Increase per hour**	**Night-time Decrease per hour**	**Day-time Decrease per hour**	**Daily Decrease (max decrease in 24-hour period)**
Hills Creek	200 cfs	From 400 to 1700 cfs, 100 cfs/hour. Outflow above 1700 cfs is reduced 0.1 ft/hour at HCRO	0.2 ft/hour at HCRO	lesser of 1 ft/24 hrs at HCRO or 50% flow volume
Dexter	0.2 ft/hour and 0.5 ft/day at DEXO	0.1 ft/hour at DEXO	0.2 ft/hour at DEXO	0.5 ft/24 hrs at DEXO
Fall Creek	200 cfs	From 50 to 500 cfs, 50 cfs/hour. Outflow above 500 cfs is reduced 0.1 ft/hour at FALO	From 50 to 300 cfs, 50 cfs/hour. Outflow above 300 cfs is reduced 0.2 ft/hour at FALO	lesser of 1 ft/24 hrs at FALO or 50% flow volume
Cottage Grove	100 cfs per hour 300 cfs max per day	100 cfs per hour	100 cfs per hour	lesser of 1 ft/24 hrs at COTO or 50% flow volume
Dorena	200 cfs per hour 500 cfs max per day	200 cfs per hour 500 cfs max per day	200 cfs per hour 500 cfs max per day	lesser of 1 ft/24 hrs at DORO or 50% flow volume
Fern Ridge	200 cfs	200 cfs per hour	200 cfs per hour	lesser of 1 ft/24 hrs at FRNO or 50% flow volume
Cougar	200 cfs	From 300 to 2400 cfs, 150 cfs/hour. Outflow above 2400 cfs is reduced 0.1 ft/hour at CGRO	0.2 ft/hour at CGRO	lesser of 1 ft/24 hrs at CGRO or 50% flow volume
Blue River	50 - 100cfs: 50 cfs 100-500cfs: 100 cfs 500-1000cfs: 200 cfs 1000-2000cfs: 400 cfs 2000-3700cfs: 600 cfs	From 50 to 2300 cfs, 100 cfs/hour. Outflow above 2300 cfs is reduced 0.1 ft/hour at BLUO	From 50 to 500 cfs, 100 cfs/hour. Outflow above 500 cfs is reduced 0.2 ft/hour at BLUO	lesser of 1 ft/24 hrs at BLUO or 50% flow volume
Foster	300 cfs	0.1 ft/hour at SSFO	0.2 ft/hour at SSFO	lesser of 1 ft/24 hrs at SSFO or 50% flow volume
Big Cliff	0.3 ft / hour and 0.5 ft/day at BCLO	0.1 ft/hour at BCLO	0.2 ft/hour at BCLO	0.5 ft/24 hrs at BCLO

NOTES:
1. Four letter codes [e.g., BCLO] indicate specific stream gaging locations.
2. Avoid a flow volume reduction of more than 50% per hour or the lesser of 1 foot or 50% per 24 hours.
3. Ramping rates listed are for reservoir operation other than when reducing project outflow to manage for downstream flood damage reduction.

i. From January 1 through March 31, the NMFS prefers using a 0.1 ft/hr down ramp during all hours because mostly fry-aged fish are present and are less able to avoid ramping effects. However, 0.2 ft/hr down ramp will not cause a reportable violation since the Biological Opinion indicates that this is an acceptable down ramp rate during all months of the year.

ii. From April through December, it is preferred that reduction of project outflow occurs during daylight hours to reduce the risk of stranding smaller fish. This recommendation is applicable for all projects listed in Table 4.

iii. For the safety of downstream anglers, it is preferable to increase project outflow during night-time hours.

iv. Ramp rates will be higher during regulation of high flow events when forecasts are rapidly changing, and there is risk of dropping a reservoir's elevation below minimum conservation pool.

d. It is not anticipated that power projects will be drafted below minimum conservation pools into the exclusive power pools. Power generated during the drawdown will be marketable. The use of any power pool is not a planned activity.

e. The flow objectives shown above have been previously discussed with Oregon Water Resources Department, ODFW, Department of Environmental Quality, Oregon Parks, Oregon Marine Board, NMFS, USFWS, NWS, NRCS, Forest Service, and Bonneville Power Administration. The April 1 - 30, 7-day running average threshold flow of 17,800 cfs is supported by NMFS as it is part flow management section of the 2008 Biological Opinion.

5. Operation of Individual Projects

The general operational goal is to ensure that each reservoir has water stored above minimum conservation pool through October 31. When discussing downstream flow objectives, the four letter code specifies a river gage that is downstream of the project. Specific project operations are as follows.

a. A primary objective for Green Peter reservoir is to meet Salem targets in the spring in order to preserve storage in the reservoirs above Albany for use to meet streamflow goals later in the conservation season. Adequate storage is expected to be available to keep Foster full through Labor Day weekend and to maintain summer minimum flow requirements measured downstream of the dam at SSFO. Minimum outflow targets for winter steelhead and spring Chinook spawning and redd incubation are included in Table 3. Maximum outflow from Foster should be 3,000 cfs when augmenting for mainstem flow requirements at Salem. This maximum flow level is to provide a river stage at which the subsequent incubation flow of 1,100 cfs will be adequate to maintain water over redds. Flows higher than 3,000 cfs which are sustained longer than 72 hours may result in higher incubation flows and should be done with care.

An operational strategy for providing mainstem flow augmentation is to fill Foster from February through March in accordance with the seasonal filling schedule. Then on April 1, draft Foster at a rate that returns the reservoir back to elevation 614 feet by April 15. This should provide an additional 500 cfs/day augmentation for the Salem flow target. From April 15 to May 15, the Foster pool is held at minimum pool for fish passage over the spillway fish weir. After May 15, the pool is filled in time for Memorial Day weekend boating.

b. A primary objective at Cougar is to meet Salem flow targets in the spring and Albany flow targets through July 15, as well as to keep enough storage to maintain summer minimum flow requirements measured downstream of the dam at CGRO. A minimum outflow of 400 cfs is considered beneficial for maintaining flow in downstream side channels that offer rearing habitat. Drafting the reservoir to elevation 1635 feet on or after September 7 and reaching elevation 1532 feet on or after October 31 would be considered beneficial for fish, recreation, and for supporting mainstem minimum flow objectives. This operation is beneficial for ESA-listed Chinook salmon because it would allow for a maximum outflow of 580 cfs from September 1-30 (see Table 3). This operation is beneficial for recreation because the lowest boat ramp would be available through Labor Day weekend and beneficial for mainstem flows because all water released from Cougar passes the Albany control point. Augmentation for the Albany control point generally comes from releases from Dexter (storage from Lookout Point and Hills Creek) and releases from Cougar. A regulating outlet flow between 300 to 500 cfs is considered beneficial for keeping total dissolved gas levels below 110% in the downstream channel.

c. A primary objective for Lookout Point reservoir is to store enough water during the spring to help meet the summer flow objective at Albany. Augmentation for spring Salem targets is a secondary objective for the combined Lookout Point/Hills Creek storage. Limiting outflow to a maximum of 2,700 cfs from Dexter is considered beneficial for downstream recreation after mid-May. Use of Lookout Point storage to maintain the Salem and Albany target flows while keeping Hills Creek above elevation 1520 feet is considered beneficial for the communities of Oakridge and West Fir.

i. NMFS requested a maximum Dexter outflow of 2,400 cfs from September 1-30 (see Table 3). The NMFS would also like the water released in the fall to be shaped in pulses rather than a flat release (see Section 6).

ii. Corps will not operate Lookout Point for resident Oregon chub located in Hospital Pond. The structural repair performed several years ago is technically sufficient for adequate chub spawning. However, more recent biological studies indicate that maintaining Lookout Point above elevation 919 feet until mid-July ensures good availability of spawning areas within the pond, which results in higher juvenile chub counts for that year class.

d. A primary objective for Hills Creek reservoir is to save stored water to help achieve the summer flow requirement at Albany. If inflow to Hills Creek is above 450 cfs in July or August, targeting 450 cfs outflow is preferred by ODFW for resident fish. Maintaining Hills Creek above elevation 1520 feet, which is the toe of the Bingham Landing ramp, is considered beneficial for recreation.

e. Blue River may be used to meet spring flow targets. The toe of the boat ramp at Lookout Boating is elevation 1330 feet. Use of Blue River storage to maintain pool elevation above 1330 feet is considered beneficial for recreation.

f. Fall Creek may be used to meet spring flow targets. Pulsed outflows to 150 cfs during July and August for fish migration has been an operation in the past, and may be reinitiated this year depending on the number of fish that return to the project. The toe of the Winberry Creek Park ramp is elevation 780 feet. Use of Fall Creek storage to maintain pool elevation above 780 feet is considered beneficial for recreation.

g. Dorena may be used to meet spring flow targets. Maintaining Dorena above elevation 825 feet, which is the toe of the Harms Park ramp, is considered beneficial for recreation.

h. Cottage Grove should be used last to meet spring flow targets, as there is such a small amount of storage available to augment flows. Maintaining Cottage Grove above elevation 779 feet, which is the toe of the Wilson Creek Ramp, is considered beneficial for recreation.

i. Foster storage will not be used to meet flow objectives on the mainstem Willamette. Foster will be held near elevation 614 feet to facilitate downstream passage of native winter steelhead smolts from April 15 to May 15. Foster Reservoir will fill before Memorial Day weekend and be kept full through Labor Day weekend using water stored in Green Peter.

j. A primary objective in basin operation will be to hold Detroit Lake as high as practicable for traditional recreational use. Detroit storage will be used from March 16 through July 15 (and possibly to July 30 depending on status of emergence) to provide releases for steelhead spawning and incubation. Detroit storage will also be used from September 1 to November 30 for spring Chinook spawning and rearing. Maximum outflow from Big Cliff should be 3,000 cfs to limit the river stage to a level at which an incubation flow of 1,200 cfs will be adequate to maintain water over redds. Flows higher than 3,000 cfs which are sustained longer than 72 hours may result in the need for higher incubation flows. Water levels above elevation 1546 feet through Labor Day weekend will provide adequate recreational opportunities for reservoir users.

k. Fern Ridge will not be used to meet flow requirements at Salem. A primary objective will be to hold the lake as high as practicable for traditional recreational use. Storage at Fern Ridge will be used to augment natural flows to meet target flow on the Long Tom River at Monroe for irrigation purposes.

l. On the mainstem below the confluence of the Coast and Middle Fork Willamette to the confluence of the McKenzie River, there is an in-stream water right (ISWR) of 2000 cfs from June through October and 2500 cfs from November through May. Dropping flows below these levels at EUGO, the closest gage station, will impact the cities of Creswell and West Fir. It is our understanding that if flow at EUGO is below the ISWR, then Creswell/West Fir cannot use in-stream water for their municipal water supply needs. Releases from Hills Creek, Lookout Point, Dexter, Fall Creek, Cottage Grove, and Dorena should be managed to keep flow in the Middle Fork Willamette at or above the ISWR until the point where these projects are passing inflow. Stored water will not be used to meet the ISWR (reference ISWR certificate 59549).

Table 5. Summary of Project Hierarchy when Augmenting Mainstem Flow Goals

No Augmentation	Primary Spring Augmentation (April – June 30)	Summer/Fall Augmentation (July 1 – Oct 31)
Fern Ridge	Green Peter (outflow up to 3000 cfs; monitor interim draft limits to ensure adequate storage for fall spawning flows)	Lookout Point (outflow up to 2700 cfs)
Detroit (above el. 1546 ft is adequate for recreation)	Cougar (above elev. 1635 ft; up to 500 cfs spill unless above rule curve)	Cougar (above elev. 1635 by Sep 4 and elev. 1532 ft by Oct 31)
Foster	Lookout Point (above elev. 919 ft and Dexter outflow up to 2700 cfs)	Hills Creek (above elev. 1520 ft)
Dexter	Hills Creek (full powerhouse) (above elev. 1520 ft)	Green Peter (Foster outflow 1500 cfs from Sep 1-30; 1100 cfs from Oct 1 - Jan 31)
Big Cliff	Blue River (above elev. 1330 ft)	Blue River
	Fall Creek (above elev. 780 ft)	Fall Creek (above elev. 780 ft)
	Dorena (above elev. 825 ft)	Dorena (above elev. 825 ft)
	Cottage Grove (above elev. 779 ft)	Cottage Grove (above elev. 779 ft)

Note: Listed outflows and elevations are "soft" objectives that may be replaced by higher priorities. For example, minimum project outflow and operating at or below the flood control rule curve is a higher priority than operating to maintain a reservoir elevation above a recommended recreation elevation.

6. Sustainable Rivers Project Partnership

a. The Sustainable Rivers team proposes implementation of a set of flow releases from Dexter Dam. Releases would be based upon natural rain events and water availability in the Corps' reservoirs. Managing the water stored above minimum conservation pool to provide a pulse rather than a sustained flat flow is achievable and desirable.

i. Fall Transition Flows
Recommendation:
Time period: September 1 - October 1.
Magnitude range: 1500 - 1800 cfs.
Related ecosystem functions and general guidelines:
Maintain incubation flows above spawning flows.
Avoid rapid flushing of warm water from reservoir.
Initiate increase in fall flows for fish passage.

ii. Small Fall Pulses

Recommendation:

Time period: October 1 - November 15.
Number of events: 1 - 4 based on precipitation events.
Magnitude range: 1500 - 3000 cfs.
Duration: <5 days.

Related ecosystem functions and general guidelines:

Passage for fish.
Avoid flushing of warm water from reservoir.
Avoid stranding.

iii. Winter Bankfull Flow Pulses

Recommendation:

Time period: November 15 - March 15.
Number of events: 1-5 based on precipitation events.
Magnitude range: 18,000-20,000 cfs at Jasper and 10,000-12,000 cfs at Goshen.
Duration: Mimic duration of natural (unregulated) events.

Related ecosystem functions and general guidelines:

Provide flows for downstream migration of juvenile salmonids.
Create lateral habitats on floodplain margin.
Transport sediment and create new pools and riffles.
Create new floodplain surfaces through bar development.
Smooth transitions after winter high flow events are required for aquatic communities to move between lateral refuges.

iv. Small Spring Pulses

Recommendation:

Time period: late February through early June.
Number of events: 1 - 4 based on precipitation events.
Magnitude range: estimate current unregulated flow.
Duration: <5 days.

Related ecosystem functions and general guidelines:

Passage for fish.
Maintain a smooth, natural recession to avoid stranding juvenile fish.

v. Spring to Summer Transition Flow

Recommendation:

Time period: March 15 - July 1.
Magnitude range: 5,000 down to 1,500 cfs.

Related ecosystem functions and general guidelines:

Rate of drawdown in spring is critical for seed dispersal and cottonwood seedling establishment.
Smooth transitions after winter high flows are required for aquatic species to move between lateral refuges.
Use of floodplains and near channel environments for wildlife reproduction requires gradual recession rates.

vi. Summer Base Flow
Recommendation:
Time period: June 1 - August 31.
Magnitude range: 1,200 - 2,000 cfs (this flow may be higher to support mainstem flow requirements at Albany and Salem).
Related ecosystem functions and general guidelines:
Limit increases in summer low flows after drawdown to avoid negative effects on terrestrial and aquatic species with critical habitats close to the river margin.
Protect riparian plant seedlings near channel margins.
Keep base flows low as nesting shorebird species may have nests inundated by rising river levels.

7. Other Operational Considerations

a. Drawdown of Fall Creek to elev. 690 from Dec 1 - Jan 31 for fish passage.

b. Biological Studies:
Cougar: special operations to study different configurations of temperature control tower and regulating outlets for fish passage..
Head of Reservoir: research with screw traps positioned above normal maximum conservation pool.

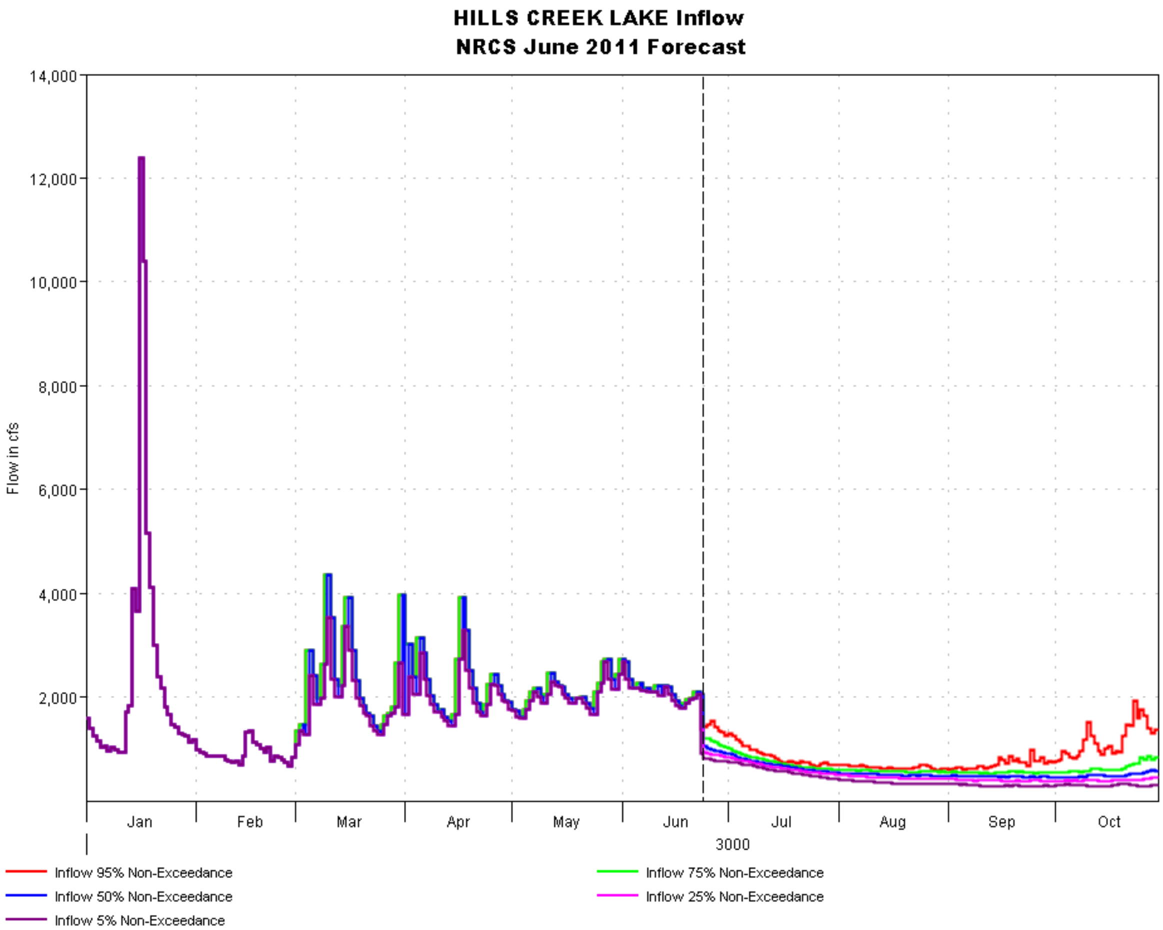
c. Water Quality:
Temperature collection in all deep reservoirs and re-regulation projects.
Detroit interim temperature control operations.

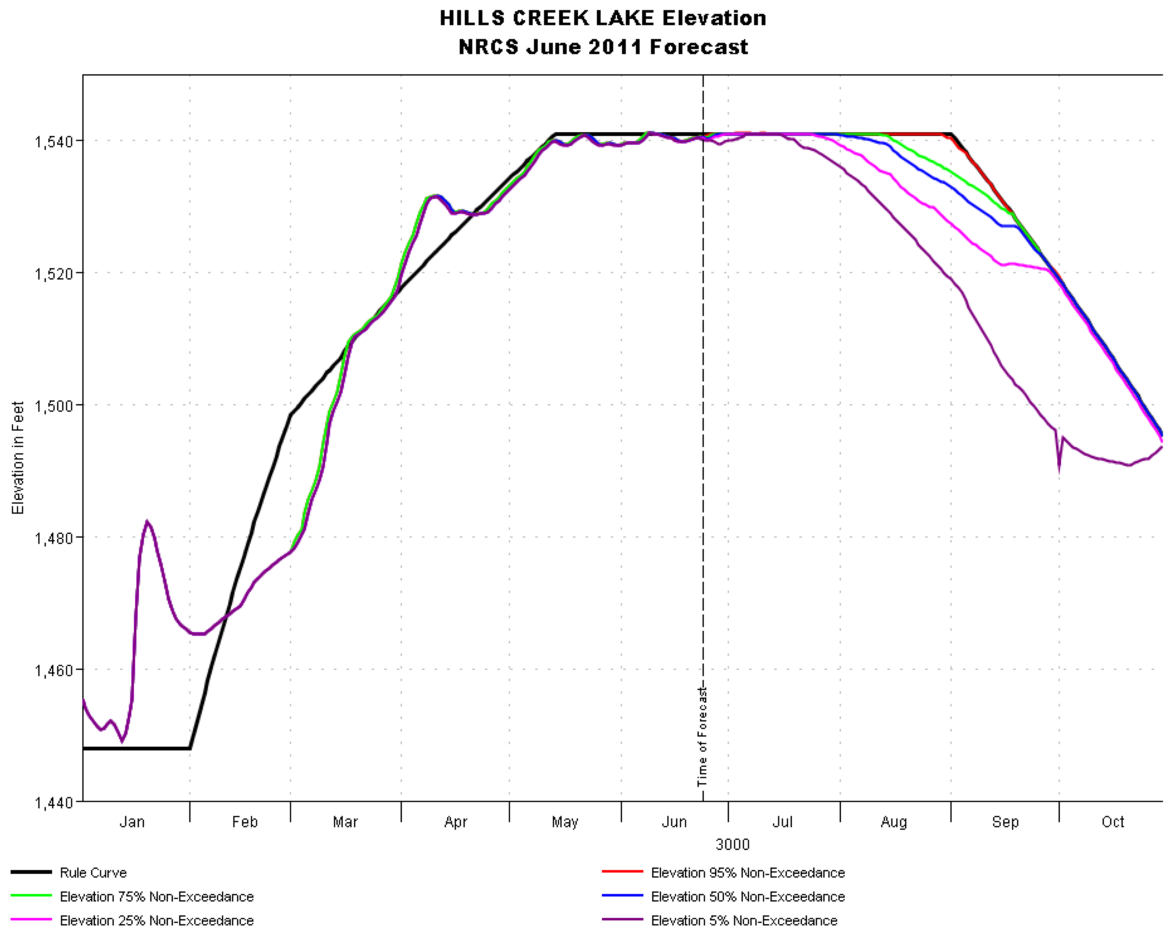
d. Small Projects Team
No projects identified at this time.

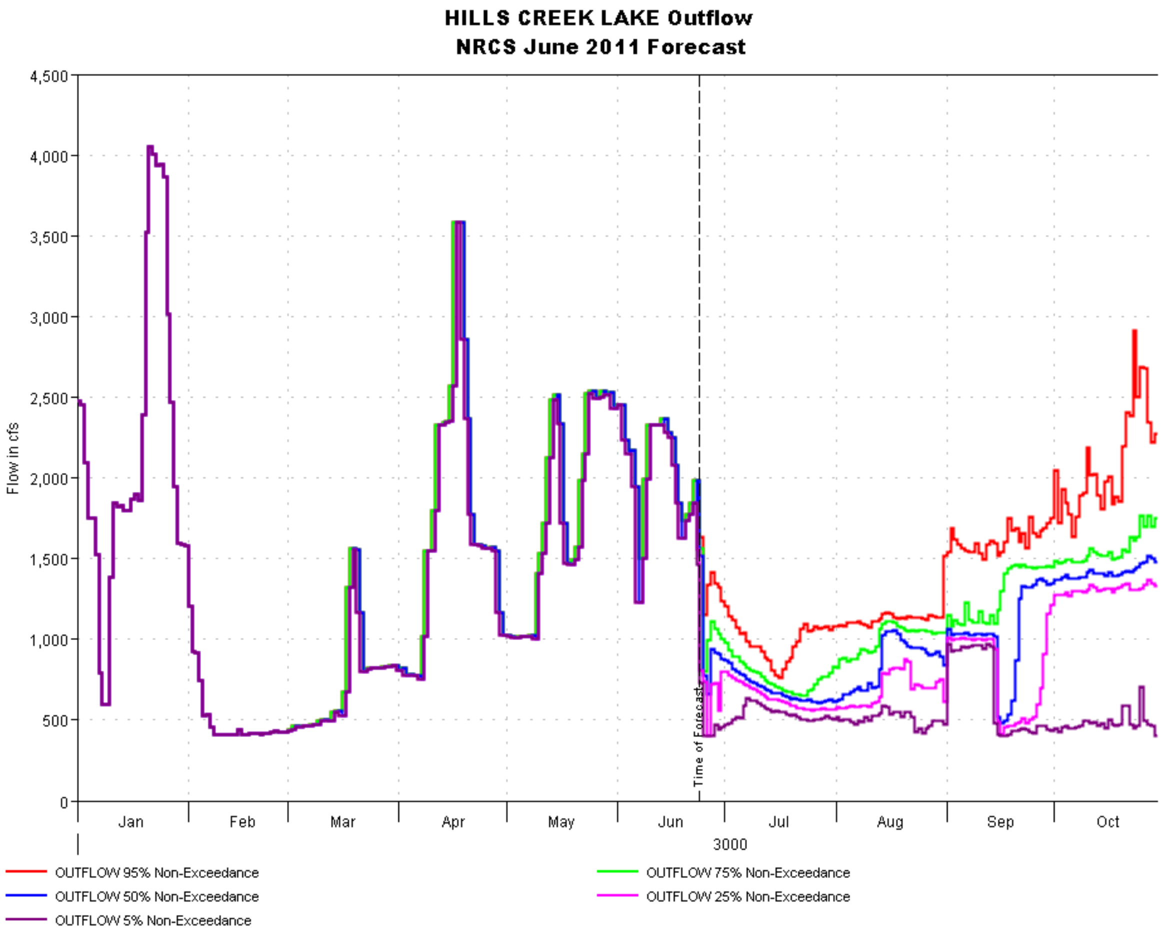
f. Interim Risk Reduction Measures (IRRM)
Big Cliff Pool: elev. range 1182 - 1193 ft until two spillway gates are strengthened.
Dexter Pool: elev. range 690 - 691 ft until three spillway gates are repaired.
Hills Creek < 1529 ft (winter).
Lookout Pool: elev. < 900 ft (RO constraint) < 915 ft (spillway constraint) (all year).
Detroit Pool: elev. < 1568.5 ft (all year).
Green Peter Pool: elev. < 1002 ft (winter).
Cougar Pool: elev. < 1671 ft (winter).
Blue River Pool: elev. < 1343 ft (winter).
Fall Creek Pool: elev. < 822 ft (winter).

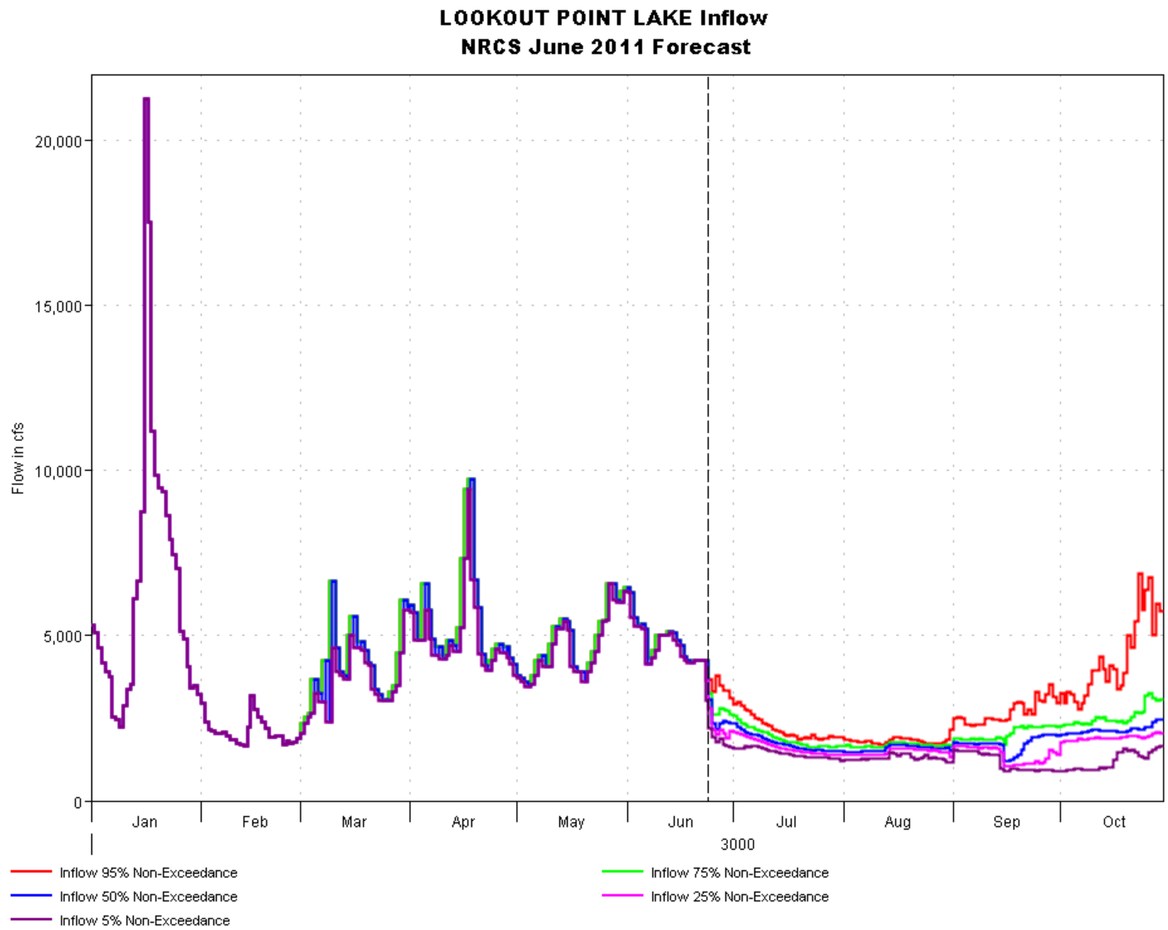
8. Res-Sim Modeling Results

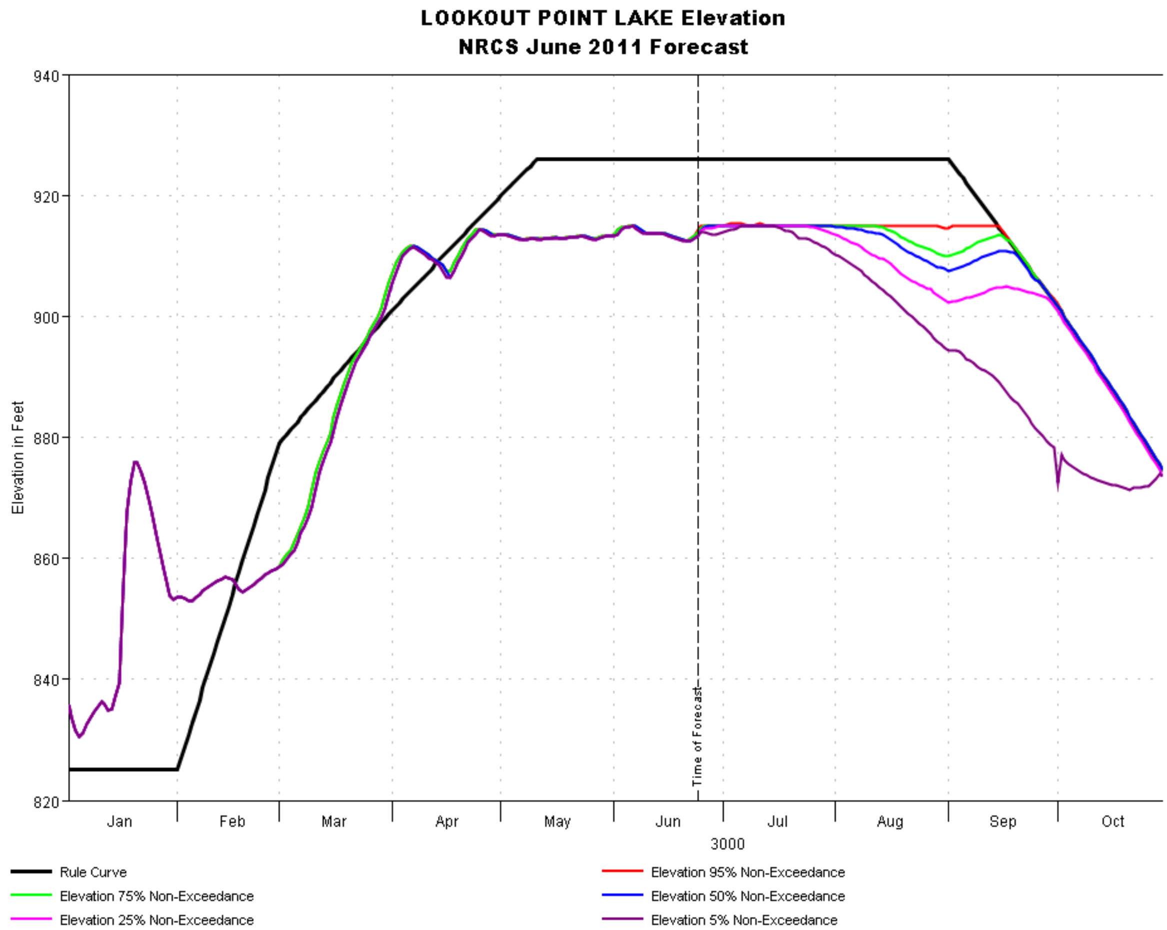
The next section of graphics is from the June NRCS forecast modeled with the Res-Sim program. Observed data through June 23, 2011 and forecast data through October 31, 2011.

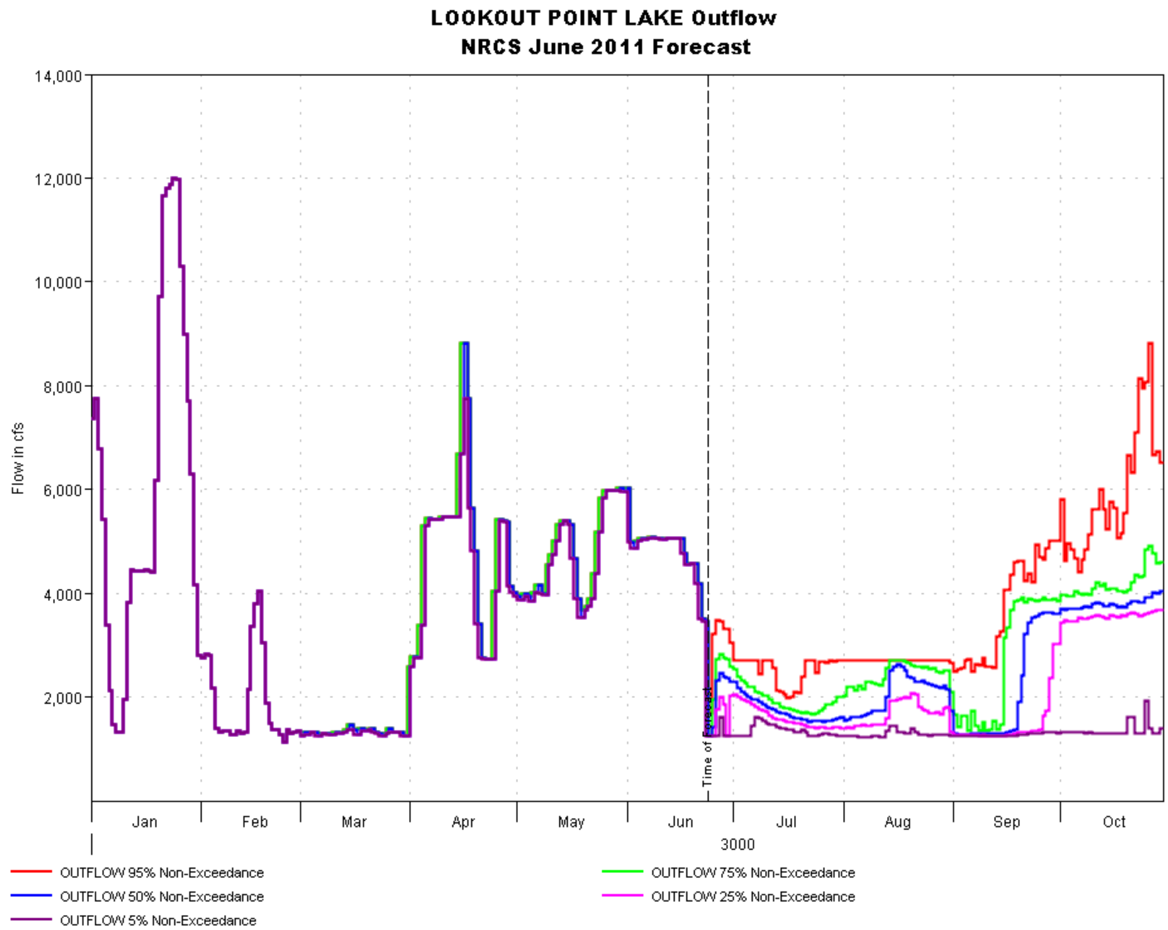

HILLS CREEK LAKE Inflow
NRCS June 2011 Forecast
Flow in cfs
14,000
12,000
10,000
8,000
6,000
4,000
2,000
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Inflow 95% Non-Exceedance
Inflow 75% Non-Exceedance
Inflow 50% Non-Exceedance
Inflow 25% Non-Exceedance
Inflow 5% Non-Exceedance

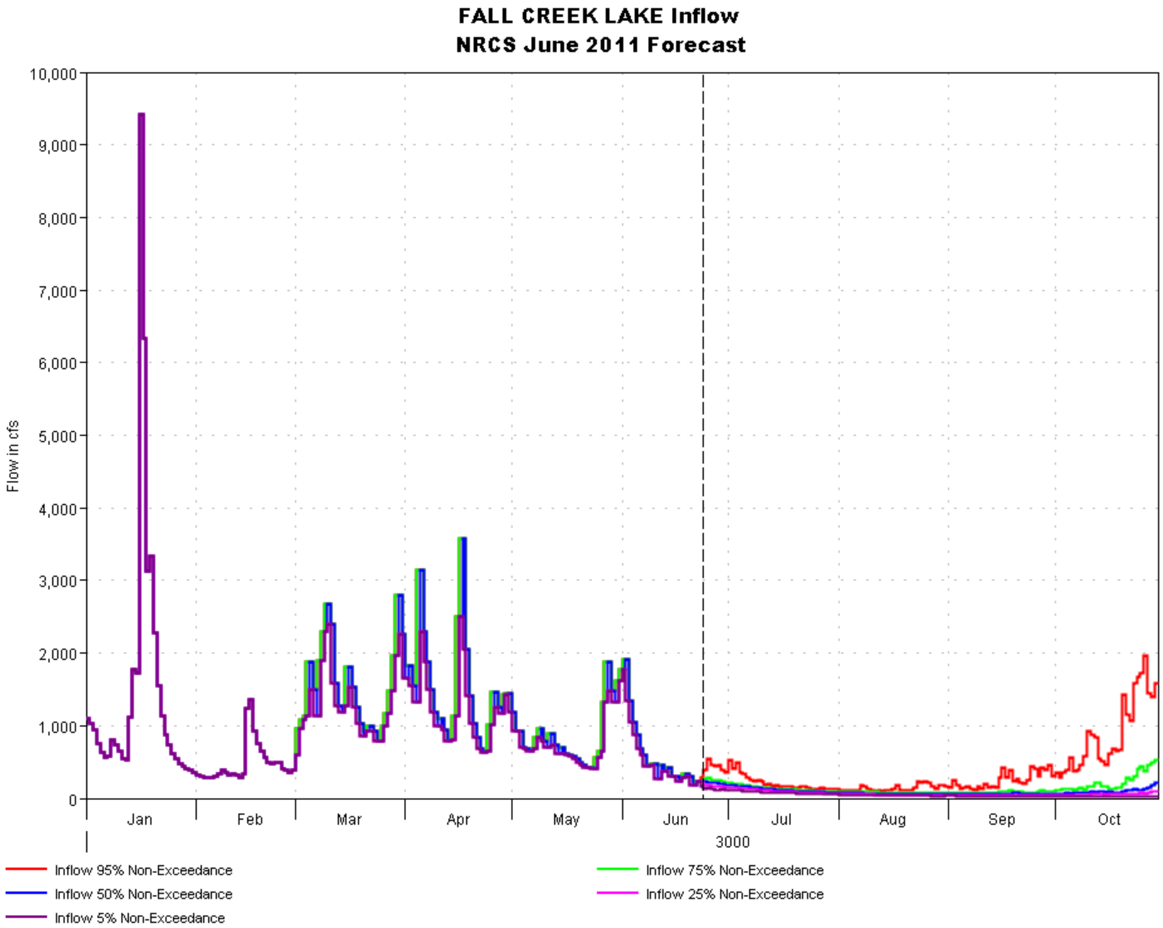

HILLS CREEK LAKE Elevation
NRCS June 2011 Forecast
Elevation in Feet
1,540
1,520
1,500
1,480
1,460
1,440
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Time of Forecast
Rule Curve
Elevation 75% Non-Exceedance
Elevation 25% Non-Exceedance
Elevation 95% Non-Exceedance
Elevation 50% Non-Exceedance
Elevation 5% Non-Exceedance

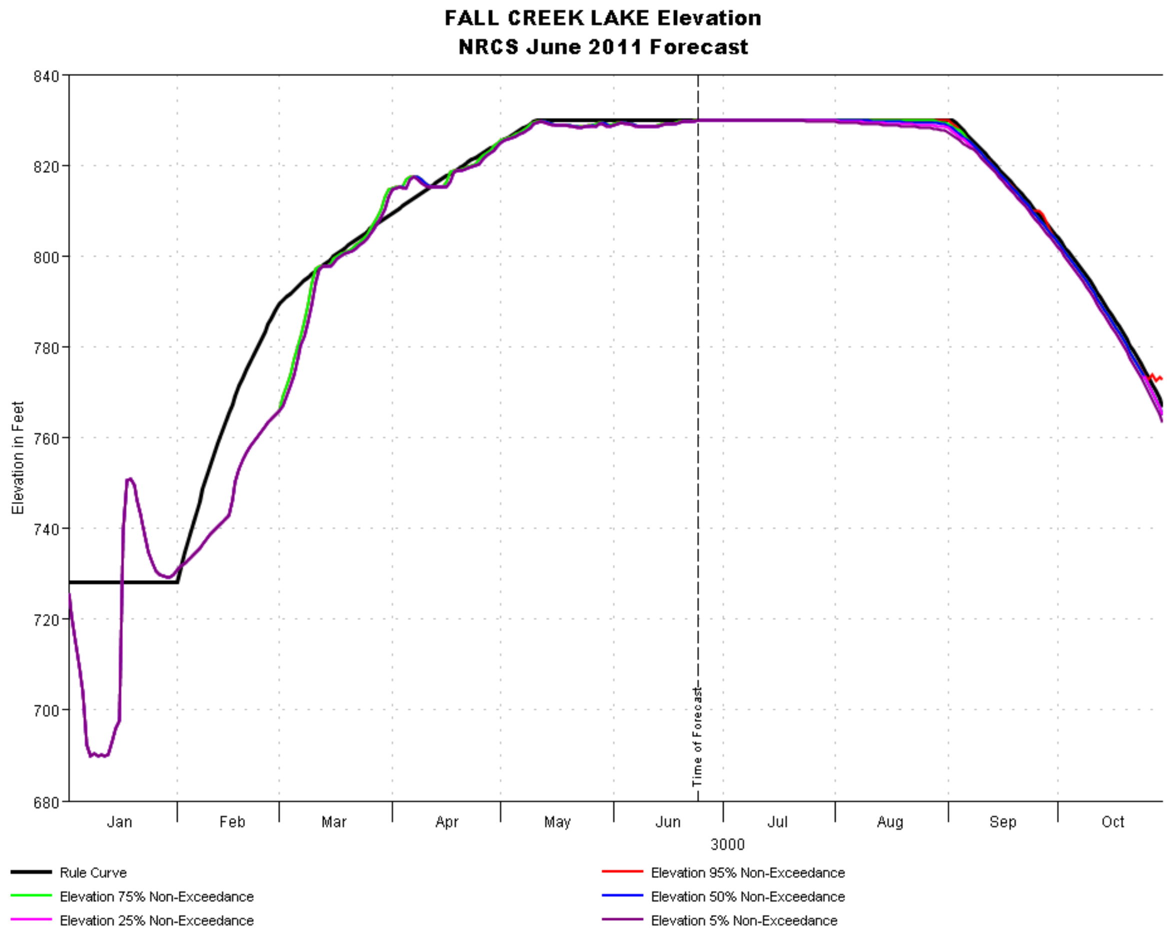

HILLS CREEK LAKE Outflow
NRCS June 2011 Forecast
Flow in cfs
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Time of Forecast
OUTFLOW 95% Non-Exceedance
OUTFLOW 50% Non-Exceedance
OUTFLOW 5% Non-Exceedance
OUTFLOW 75% Non-Exceedance
OUTFLOW 25% Non-Exceedance

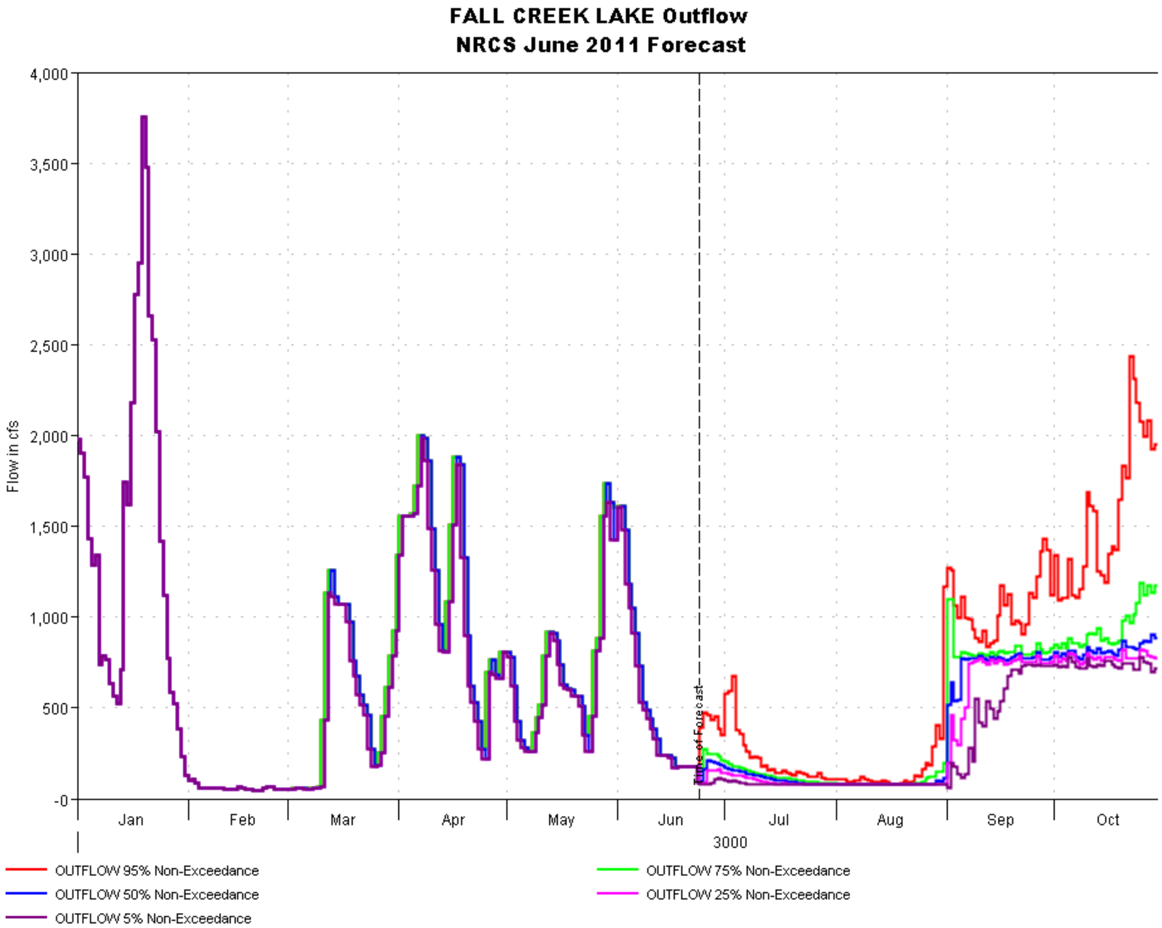

LOOKOUT POINT LAKE Inflow
NRCS June 2011 Forecast
Flow in cfs
20,000
15,000
10,000
5,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Inflow 95% Non-Exceedance
Inflow 75% Non-Exceedance
Inflow 50% Non-Exceedance
Inflow 25% Non-Exceedance
Inflow 5% Non-Exceedance


LOOKOUT POINT LAKE Elevation
NRCS June 2011 Forecast
Elevation in Feet
940
920
900
880
860
840
820
Time of Forecast
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Rule Curve
Elevation 75% Non-Exceedance
Elevation 25% Non-Exceedance
Elevation 95% Non-Exceedance
Elevation 50% Non-Exceedance
Elevation 5% Non-Exceedance

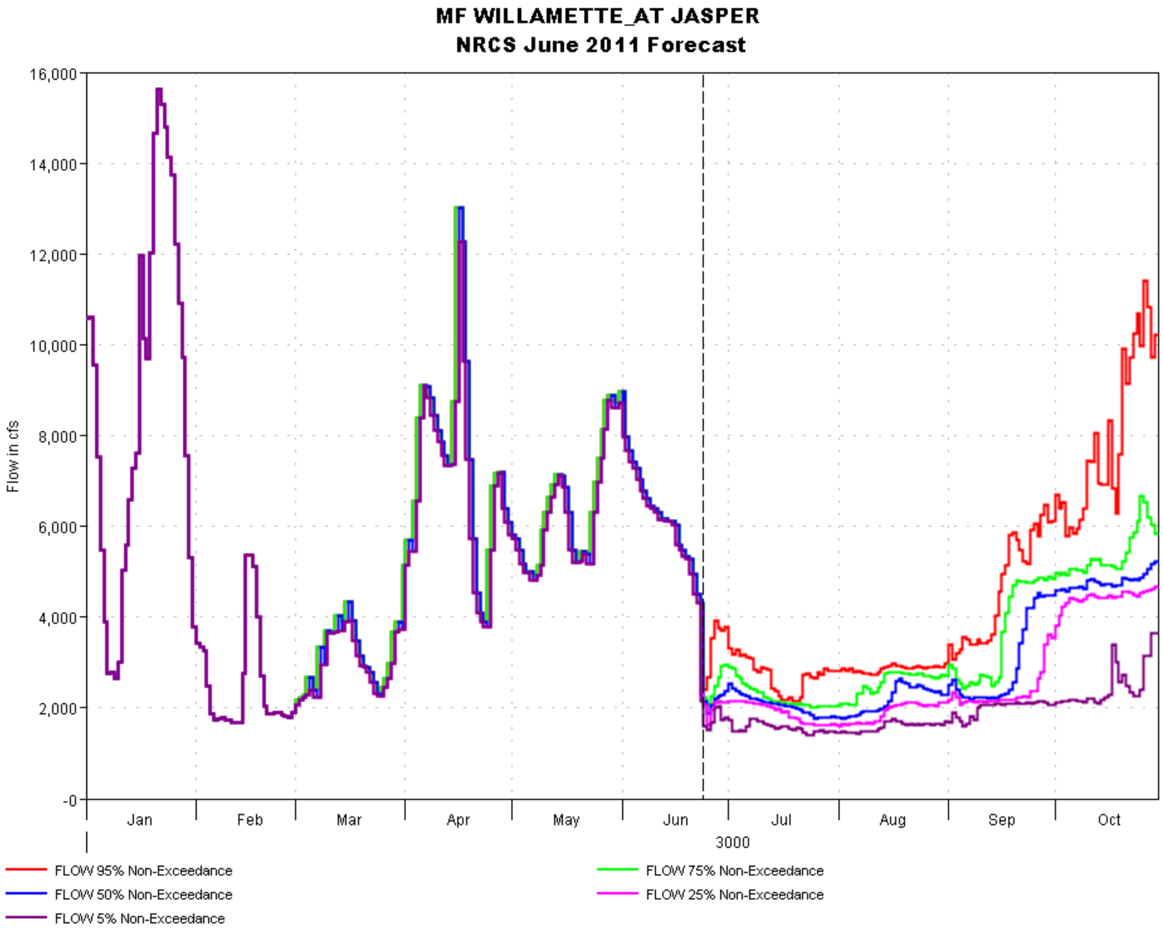

LOOKOUT POINT LAKE Outflow
NRCS June 2011 Forecast
Flow in cfs
14,000
12,000
10,000
8,000
6,000
4,000
2,000
Time of Forecast
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
OUTFLOW 95% Non-Exceedance
OUTFLOW 75% Non-Exceedance
OUTFLOW 50% Non-Exceedance
OUTFLOW 25% Non-Exceedance
OUTFLOW 5% Non-Exceedance

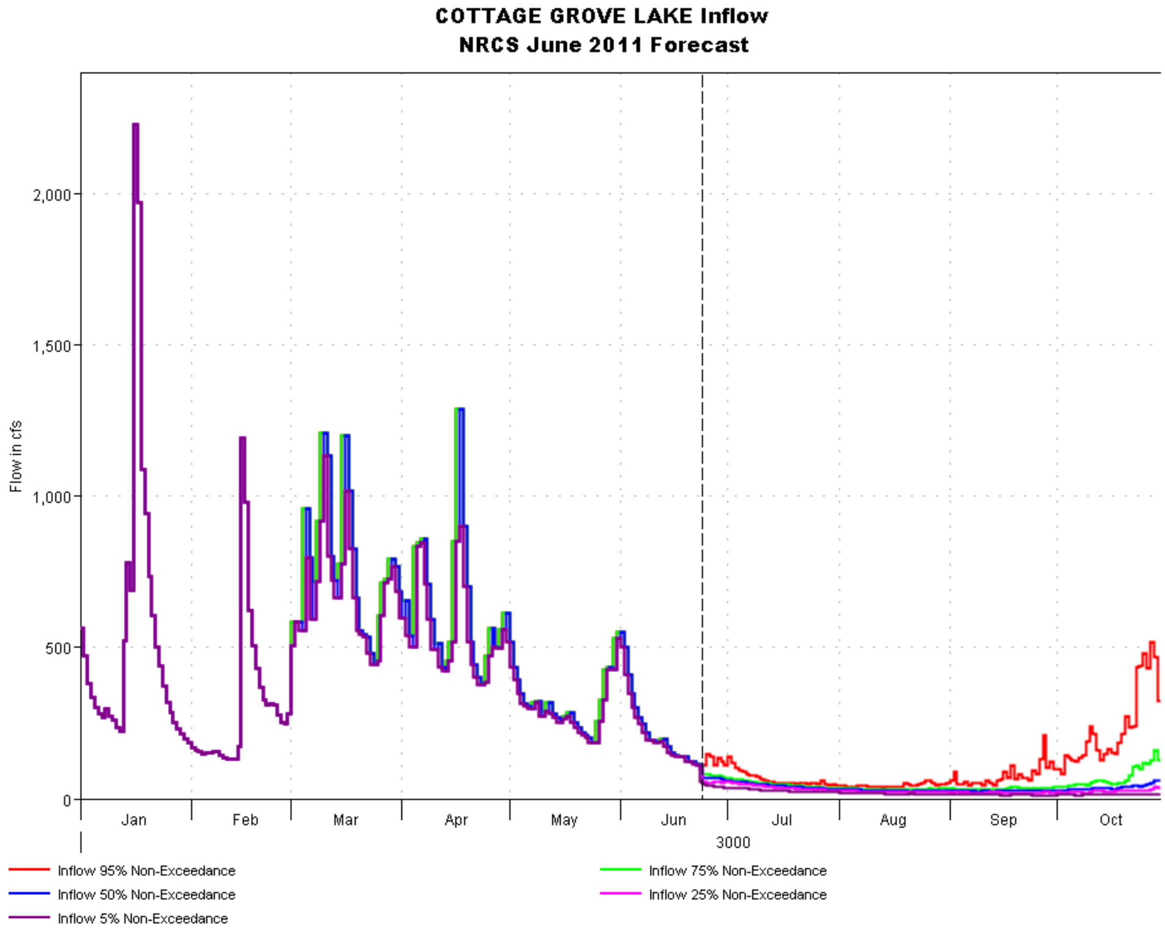

FALL CREEK LAKE Inflow
NRCS June 2011 Forecast
Flow in cfs
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Inflow 95% Non-Exceedance
Inflow 75% Non-Exceedance
Inflow 50% Non-Exceedance
Inflow 25% Non-Exceedance
Inflow 5% Non-Exceedance

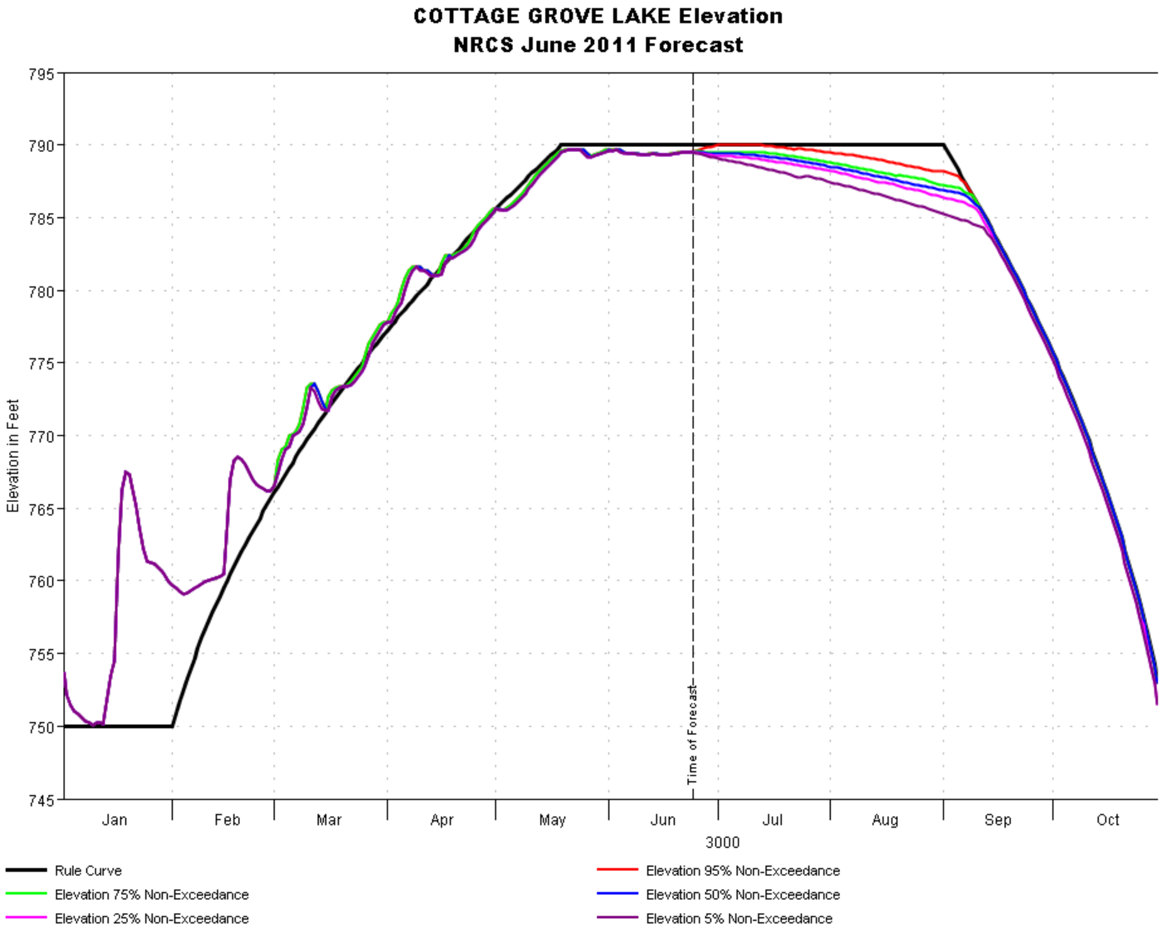

FALL CREEK LAKE Elevation
NRCS June 2011 Forecast
Elevation in Feet
840
820
800
780
760
740
720
700
680
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Time of Forecast
Rule Curve
Elevation 75% Non-Exceedance
Elevation 25% Non-Exceedance
Elevation 95% Non-Exceedance
Elevation 50% Non-Exceedance
Elevation 5% Non-Exceedance

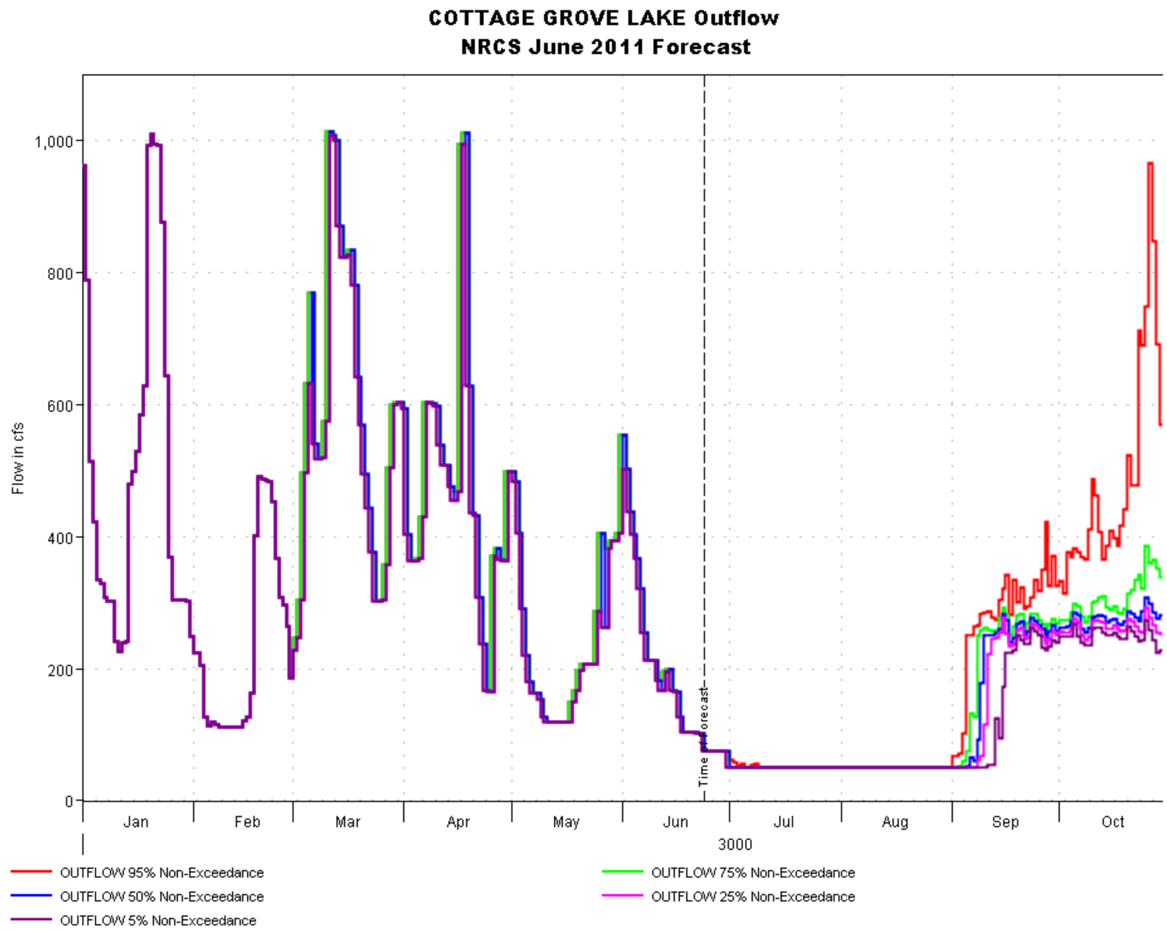


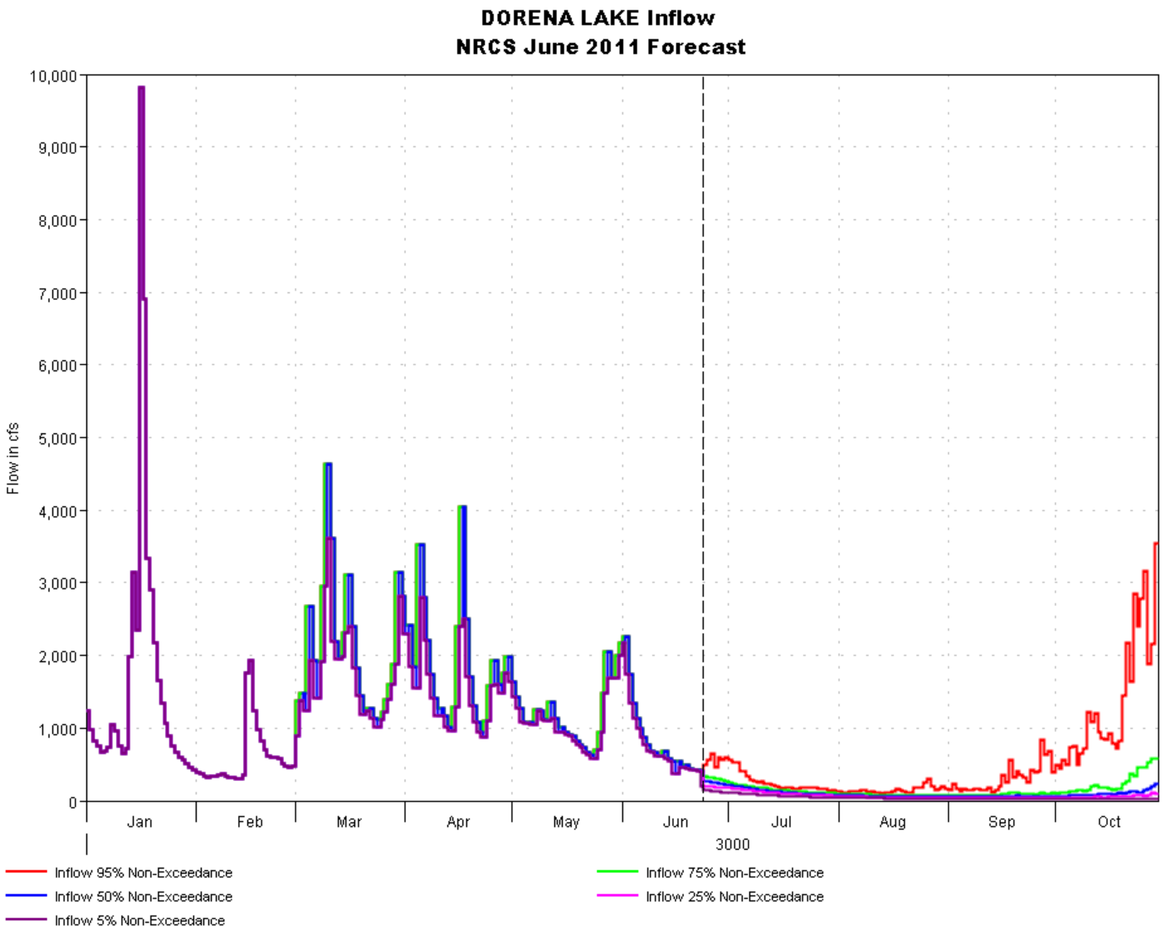
FALL CREEK LAKE Outflow
NRCS June 2011 Forecast
Flow in cfs
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
-0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Time-of-Forecast
OUTFLOW 95% Non-Exceedance
OUTFLOW 75% Non-Exceedance
OUTFLOW 50% Non-Exceedance
OUTFLOW 25% Non-Exceedance
OUTFLOW 5% Non-Exceedance

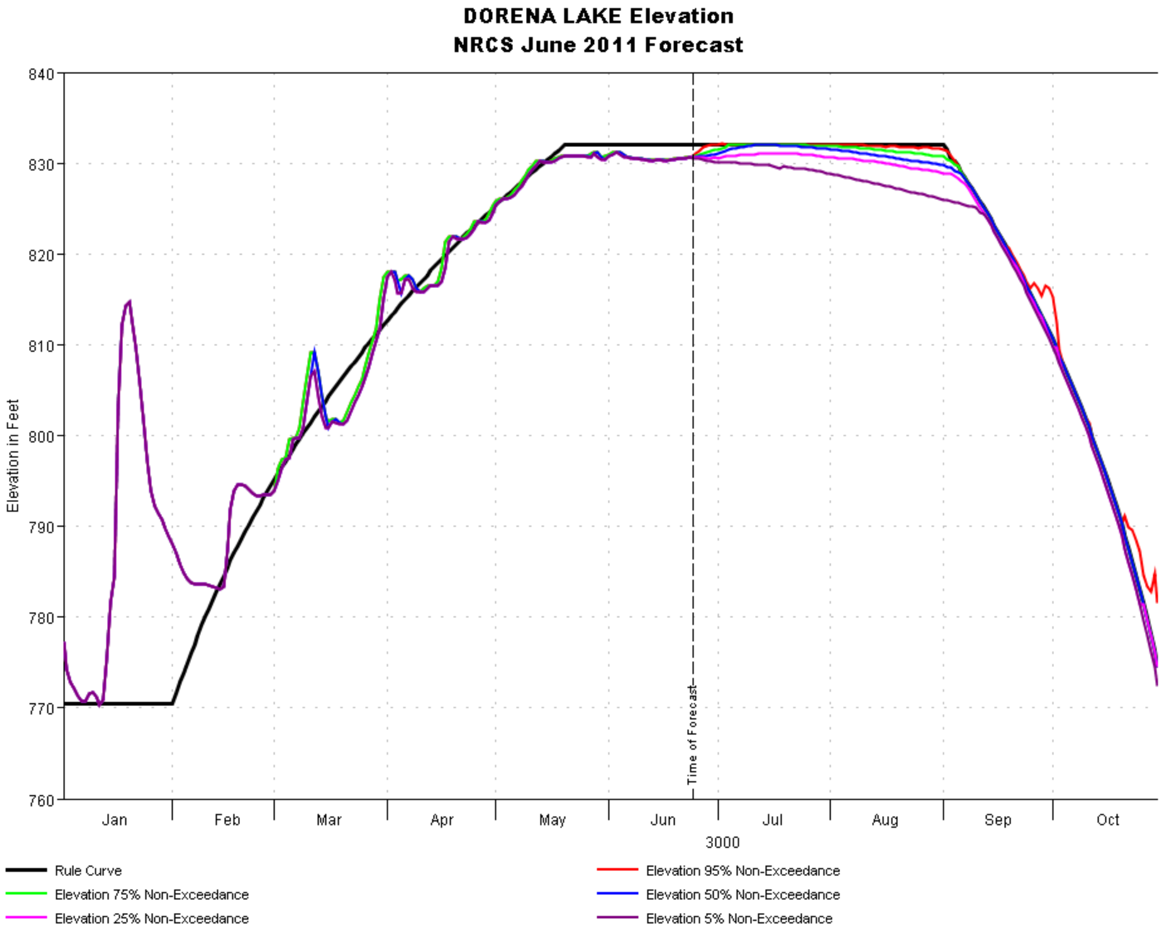

MF WILLAMETTE_AT JASPER
NRCS June 2011 Forecast
Flow in cfs
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
-0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
FLOW 95% Non-Exceedance
FLOW 75% Non-Exceedance
FLOW 50% Non-Exceedance
FLOW 25% Non-Exceedance
FLOW 5% Non-Exceedance

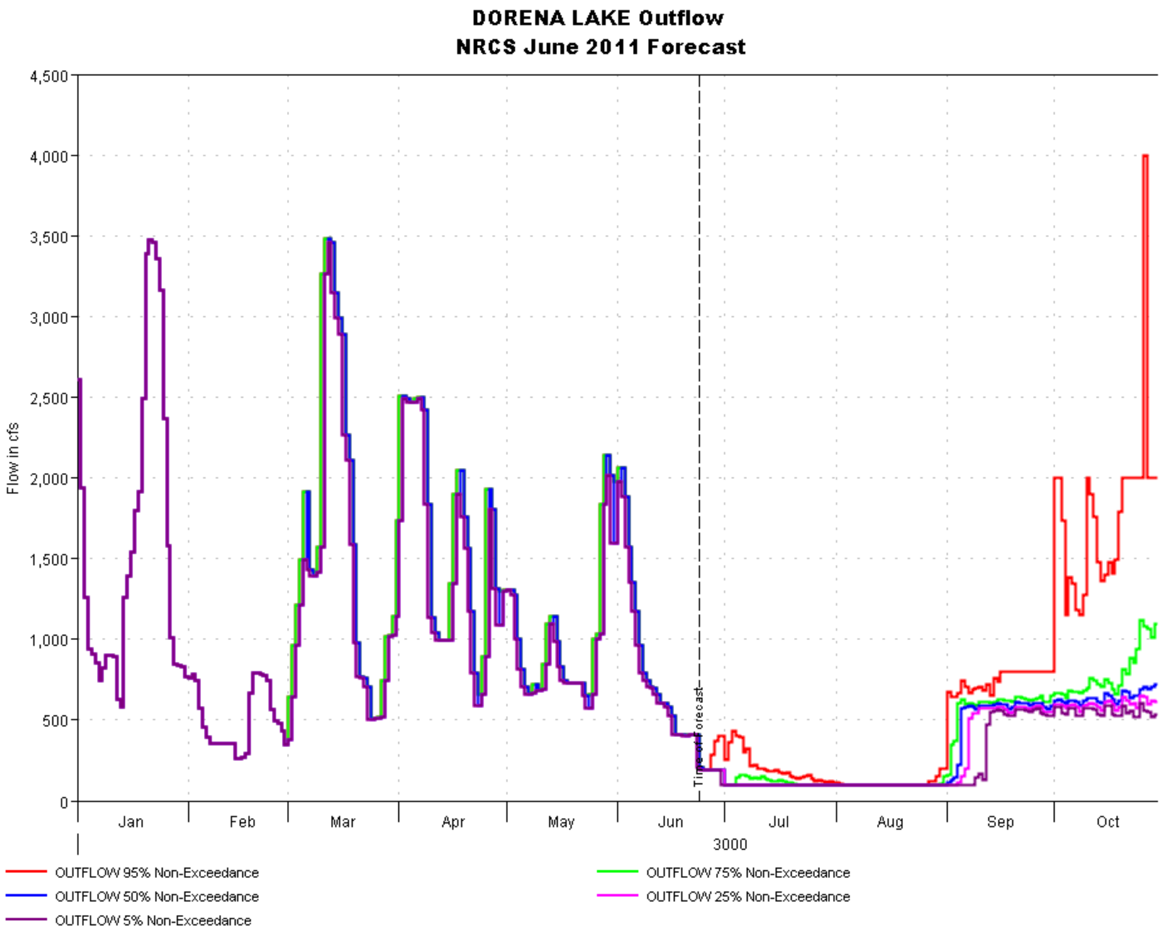

COTTAGE GROVE LAKE Inflow
NRCS June 2011 Forecast
Flow in cfs
2,000
1,500
1,000
500
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Inflow 95% Non-Exceedance
Inflow 75% Non-Exceedance
Inflow 50% Non-Exceedance
Inflow 25% Non-Exceedance
Inflow 5% Non-Exceedance

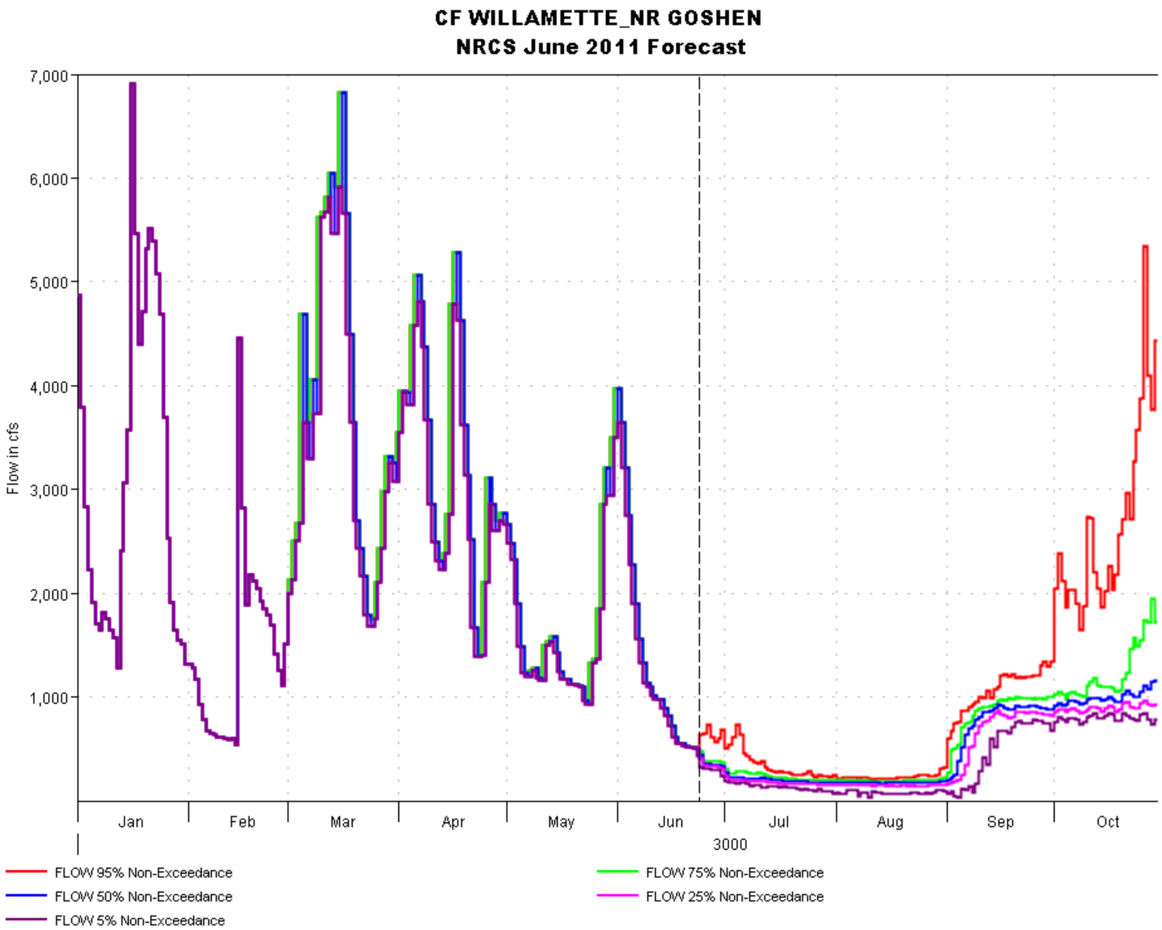

COTTAGE GROVE LAKE Elevation
NRCS June 2011 Forecast
Elevation in Feet
795
790
785
780
775
770
765
760
755
750
745
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Time of Forecast
Rule Curve
Elevation 75% Non-Exceedance
Elevation 25% Non-Exceedance
Elevation 95% Non-Exceedance
Elevation 50% Non-Exceedance
Elevation 5% Non-Exceedance

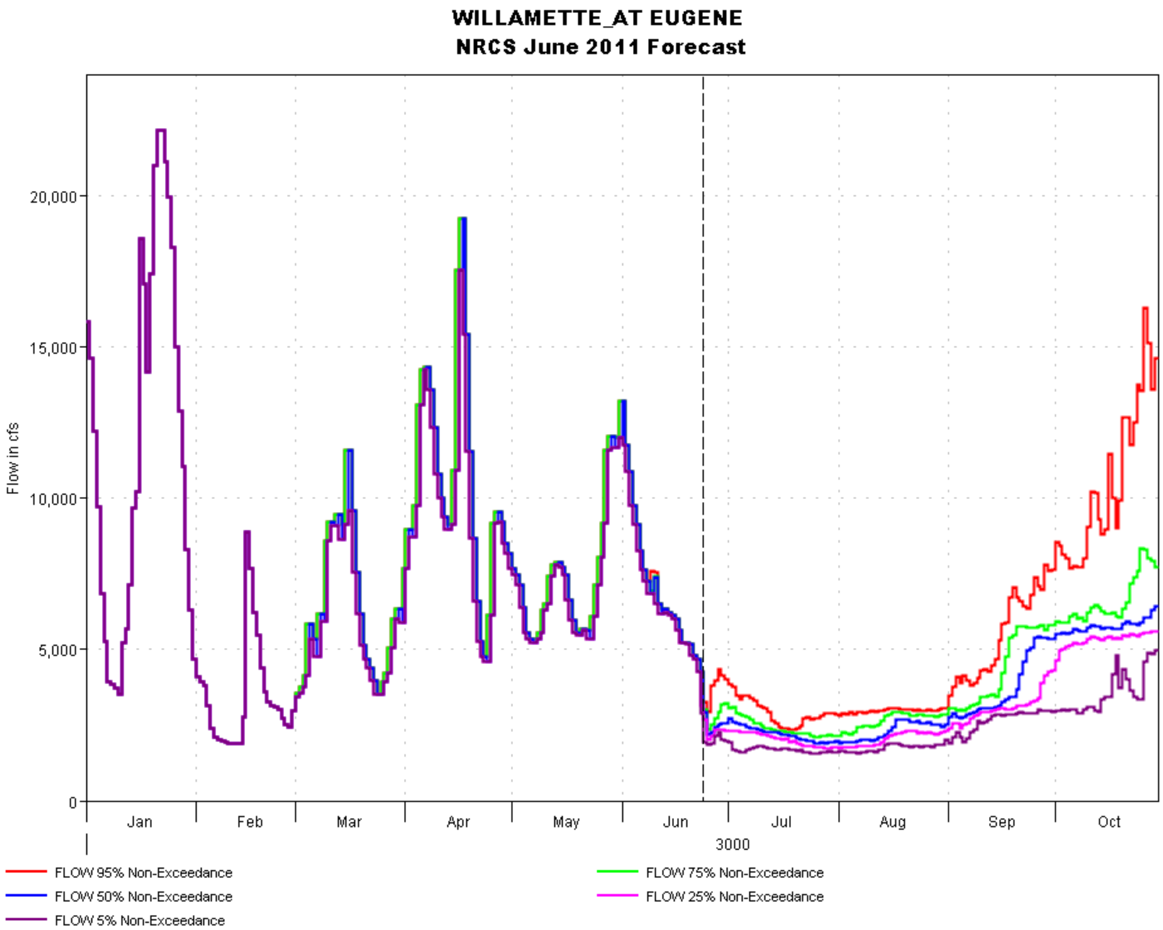

COTTAGE GROVE LAKE Outflow
NRCS June 2011 Forecast
Flow in cfs
1,000
800
600
400
200
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Time of Forecast
OUTFLOW 95% Non-Exceedance
OUTFLOW 50% Non-Exceedance
OUTFLOW 5% Non-Exceedance
OUTFLOW 75% Non-Exceedance
OUTFLOW 25% Non-Exceedance

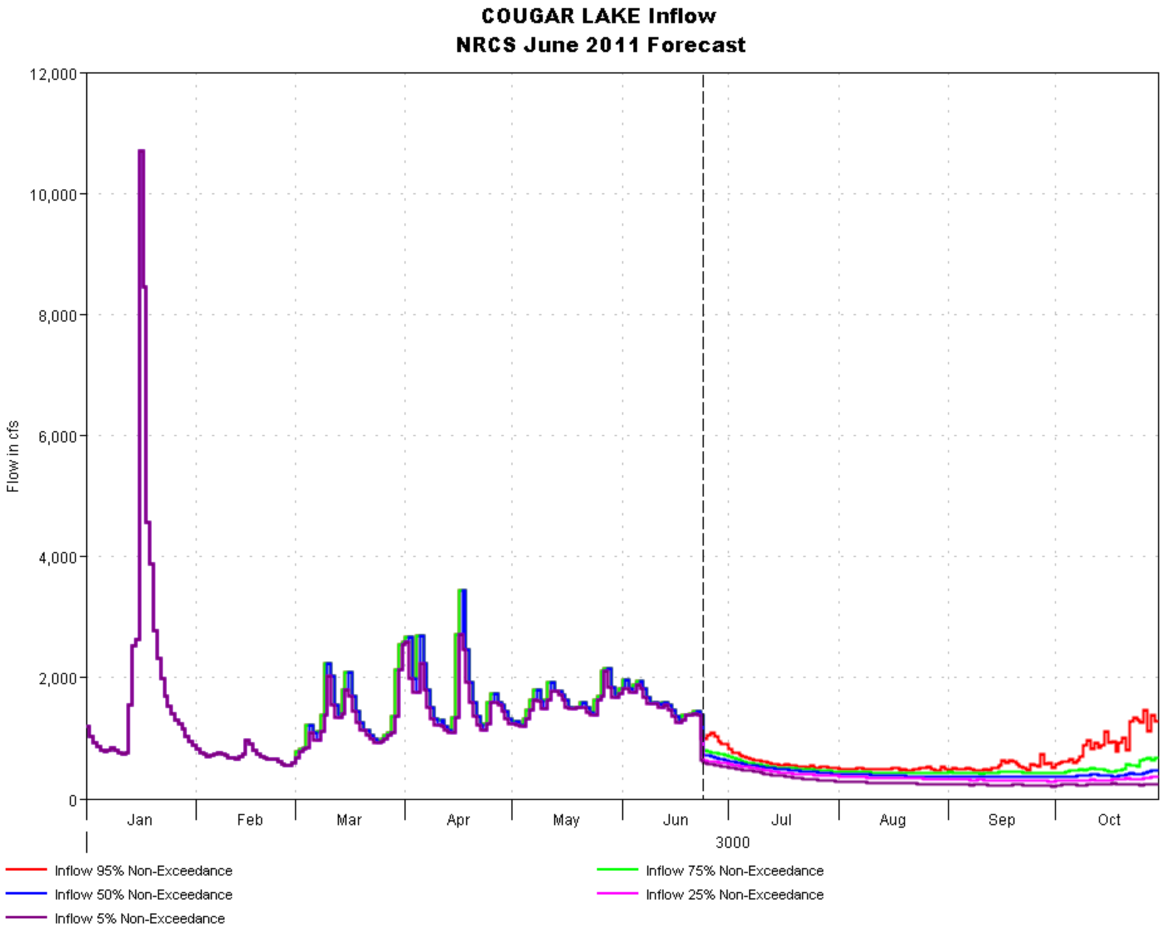

DORENA LAKE Inflow
NRCS June 2011 Forecast
Flow in cfs
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Inflow 95% Non-Exceedance
Inflow 75% Non-Exceedance
Inflow 50% Non-Exceedance
Inflow 25% Non-Exceedance
Inflow 5% Non-Exceedance

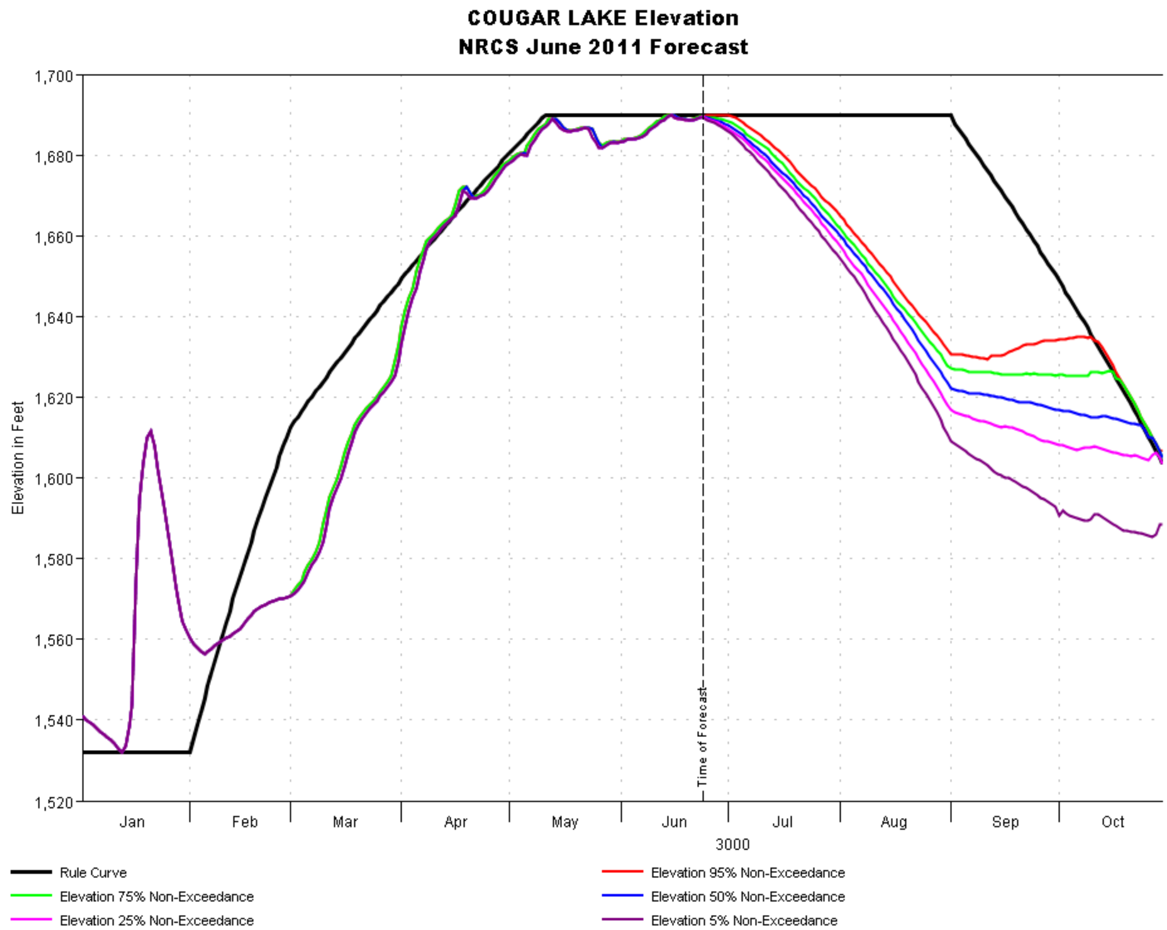

DORENA LAKE Elevation
NRCS June 2011 Forecast
Elevation in Feet
840
830
820
810
800
790
780
770
760
Time of Forecast
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Rule Curve
Elevation 75% Non-Exceedance
Elevation 25% Non-Exceedance
Elevation 95% Non-Exceedance
Elevation 50% Non-Exceedance
Elevation 5% Non-Exceedance


DORENA LAKE Outflow
NRCS June 2011 Forecast
Flow in cfs
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Time of Forecast
OUTFLOW 95% Non-Exceedance
OUTFLOW 75% Non-Exceedance
OUTFLOW 50% Non-Exceedance
OUTFLOW 25% Non-Exceedance
OUTFLOW 5% Non-Exceedance

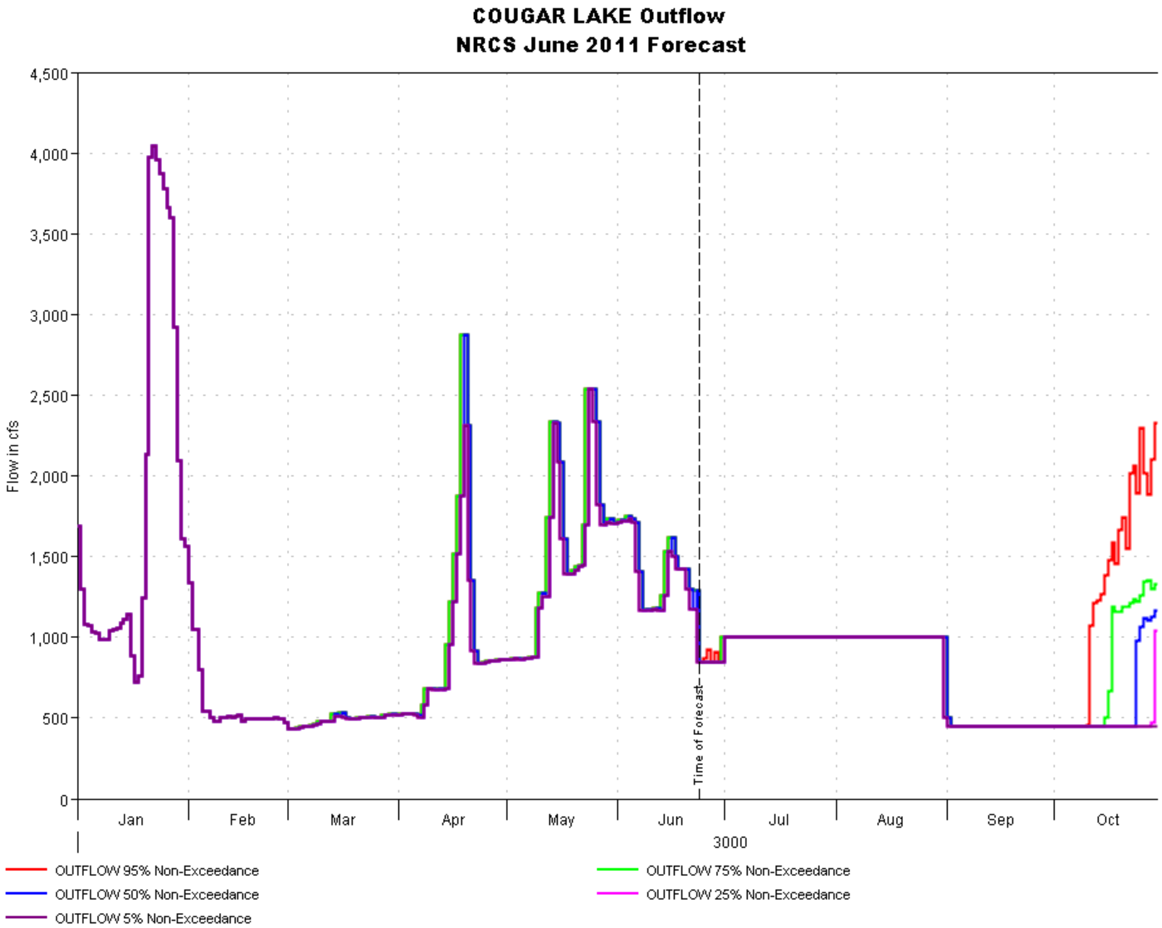

CF WILLAMETTE_NR GOSHEN
NRCS June 2011 Forecast
Flow in cfs
7,000
6,000
5,000
4,000
3,000
2,000
1,000
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
FLOW 95% Non-Exceedance
FLOW 75% Non-Exceedance
FLOW 50% Non-Exceedance
FLOW 25% Non-Exceedance
FLOW 5% Non-Exceedance

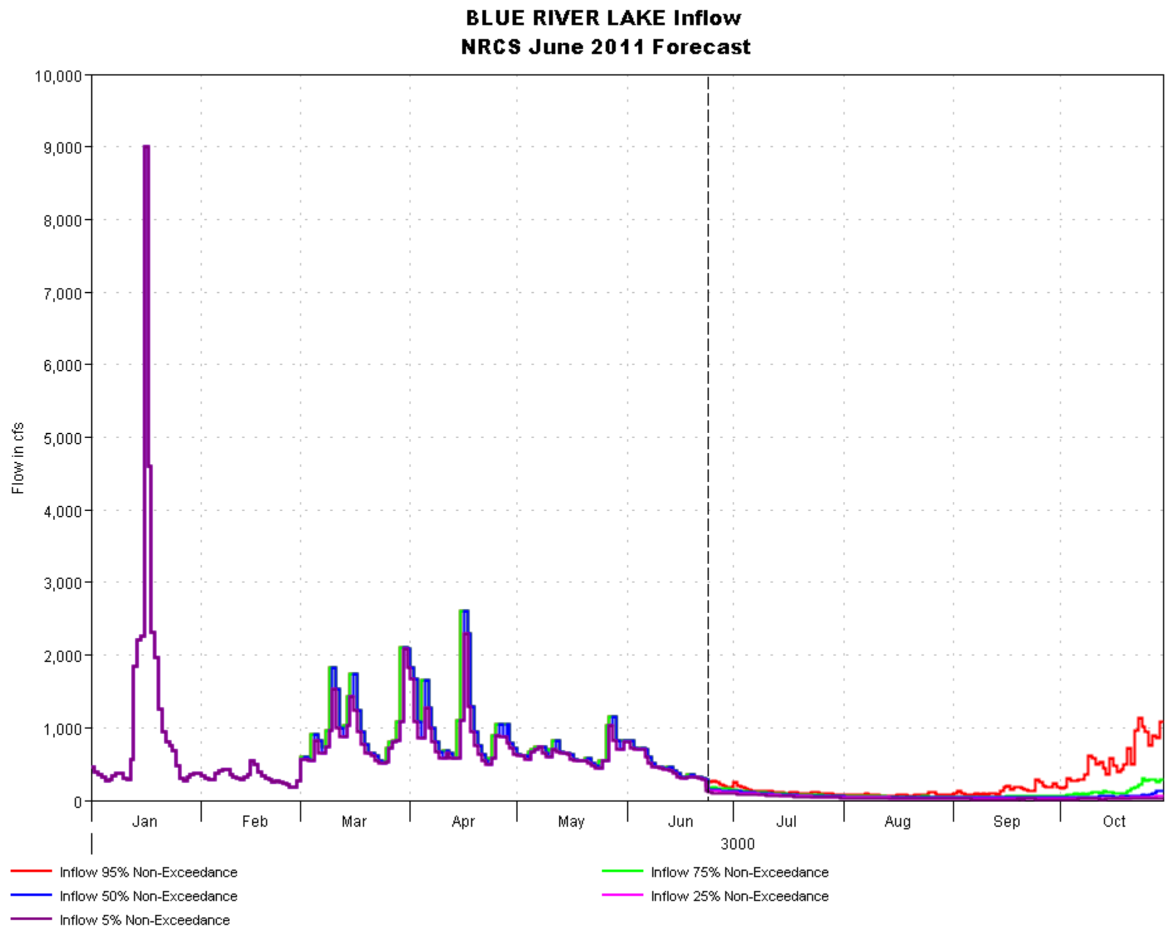

WILLAMETTE_AT EUGENE
NRCS June 2011 Forecast
Flow in cfs
20,000
15,000
10,000
5,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
FLOW 95% Non-Exceedance
FLOW 50% Non-Exceedance
FLOW 5% Non-Exceedance
FLOW 75% Non-Exceedance
FLOW 25% Non-Exceedance

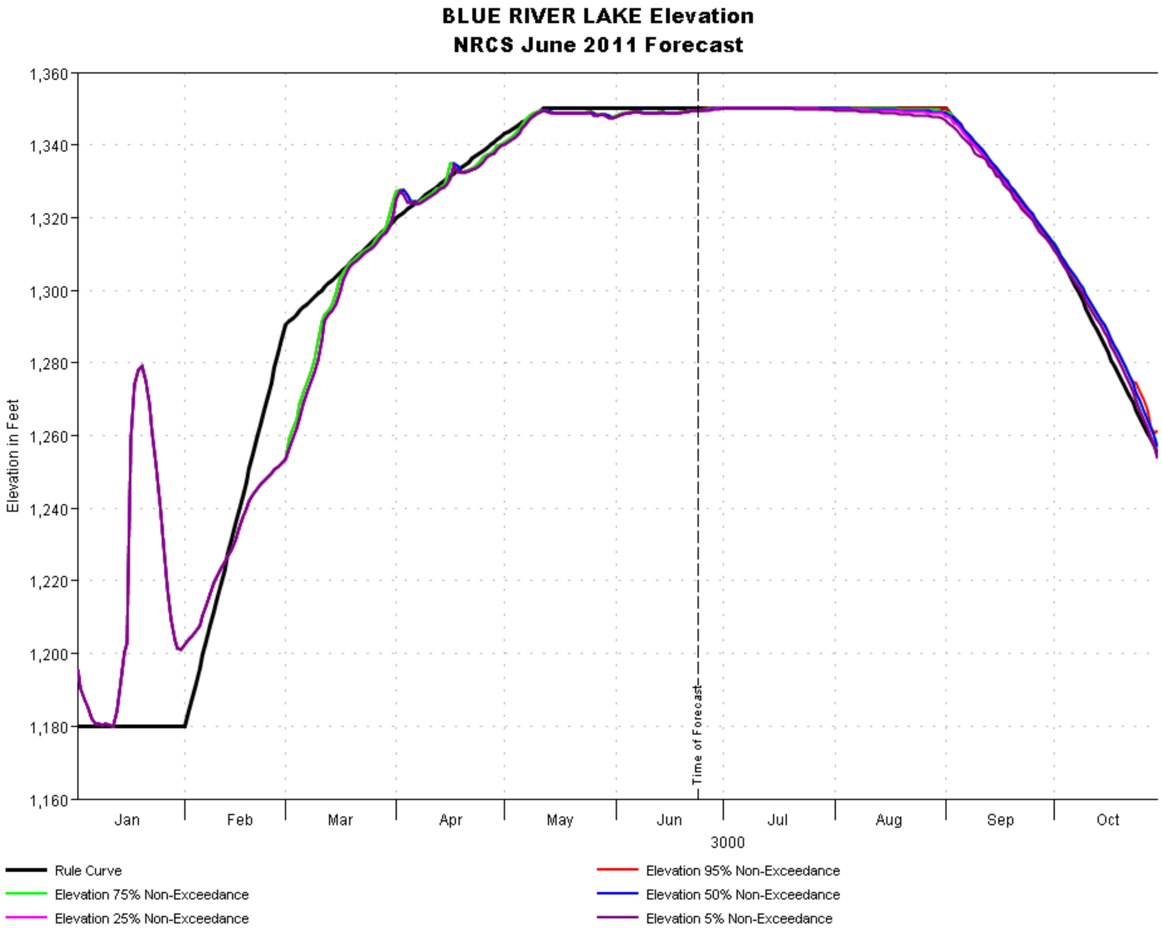

COUGAR LAKE Inflow
NRCS June 2011 Forecast
Flow in cfs
12,000
10,000
8,000
6,000
4,000
2,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Inflow 95% Non-Exceedance
Inflow 75% Non-Exceedance
Inflow 50% Non-Exceedance
Inflow 25% Non-Exceedance
Inflow 5% Non-Exceedance

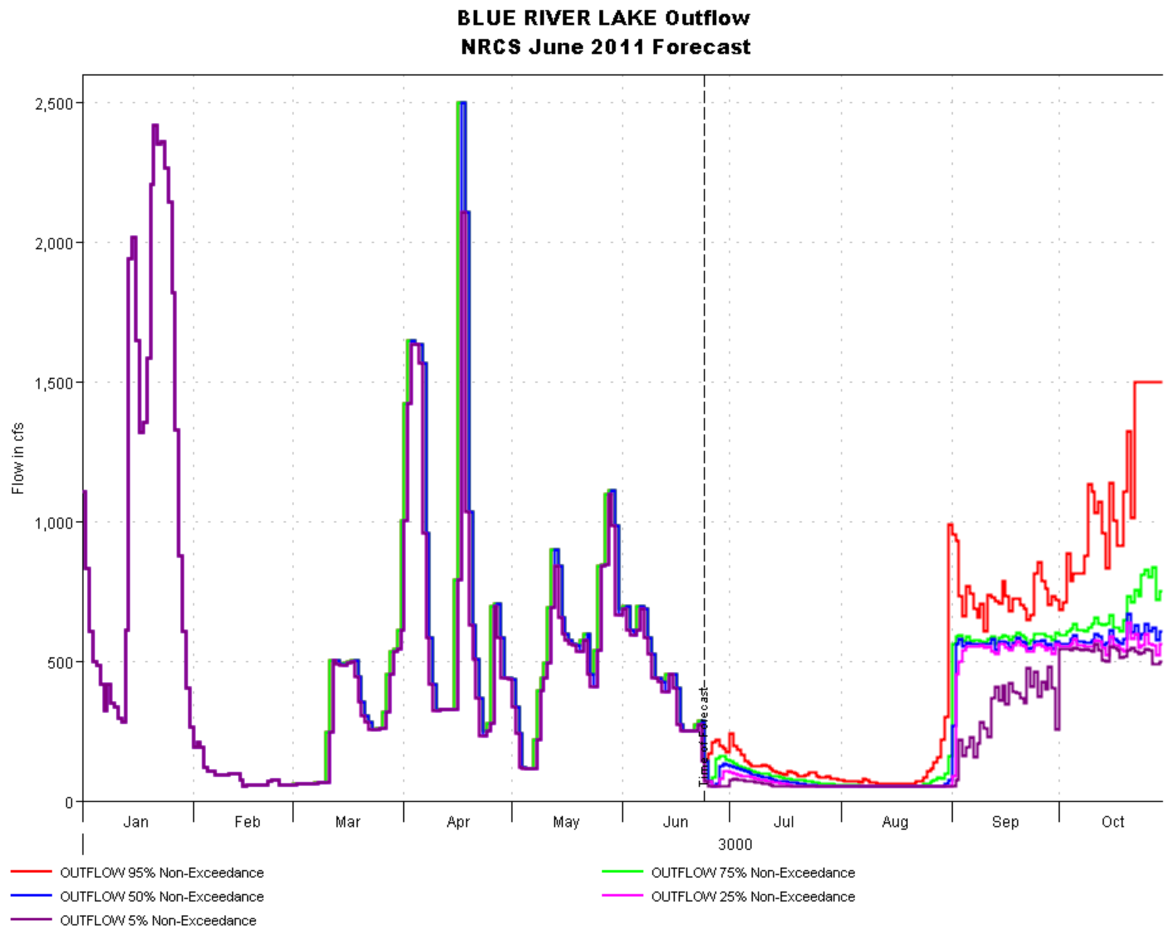


COUGAR LAKE Elevation
NRCS June 2011 Forecast
Elevation in Feet
1,700
1,680
1,660
1,640
1,620
1,600
1,580
1,560
1,540
1,520
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Time of Forecast
Rule Curve
Elevation 75% Non-Exceedance
Elevation 25% Non-Exceedance
Elevation 95% Non-Exceedance
Elevation 50% Non-Exceedance
Elevation 5% Non-Exceedance

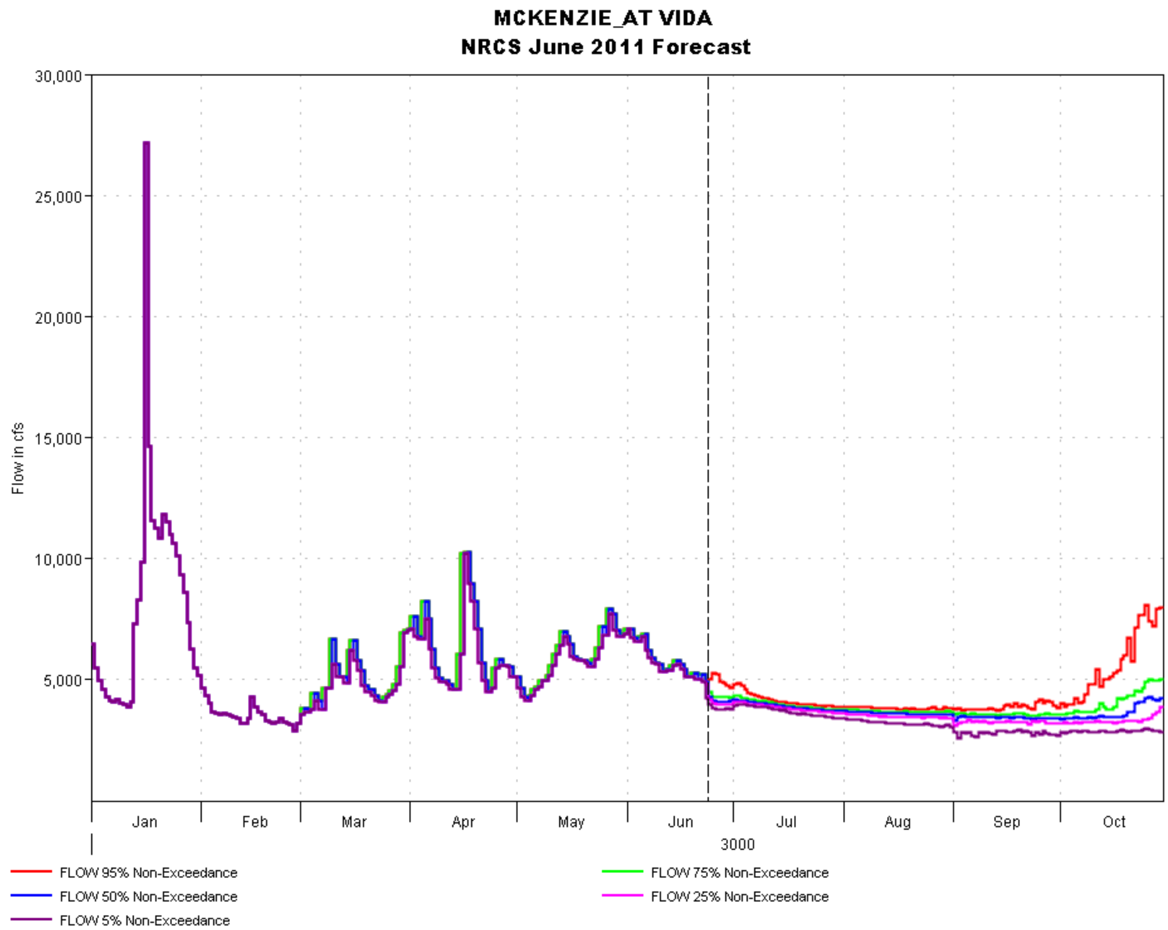

COUGAR LAKE Outflow
NRCS June 2011 Forecast
Flow in cfs
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Time of Forecast
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
OUTFLOW 95% Non-Exceedance
OUTFLOW 75% Non-Exceedance
OUTFLOW 50% Non-Exceedance
OUTFLOW 25% Non-Exceedance
OUTFLOW 5% Non-Exceedance

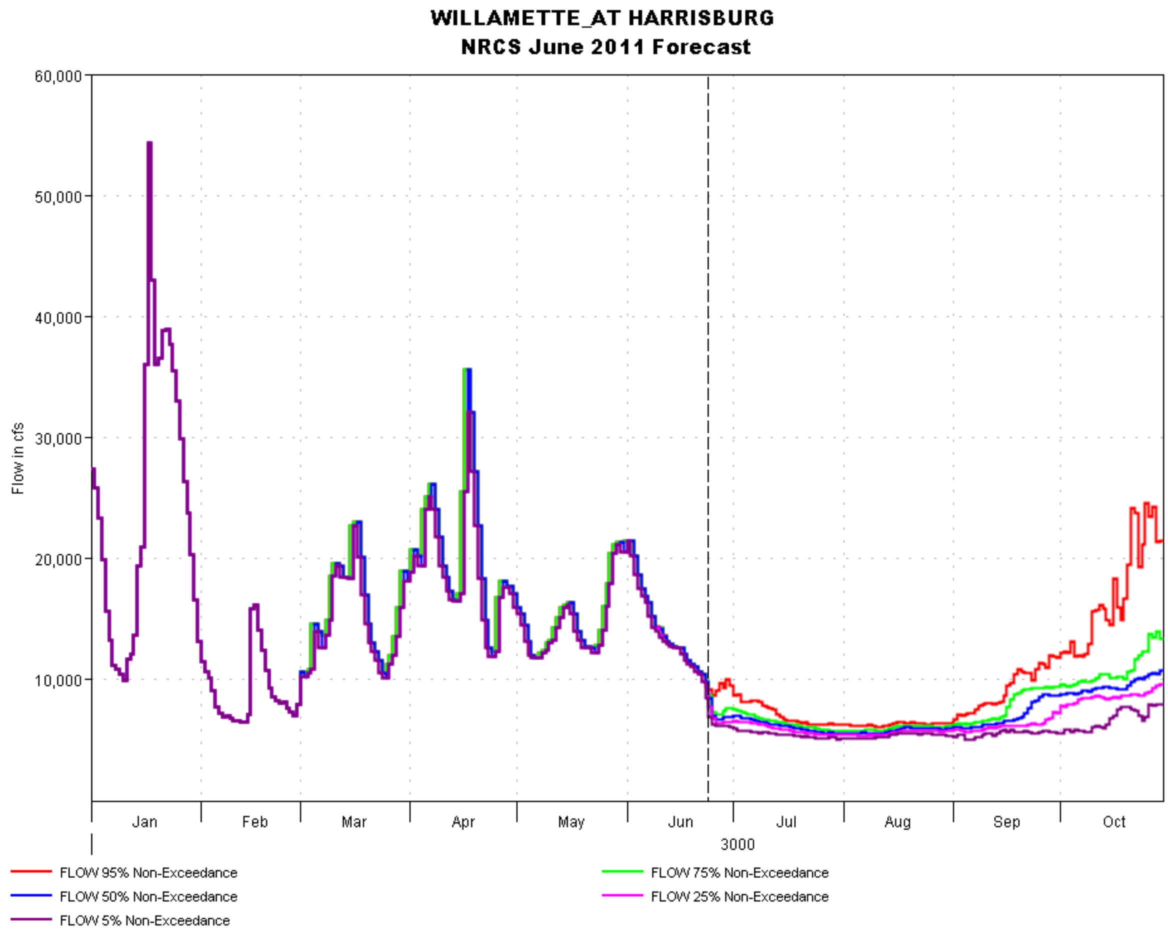

BLUE RIVER LAKE Inflow
NRCS June 2011 Forecast
Flow in cfs
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Inflow 95% Non-Exceedance
Inflow 75% Non-Exceedance
Inflow 50% Non-Exceedance
Inflow 25% Non-Exceedance
Inflow 5% Non-Exceedance

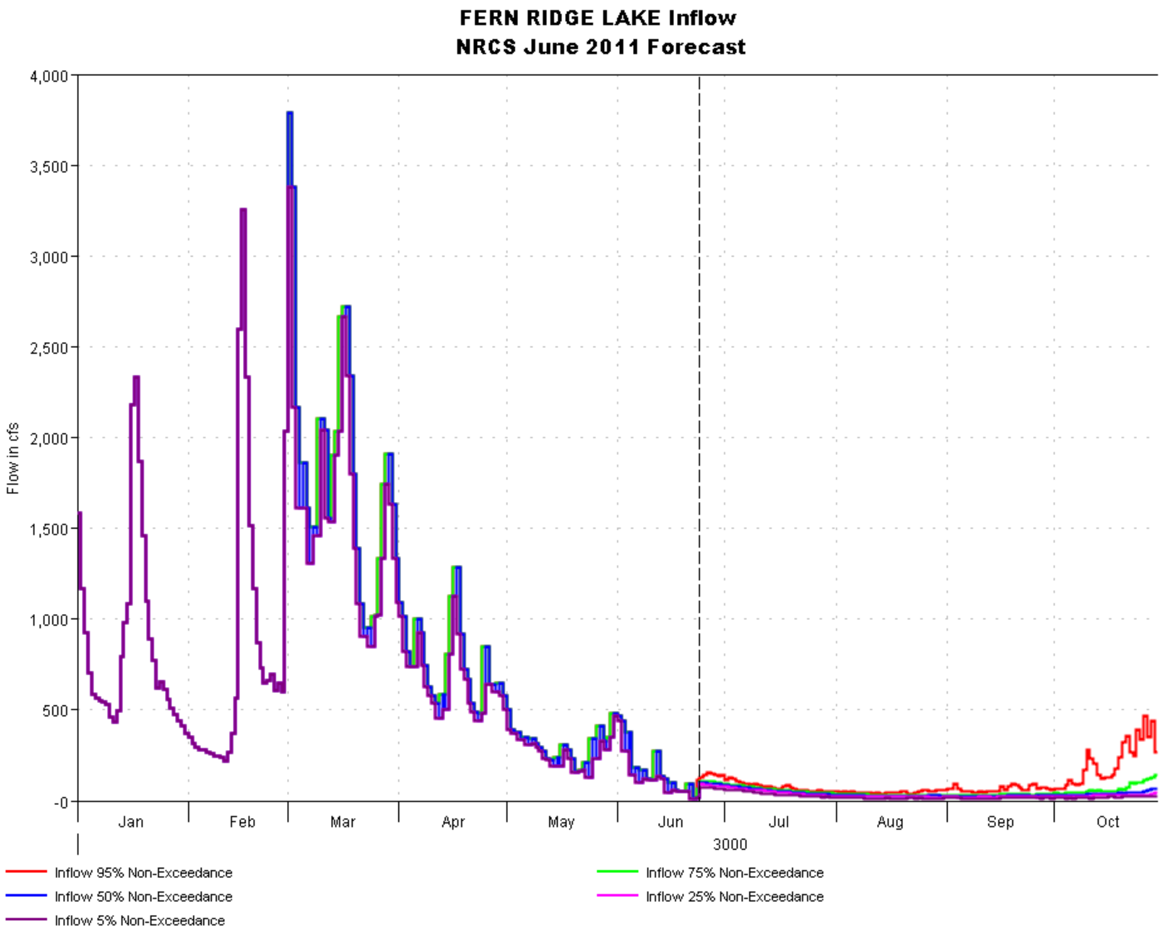

BLUE RIVER LAKE Elevation
NRCS June 2011 Forecast
Elevation in Feet
1,360
1,340
1,320
1,300
1,280
1,260
1,240
1,220
1,200
1,180
1,160
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Time of Forecast
Rule Curve
Elevation 75% Non-Exceedance
Elevation 25% Non-Exceedance
Elevation 95% Non-Exceedance
Elevation 50% Non-Exceedance
Elevation 5% Non-Exceedance

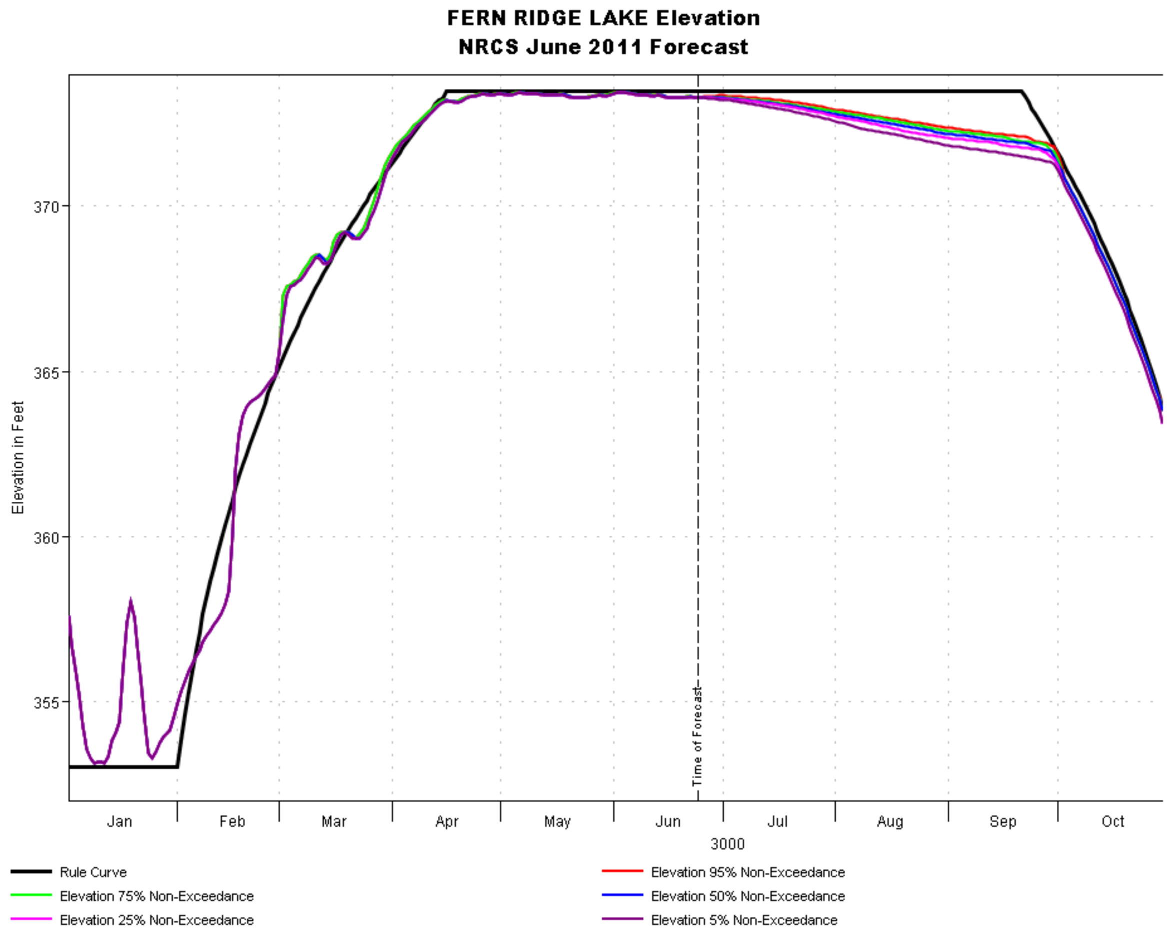


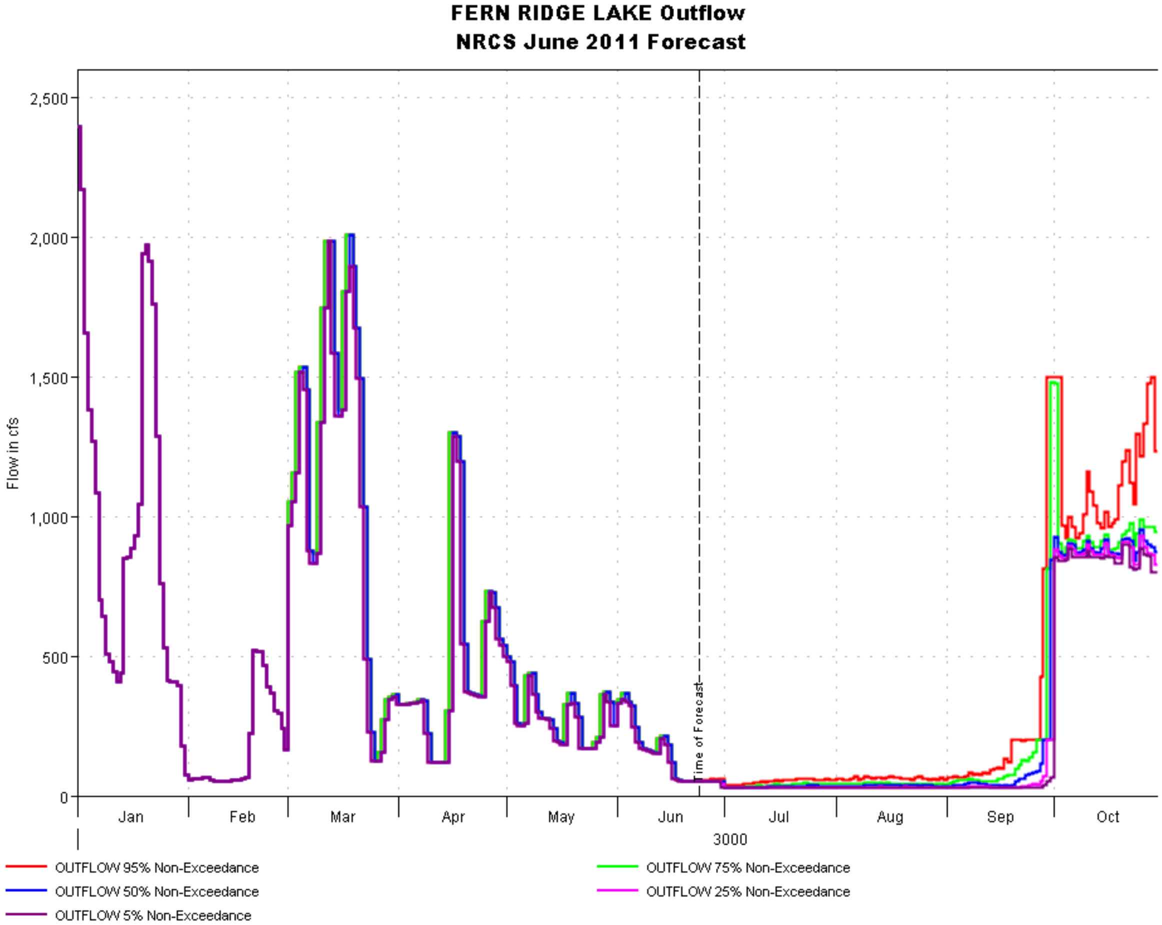
BLUE RIVER LAKE Outflow
NRCS June 2011 Forecast
Flow in cfs
2,500
2,000
1,500
1,000
500
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Time of Forecast
OUTFLOW 95% Non-Exceedance
OUTFLOW 75% Non-Exceedance
OUTFLOW 50% Non-Exceedance
OUTFLOW 25% Non-Exceedance
OUTFLOW 5% Non-Exceedance

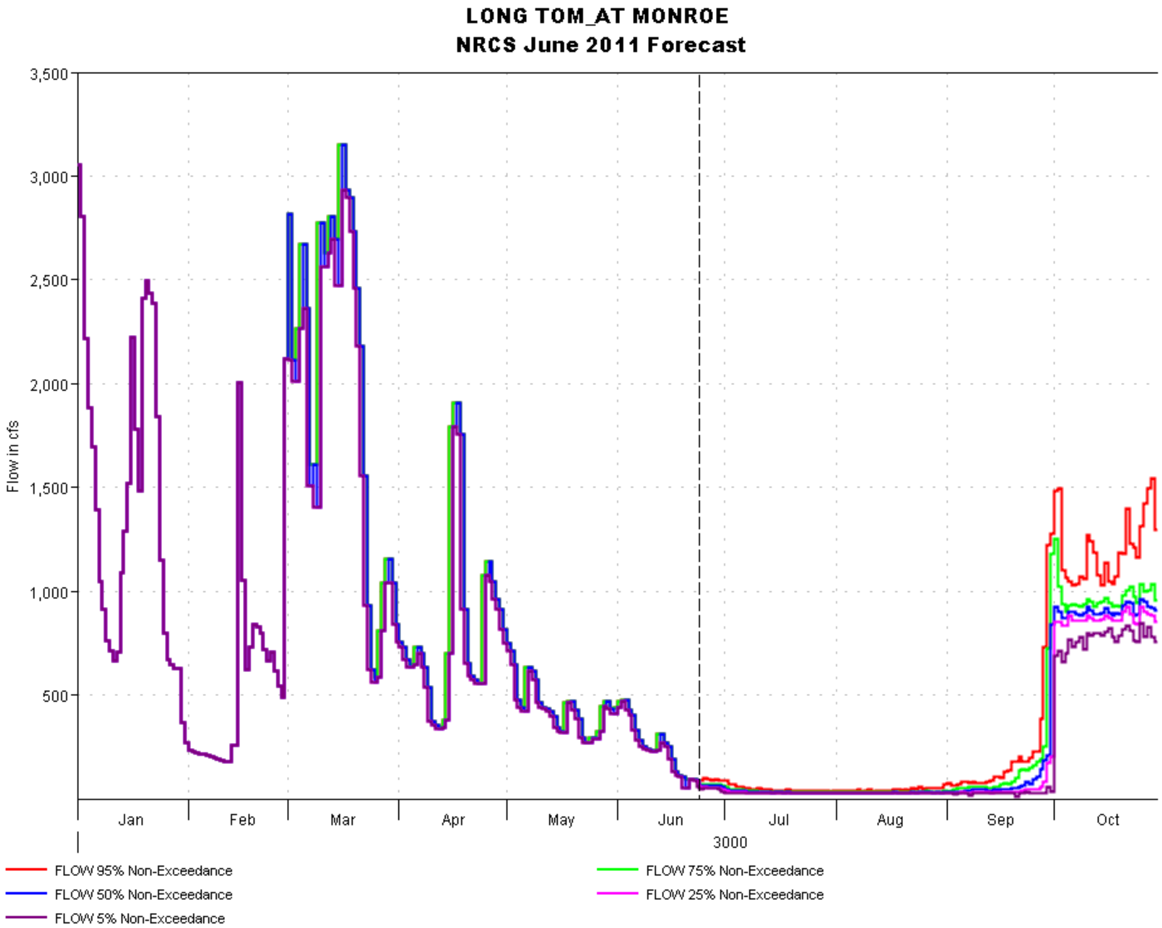

MCKENZIE_AT VIDA
NRCS June 2011 Forecast
Flow in cfs
30,000
25,000
20,000
15,000
10,000
5,000
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
FLOW 95% Non-Exceedance
FLOW 75% Non-Exceedance
FLOW 50% Non-Exceedance
FLOW 25% Non-Exceedance
FLOW 5% Non-Exceedance


WILLAMETTE_AT HARRISBURG
NRCS June 2011 Forecast
Flow in cfs
60,000
50,000
40,000
30,000
20,000
10,000
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
FLOW 95% Non-Exceedance
FLOW 75% Non-Exceedance
FLOW 50% Non-Exceedance
FLOW 25% Non-Exceedance
FLOW 5% Non-Exceedance

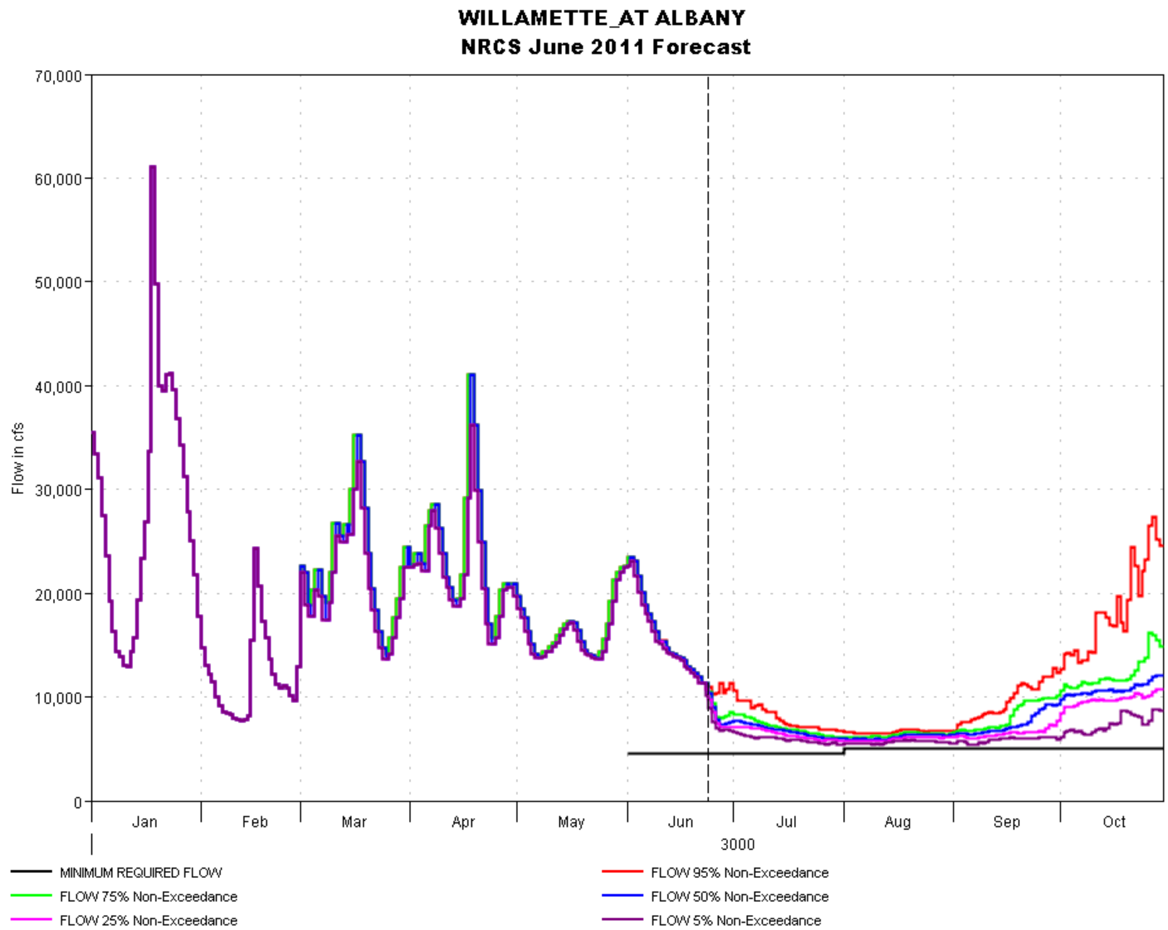

FERN RIDGE LAKE Inflow
NRCS June 2011 Forecast
Flow in cfs
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
-0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Inflow 95% Non-Exceedance
Inflow 75% Non-Exceedance
Inflow 50% Non-Exceedance
Inflow 25% Non-Exceedance
Inflow 5% Non-Exceedance

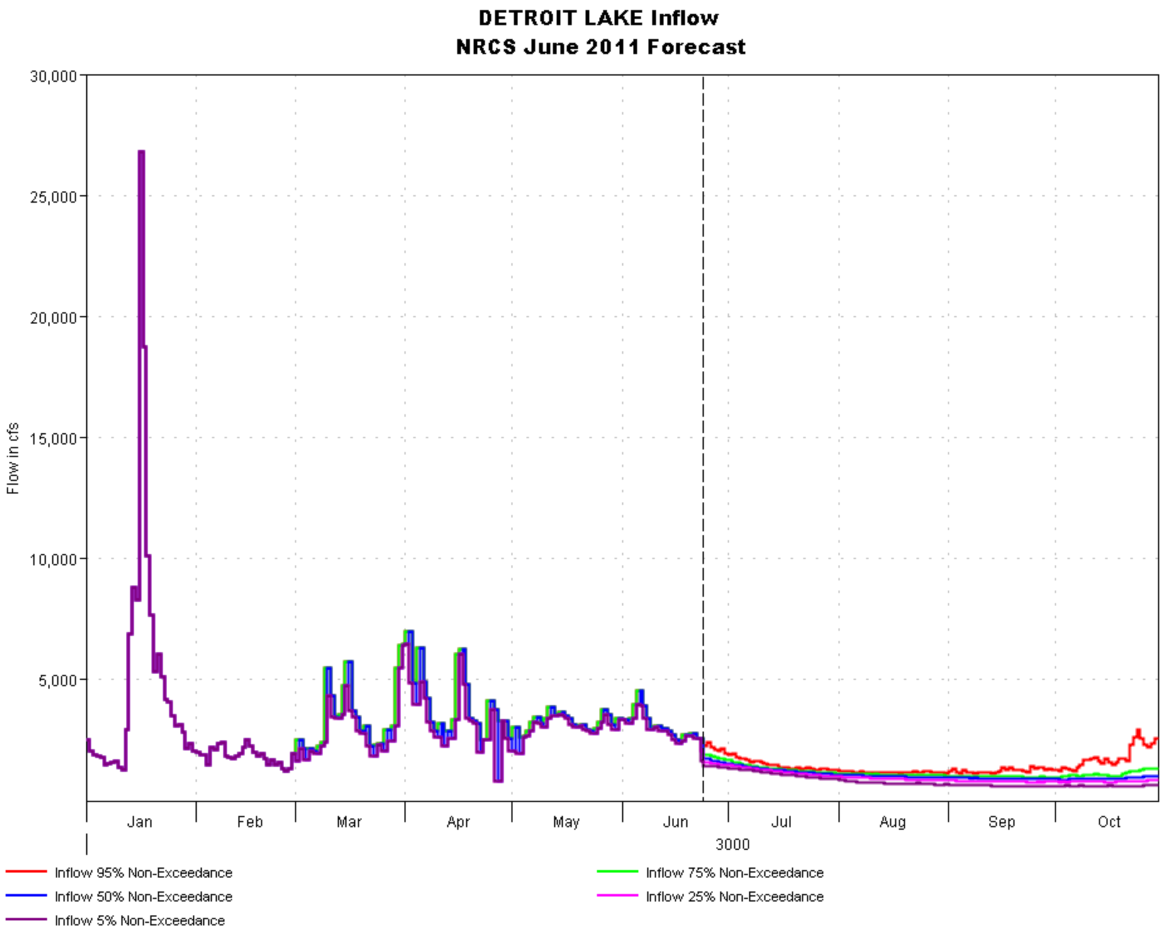

FERN RIDGE LAKE Elevation
NRCS June 2011 Forecast
Elevation in Feet
370
365
360
355
Time of Forecast
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Rule Curve
Elevation 75% Non-Exceedance
Elevation 25% Non-Exceedance
Elevation 95% Non-Exceedance
Elevation 50% Non-Exceedance
Elevation 5% Non-Exceedance

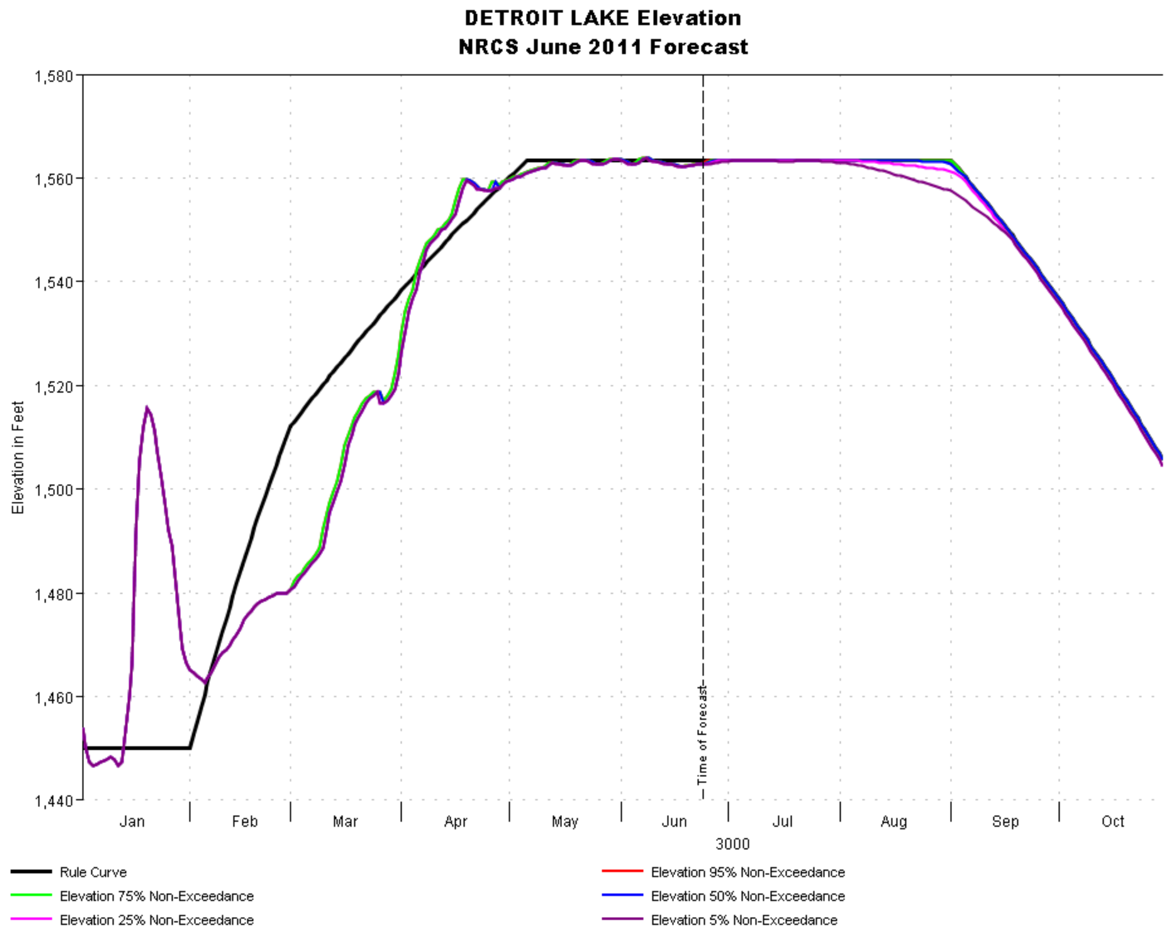

FERN RIDGE LAKE Outflow
NRCS June 2011 Forecast
Flow in cfs
2,500
2,000
1,500
1,000
500
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Time of Forecast
OUTFLOW 95% Non-Exceedance
OUTFLOW 50% Non-Exceedance
OUTFLOW 5% Non-Exceedance
OUTFLOW 75% Non-Exceedance
OUTFLOW 25% Non-Exceedance

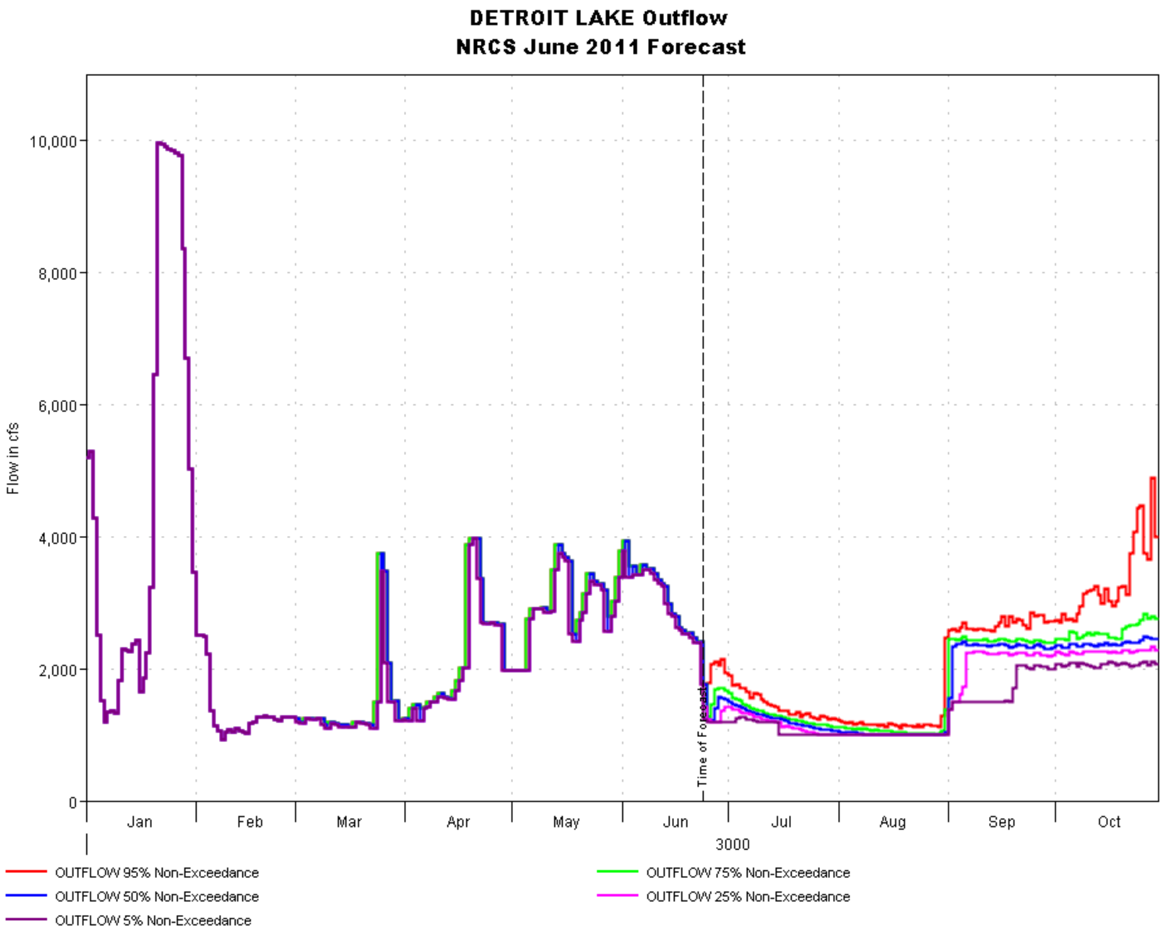


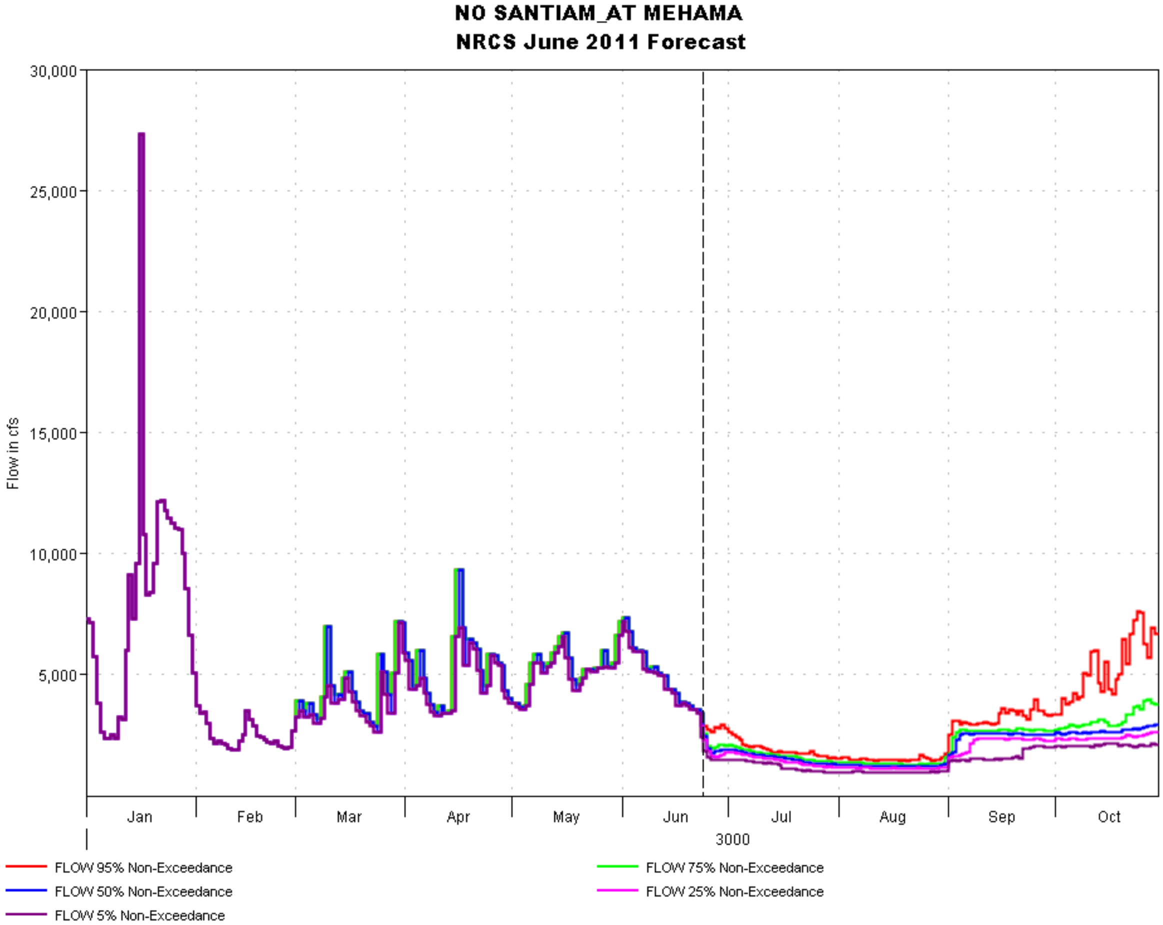
LONG TOM_AT MONROE
NRCS June 2011 Forecast
Flow in cfs
3,500
3,000
2,500
2,000
1,500
1,000
500
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
FLOW 95% Non-Exceedance
FLOW 75% Non-Exceedance
FLOW 50% Non-Exceedance
FLOW 25% Non-Exceedance
FLOW 5% Non-Exceedance

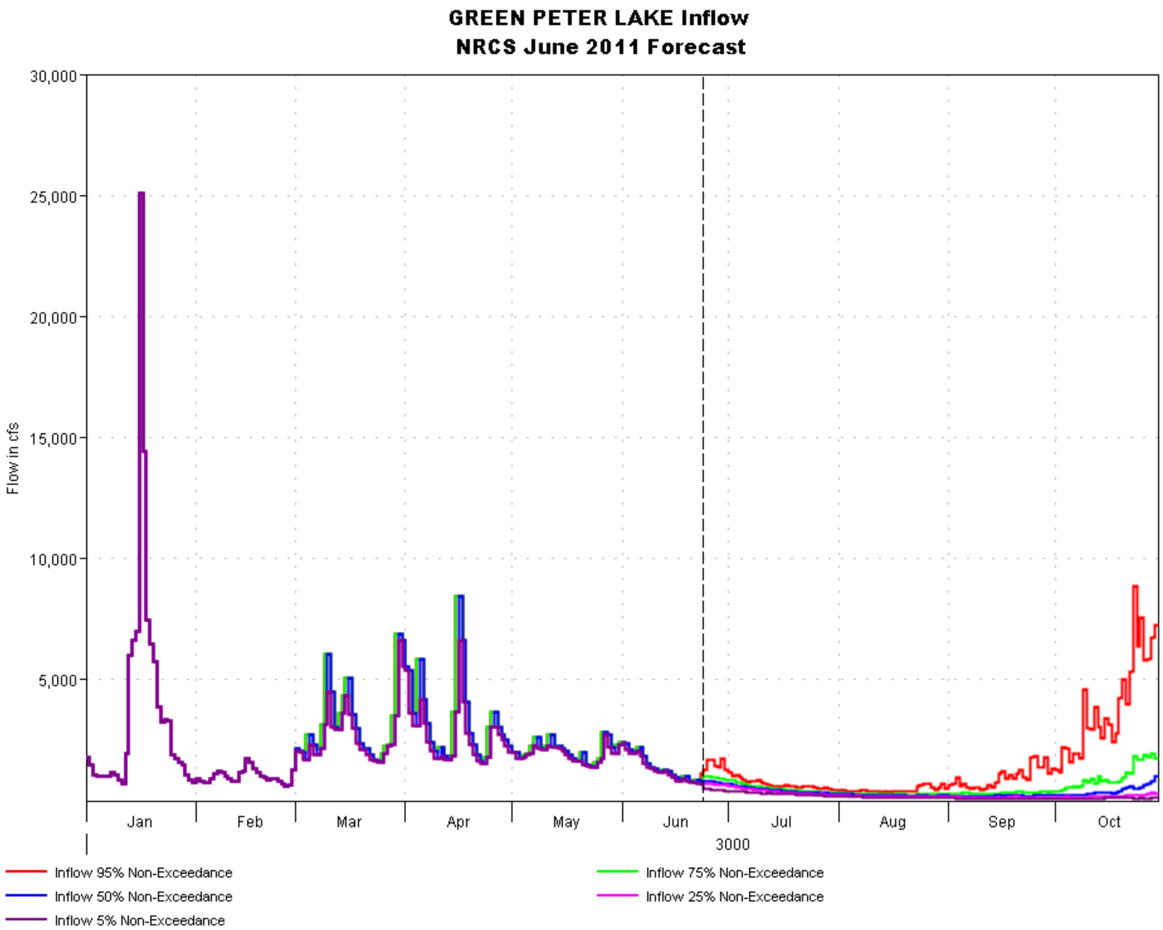

WILLAMETTE_AT ALBANY
NRCS June 2011 Forecast
Flow in cfs
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
MINIMUM REQUIRED FLOW
FLOW 75% Non-Exceedance
FLOW 25% Non-Exceedance
FLOW 95% Non-Exceedance
FLOW 50% Non-Exceedance
FLOW 5% Non-Exceedance

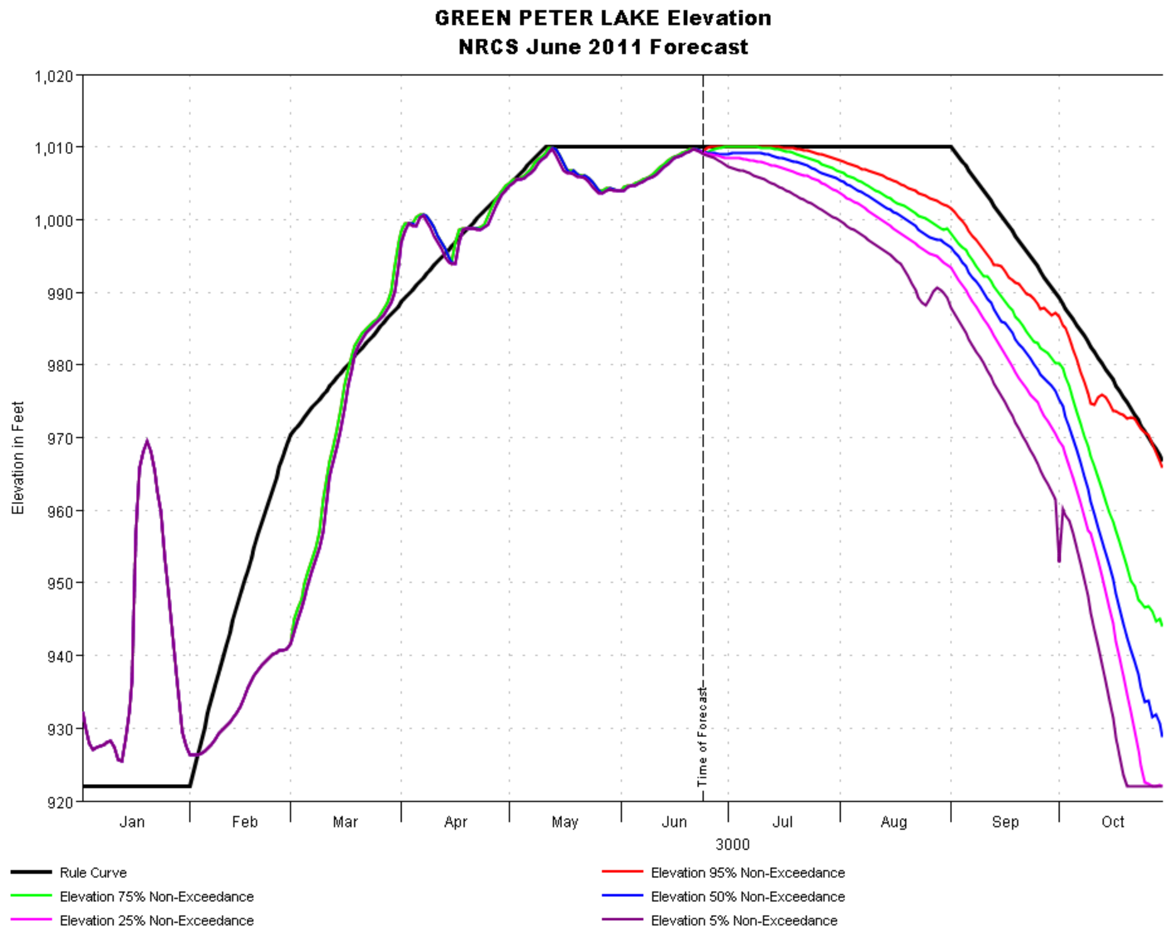

DETROIT LAKE Inflow
NRCS June 2011 Forecast
30,000
25,000
20,000
15,000
10,000
5,000
Flow in cfs
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Inflow 95% Non-Exceedance
Inflow 75% Non-Exceedance
Inflow 50% Non-Exceedance
Inflow 25% Non-Exceedance
Inflow 5% Non-Exceedance

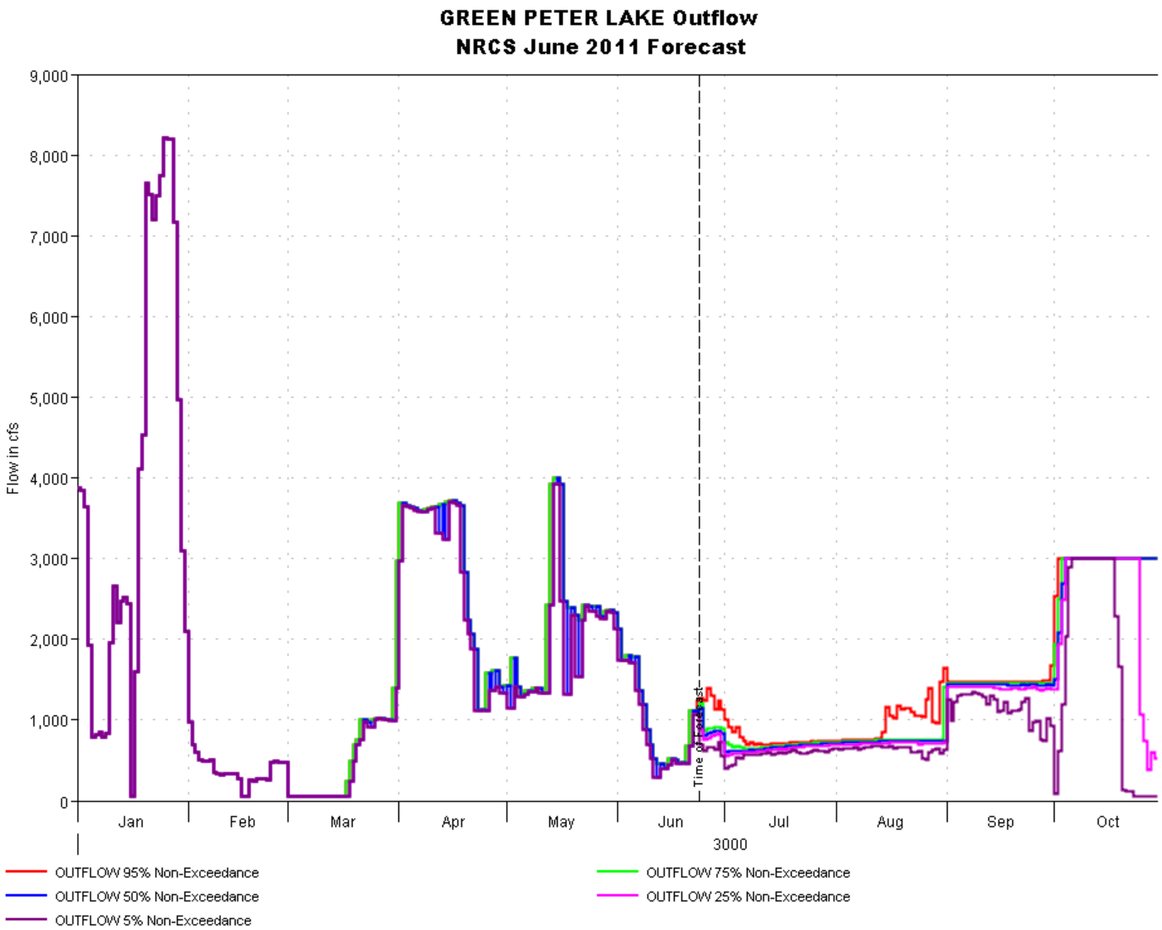

DETROIT LAKE Elevation
NRCS June 2011 Forecast
Elevation in Feet
1,580
1,560
1,540
1,520
1,500
1,480
1,460
1,440
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Time of Forecast
Rule Curve
Elevation 75% Non-Exceedance
Elevation 25% Non-Exceedance
Elevation 95% Non-Exceedance
Elevation 50% Non-Exceedance
Elevation 5% Non-Exceedance

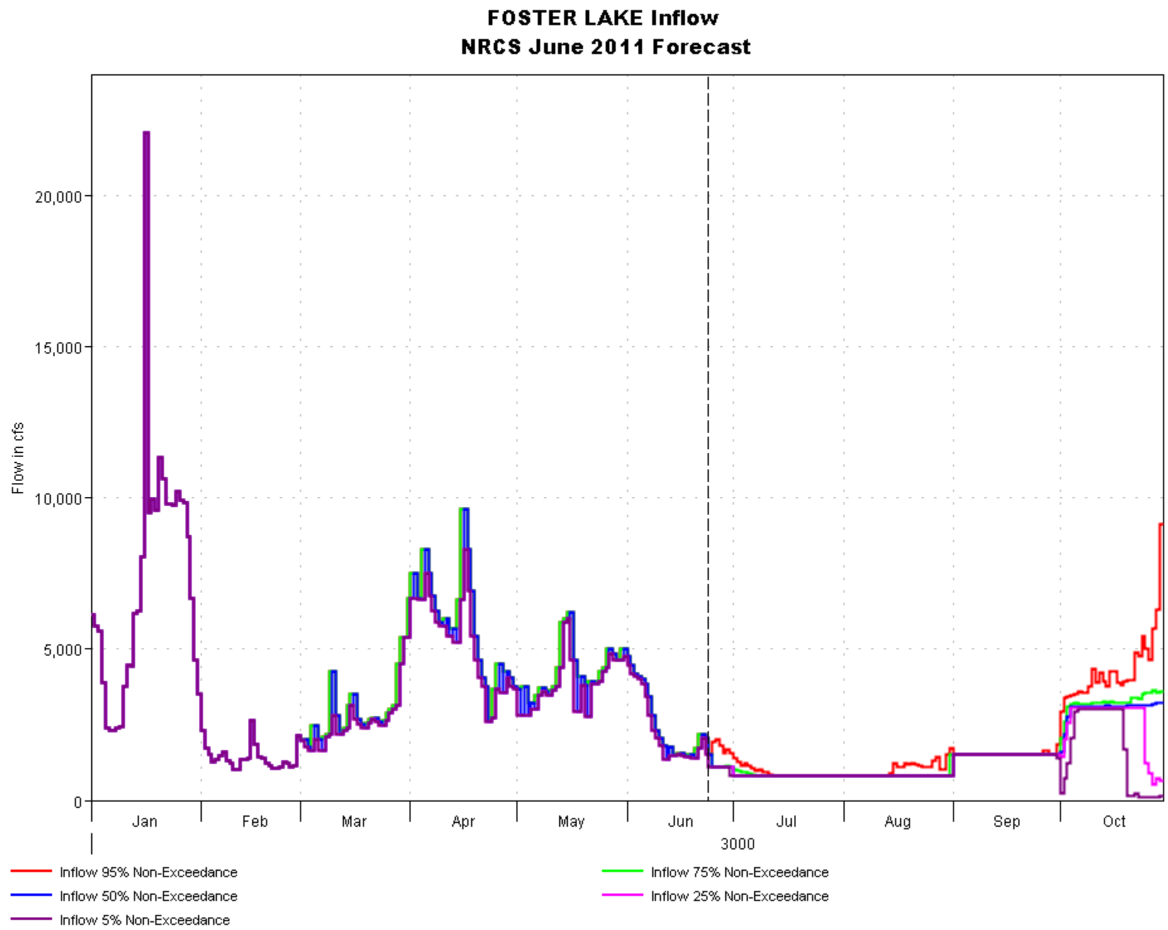

DETROIT LAKE Outflow
NRCS June 2011 Forecast
Flow in cfs
10,000
8,000
6,000
4,000
2,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Time of Forecast
OUTFLOW 95% Non-Exceedance
OUTFLOW 75% Non-Exceedance
OUTFLOW 50% Non-Exceedance
OUTFLOW 25% Non-Exceedance
OUTFLOW 5% Non-Exceedance

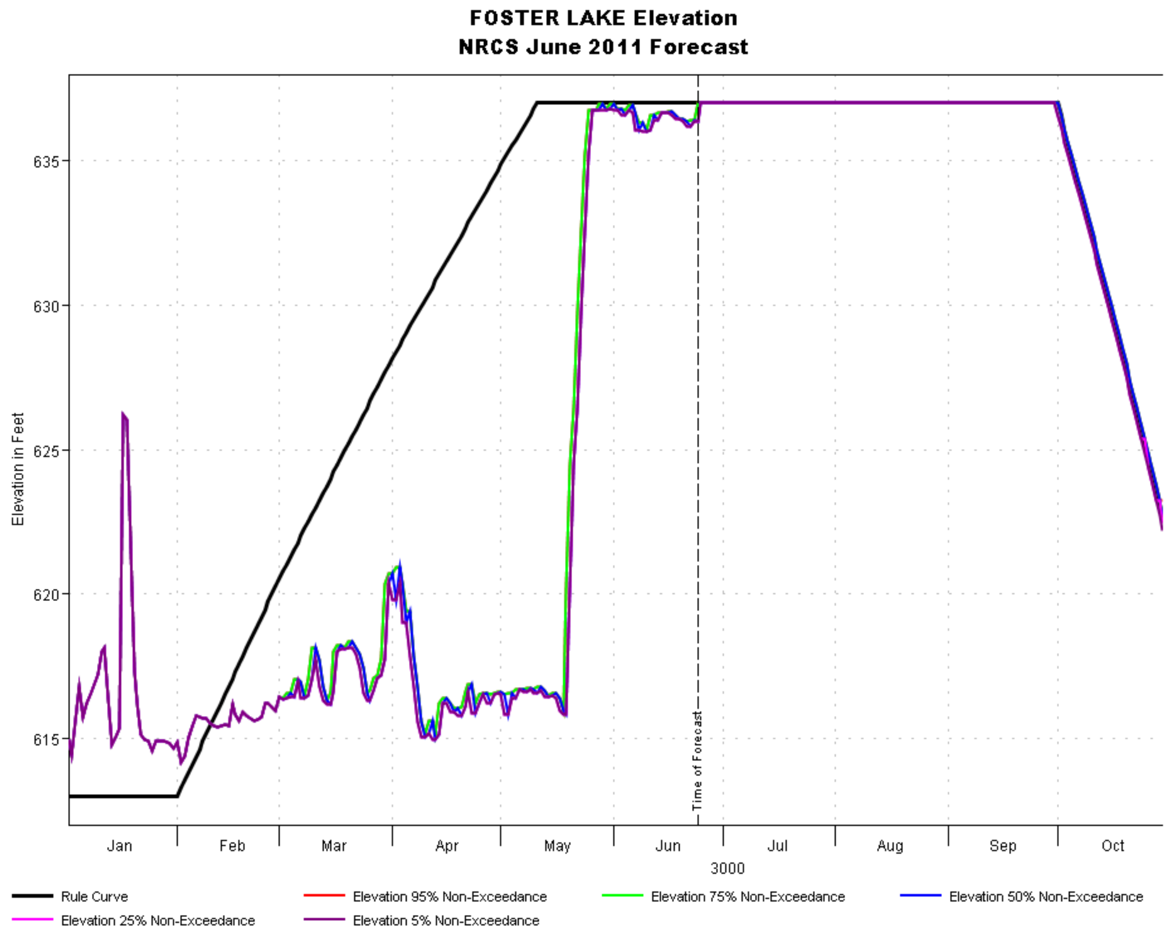

NO SANTIAM_AT MEHAMA
NRCS June 2011 Forecast
Flow in cfs
30,000
25,000
20,000
15,000
10,000
5,000
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
FLOW 95% Non-Exceedance
FLOW 75% Non-Exceedance
FLOW 50% Non-Exceedance
FLOW 25% Non-Exceedance
FLOW 5% Non-Exceedance

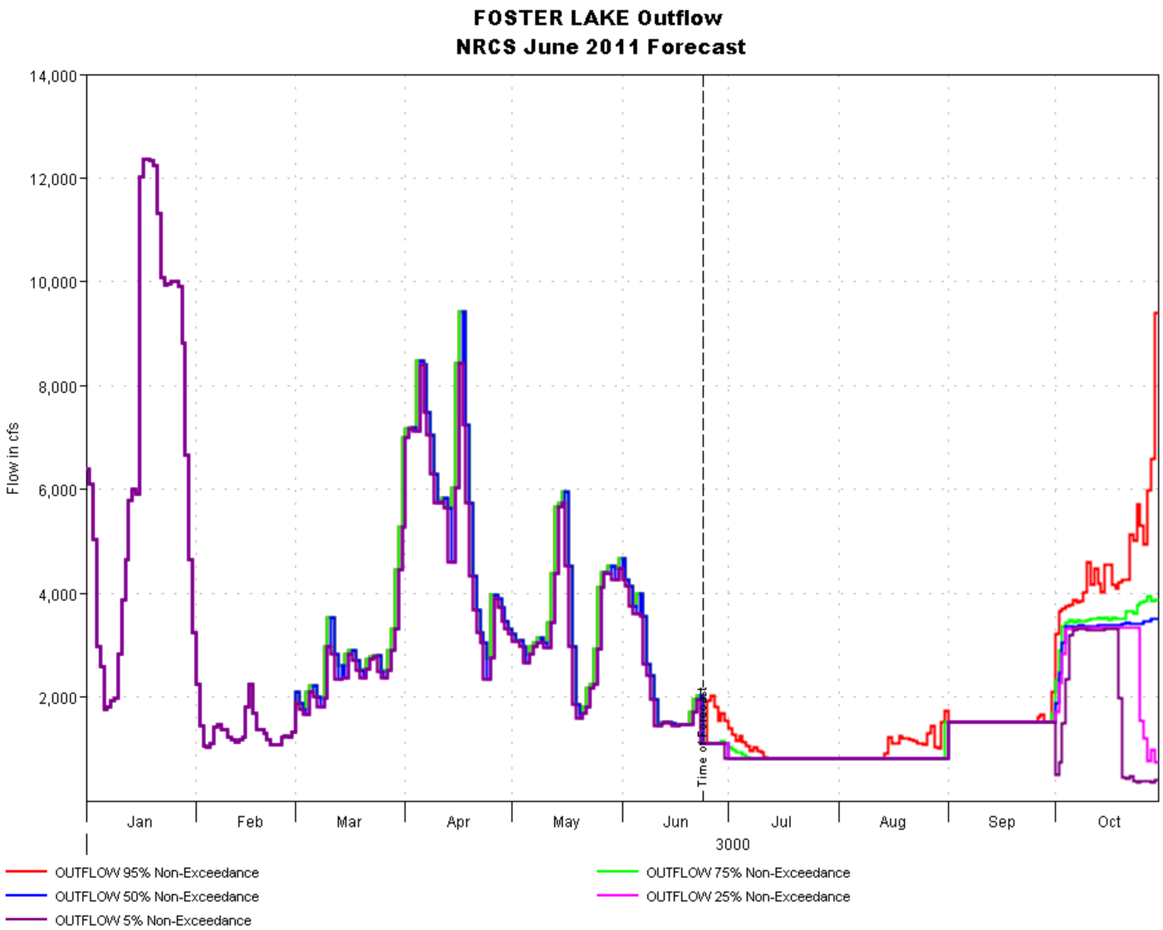

GREEN PETER LAKE Inflow
NRCS June 2011 Forecast
30,000
25,000
20,000
15,000
10,000
5,000
Flow in cfs
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Inflow 95% Non-Exceedance
Inflow 75% Non-Exceedance
Inflow 50% Non-Exceedance
Inflow 25% Non-Exceedance
Inflow 5% Non-Exceedance

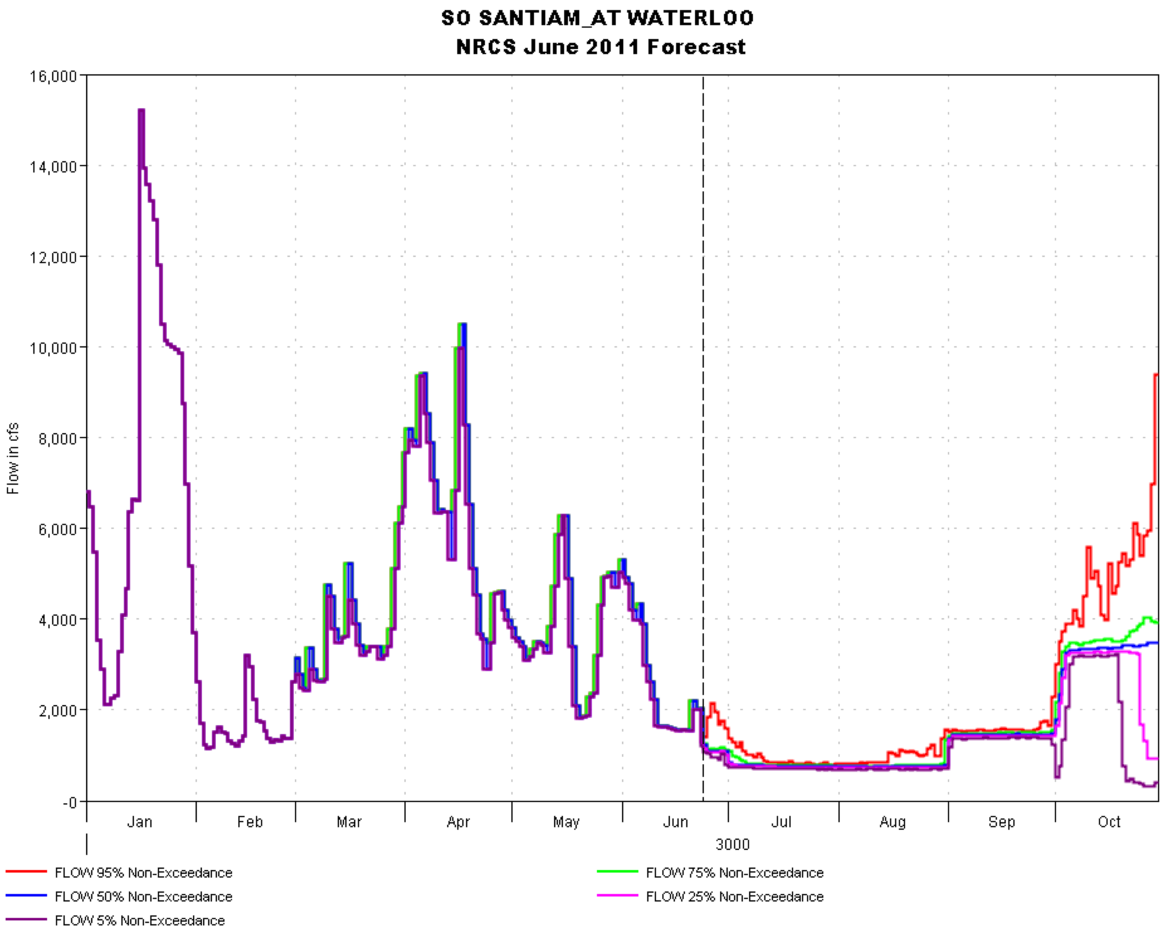

GREEN PETER LAKE Elevation
NRCS June 2011 Forecast
Elevation in Feet
1,020
1,010
1,000
990
980
970
960
950
940
930
920
Time of Forecast
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Rule Curve
Elevation 75% Non-Exceedance
Elevation 25% Non-Exceedance
Elevation 95% Non-Exceedance
Elevation 50% Non-Exceedance
Elevation 5% Non-Exceedance

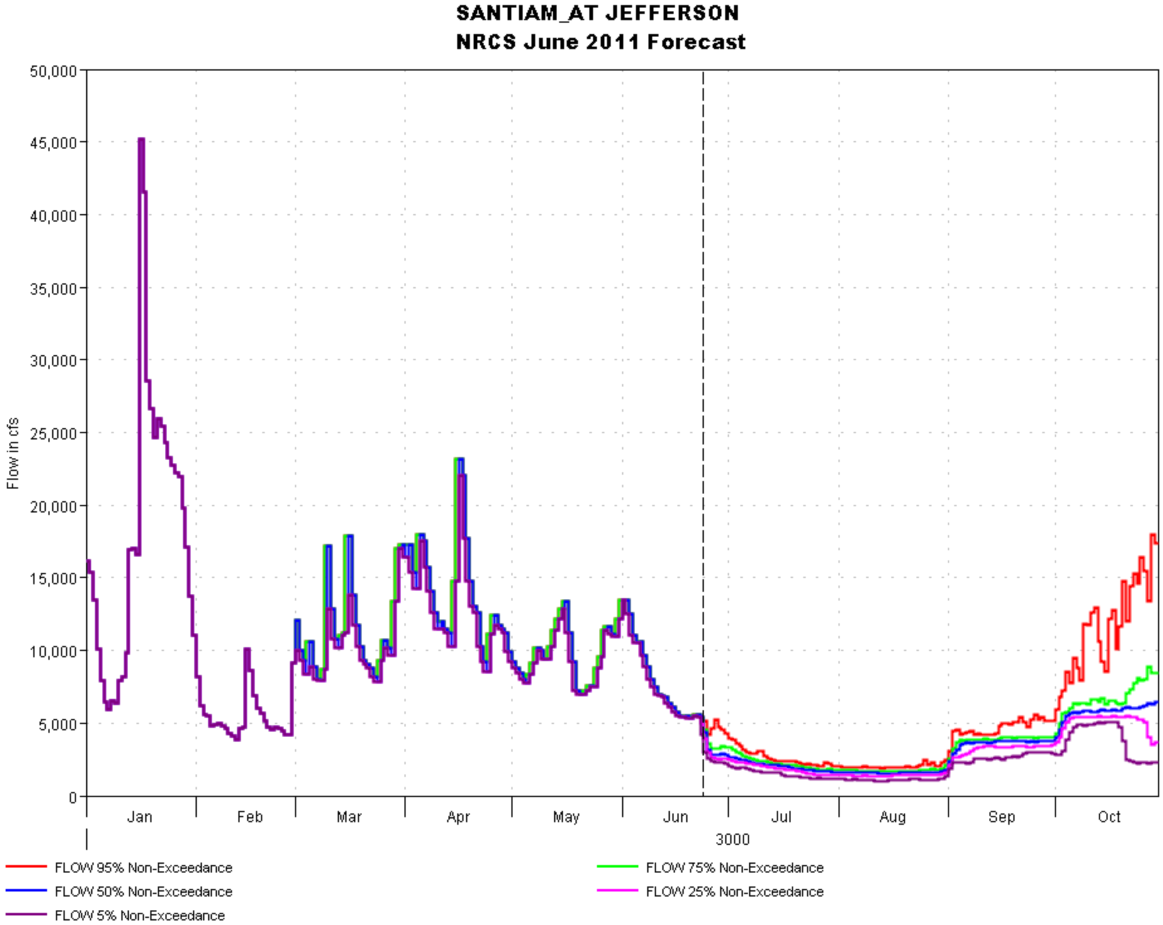

GREEN PETER LAKE Outflow
NRCS June 2011 Forecast
Flow in cfs
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Time of Forecast
OUTFLOW 95% Non-Exceedance
OUTFLOW 75% Non-Exceedance
OUTFLOW 50% Non-Exceedance
OUTFLOW 25% Non-Exceedance
OUTFLOW 5% Non-Exceedance

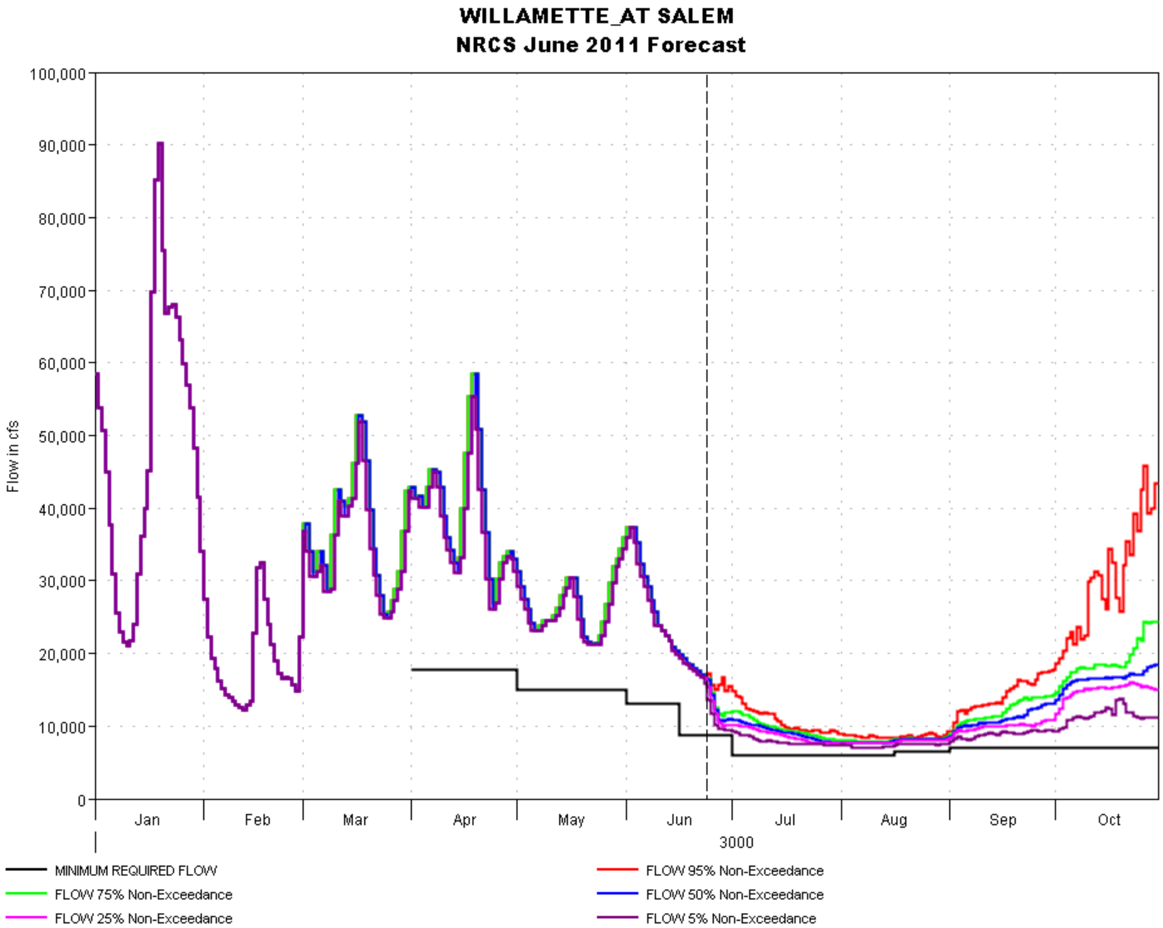

FOSTER LAKE Inflow
NRCS June 2011 Forecast
Flow in cfs
20,000
15,000
10,000
5,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Inflow 95% Non-Exceedance
Inflow 75% Non-Exceedance
Inflow 50% Non-Exceedance
Inflow 25% Non-Exceedance
Inflow 5% Non-Exceedance


FOSTER LAKE Elevation
NRCS June 2011 Forecast
Elevation in Feet
635
630
625
620
615
Time of Forecast
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Rule Curve
Elevation 95% Non-Exceedance
Elevation 75% Non-Exceedance
Elevation 50% Non-Exceedance
Elevation 25% Non-Exceedance
Elevation 5% Non-Exceedance

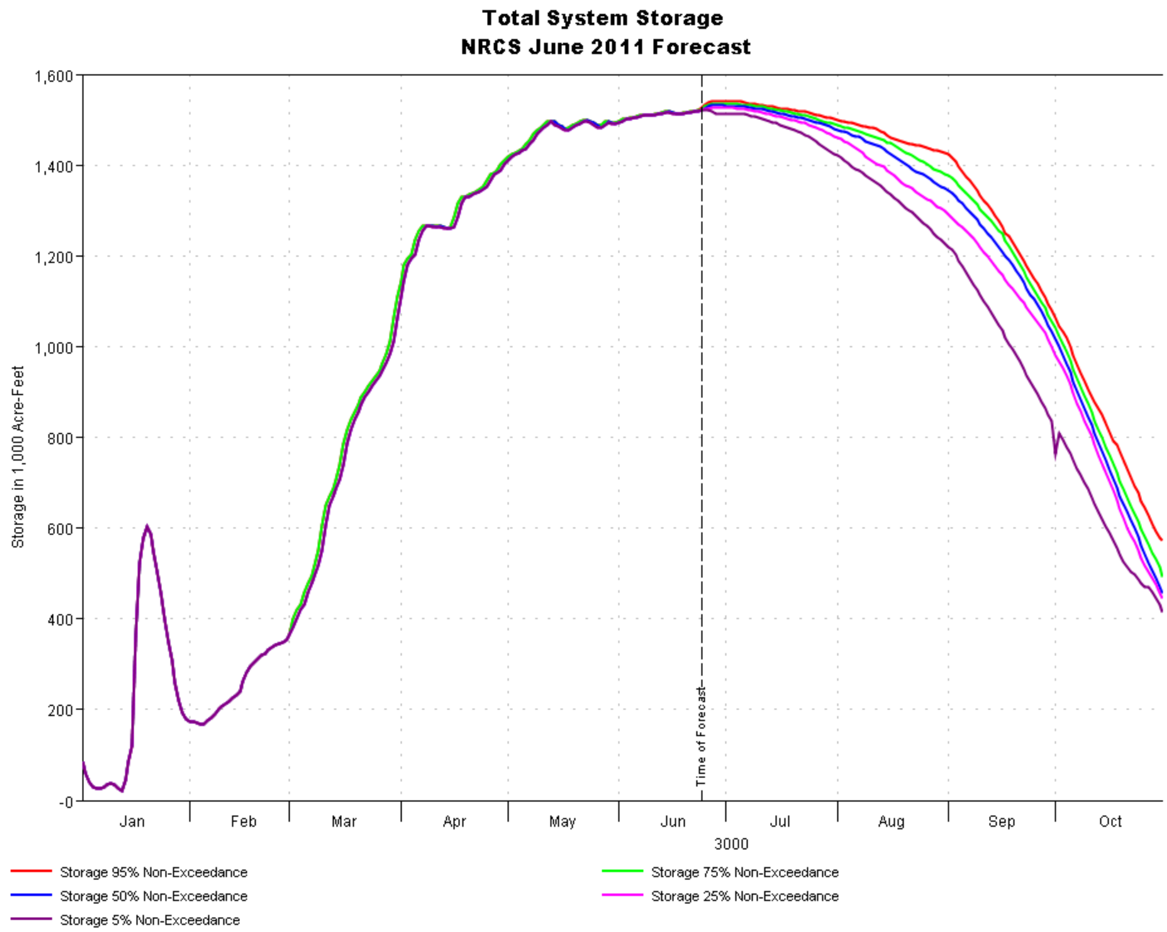

FOSTER LAKE Outflow
NRCS June 2011 Forecast
Flow in cfs
14,000
12,000
10,000
8,000
6,000
4,000
2,000
Time of Forecast
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
OUTFLOW 95% Non-Exceedance
OUTFLOW 75% Non-Exceedance
OUTFLOW 50% Non-Exceedance
OUTFLOW 25% Non-Exceedance
OUTFLOW 5% Non-Exceedance


SO SANTIAM_AT WATERLOO
NRCS June 2011 Forecast
Flow in cfs
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
-0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
FLOW 95% Non-Exceedance
FLOW 75% Non-Exceedance
FLOW 50% Non-Exceedance
FLOW 25% Non-Exceedance
FLOW 5% Non-Exceedance


SANTIAM_AT JEFFERSON
NRCS June 2011 Forecast
Flow in cfs
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
FLOW 95% Non-Exceedance
FLOW 75% Non-Exceedance
FLOW 50% Non-Exceedance
FLOW 25% Non-Exceedance
FLOW 5% Non-Exceedance



WILLAMETTE_AT SALEM
NRCS June 2011 Forecast
Flow in cfs
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
MINIMUM REQUIRED FLOW
FLOW 75% Non-Exceedance
FLOW 25% Non-Exceedance
FLOW 95% Non-Exceedance
FLOW 50% Non-Exceedance
FLOW 5% Non-Exceedance


Total System Storage
NRCS June 2011 Forecast
Storage in 1,000 Acre-Feet
1,600
1,400
1,200
1,000
800
600
400
200
-0
Time of Forecast
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3000
Storage 95% Non-Exceedance
Storage 75% Non-Exceedance
Storage 50% Non-Exceedance
Storage 25% Non-Exceedance
Storage 5% Non-Exceedance

9. NRCS Water Supply Outlook Summaries

Willamette Basin as of May 1, 2011

Following a dry January and February, March and April rebounded with well above average precipitation in the Willamette basin. April precipitation was 163 percent of average. Since the beginning of the water year, precipitation in the basin has been 111 percent of average. The May 1 snowpack as measured at 19 SNOTEL sites was 169 percent of average. It is expected that the snowpack will melt out much later than normal. April runoff boosted storage at all of the reservoirs in the basin. Reservoirs in the Willamette basin are operating well below capacity in anticipation of additional snowmelt to come. On May 1, storage at Timothy and Hagg Lake reservoirs was 102 percent of average or 97 percent of capacity. Since the April Outlook Report, summer streamflow forecasts have increased notably at a number of forecast points in the basin. The May through September streamflow forecasts range from 109 percent of average for the North Santiam at Mehama to 156 percent of average for Fern Ridge Lake Inflow. Elsewhere in the basin the McKenzie River near Vida is forecast to be 125 percent of average for the same period.

Oregon Water Supply Outlook Report as of May 1, 2011

The cool spring conditions that began in mid March continued into April bringing valley rain and mountain snow. While some snow measurement sites have begun to melt, others continued to build snowpack during April. Streamflows, reservoirs, and the mountain snowpack have benefitted from these conditions.

Runoff from the large snowpacks could pose problems downstream if temperatures were to warm up rapidly. However, below normal temperatures are forecast throughout the region for the first half of May and it is expected that snow melt and spring runoff will be delayed or at least slowed.

As of May 1, all water supply forecasts points in Oregon are projected to have well above normal flows for the summer low flow period.

SNOWPACK

All basins in the state reported well above average snowpacks on May 1. During April, some sites gained snowpack while other sites began a slow melt out. Snowpack gain or melt was a function of aspect and elevation as the sun angle increased and days lengthened. New records were set on May 1 for high snow water content at 4 SNOTEL sites in the Wallowa and Elkhorn Mountains of northeast Oregon.

On April 1, the snowpack in Oregon ranged from 149 percent of average in the Upper Deschutes and Crooked basin to 220 percent of average in the Upper John Day basin.

PRECIPITATION

April continued to be colder and wetter than normal following a stormy and wet March. All basins in the state reported a wetter than normal April. Precipitation totals for the month ranged from 132 percent of average for the Burnt, Powder, Pine, Grande Ronde, and Imnaha basins to 200 percent of average for Lake County.

Precipitation during the months of March and April has more than made up for the very dry conditions experienced during January and February this year. Since the beginning of the water year, precipitation totals range from 110 percent of average for the Klamath basin to 135 percent of average for the Owyhee and Malheur.

OREGON Water Supply Outlook Report as of June 1, 2011

The La Nina conditions present in the Pacific Ocean all winter continued to affect Oregon weather patterns during May. Water supply users will note that it has been a very wet and cold spring, bringing lots of rain to the valleys and snow to the mountains. March, April and May were colder and wetter than normal for all basins in Oregon.

The snowpack continued to build through March and April with the beginning of the melt out delayed until May. Reservoirs throughout the state were full by May 1 and began to spill water as rainfall and snowmelt combined to raise streamflows. During May, many streams began to experience high flows with some localized flooding. Numerous stream systems throughout the state continued to experience bank full conditions as of June 1.

If June weather conditions remain cool and dry, the remaining snow could melt off gradually. However, if the weather pattern warms up and/or more wet weather arrives, additional flooding is likely. Water users are cautioned to expect higher than normal flows for the next several weeks, resulting in potentially hazardous river conditions.

SNOWPACK

Late season storm events brought new snow to some sites during May. On June 1, all basins in the state were reporting residual snow at SNOTEL sites. The remaining snow is quite deep and has been melting at a steady rate. Warm rains have brought periodic rapid snowmelt to some sites causing high flows and some downstream flooding. Soil moisture sensors at SNOTEL sites have been recording elevated soil moisture as the snow melts out.

As of June 1, most basins in the state were reporting well above average snowpacks. Snow was remaining at 40 out of 77 SNOTEL sites measured in Oregon. One snow course was measured in Crater Lake National Park for the June 1 survey. At most sites with snow remaining, the snow water content was well above what is expected at this time of year.

New records were set for snow water content on June 1 at 16 SNOTEL sites throughout the state. Another 12 SNOTEL sites reported their second highest June 1 snowpack over the 25 to 30 year period of record.

PRECIPITATION

Precipitation during March, April and May has been well above average throughout Oregon. Abundant May precipitation has contributed to high stream flows and some flooding in the state. Precipitation during May ranged from 118 percent of average in the Hood, Mile Creeks and Lower Deschutes basin to 212 percent of average in the Harney basin.

Since the beginning of the water year, precipitation totals have ranged from 114 percent of average in the Willamette basin to 141 percent of average in the Owyhee and Malheur.

RESERVOIRS

Most reservoirs in the state gained storage during May, and many are at or near capacity. Others spilled to make room for more water to come. The abundant runoff and continued high reservoir inputs suggest that there may be some carryover at the end of the 2011 irrigation season.

The June 1 storage at 26 major irrigation reservoirs analyzed in this publication was 106 percent of average. A total of 2,734,100 acre feet of water were stored on June 1, representing 85 percent of useable capacity. Last year at this time, these same reservoirs stored 1,843,500 acre feet of water.

STREAMFLOW

High streamflows and localized flooding occurred in most of Oregon's basins during May. With the abundant, late season snowpack, more high water is expected in June. Additional precipitation and warm conditions could flood streams that are already running high. In the summer ahead, streamflows are expected to remain high as the snowpack melts out much later than normal.

Due to the unusually late season snowpack and above average spring precipitation, streamflow forecasts published in April have already been exceeded for a number of points in Oregon.